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Does the nonfarm economy offer pathways for upward mobility? Evidence from a panel data study in Ethiopia

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Abstract

Several empirical studies across developing countries document a positive correlation between participation in rural nonfarm employment and households' wealth or income status. However, the direction of causality is far from obvious. This paper explores whether nonfarm employment leads to higher consumption expenditure growth in Ethiopia. We find that; 1) Households' consumption expenditure growth is positively correlated with the initial share of nonfarm income. 2) The growth elasticity of nonfarm income share is higher for wealthier households; and 3) the source of growth for nonfarm participants lies in the higher rates of return participants enjoy on their human and physical capital.

Key words: rural nonfarm, income dynamics, income diversification, Africa, Ethiopia, impact

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1. Introduction

Several studies across developing countries have shown that participation in rural nonfarm employment (RNFE) is positively correlated with total income, wealth and even agricultural productivity (Reardon, 1997, Lanjouw and Lanjouw, 2001, Reardon et al., 2001, Haggblade, 2007). The observed positive correlations between nonfarm participation and higher income have fostered the hope that nonfarm employment may serve as a way out of poverty. However, studies of determinants of participation indicate that typically the rich have superior access to remunerative nonfarm activities (Corral and Reardon, 2001, de Janvry and Sadoulet, 2001, Woldenhanna and Oskam, 2001, Lanjouw and Shariff, 2002, Kung and Lee, 2001, Dercon and Krishnan, 1996) [1]. These findings thus call into question the direction of causality in the positive relationship.

Although there are several studies on nonfarm employment, only few examine the relationship between participation in nonfarm activities and subsequent income growth of households. A panel study of income diversification and poverty in India by Kijima and Lanjouw (2005) tries to link regional changes in poverty level with nonfarm sector expansion. They found no evidence for a direct impact of nonfarm employment on poverty. However, they noted that by raising the agricultural wage rate and providing the poor with a safety net, nonfarm employment play an important indirect role. Another study is Block and Webb's paper on the dynamics of livelihood diversification in Ethiopia (Block and Webb, 2001). The paper examines whether higher diversification in one period is associated with higher income and consumption outcomes in subsequent period. They found that households who are more diversified in the initial period subsequently increased their relative income and calorie intake.

While Block and Webb (2001) make an important contribution in exploring the impact of diversification on welfare dynamics, the sample used in their analysis and the initial period under consideration are too specific for broad generalizations. The survey sites in the sample were selected because of their famine experience and the two periods compared are the post famine year 1989 and post reform year 1994. Moreover, they use crop share of income as a measure of diversification. Evidently, this is not equivalent to share of nonfarm income since even the incomes of pure agriculturalists may constitute income from crop, livestock, farm wage employment and transfers. Hence the conclusions from crop share, while giving some kind of indication, can not be fully extended to what happens when households engage in nonfarm activities.

This paper examines the impact of rural farm households' diversification into nonfarm employment on their consumption expenditure dynamics. It addresses the limitations in Block and Webb (2001) by focusing on income from rural nonfarm employment and by using panel data on a diversified sample. Our study also goes further and investigates the sources of income growth for nonfarm participants. Moreover, this paper examine whether nonfarm employment is pro-poor by estimating its impact on expenditure growth separately for the poor and the rich.

Consistent with the pattern in other African countries, we find that *total nonfarm income* increases across expenditure and wealth terciles. Households at the top tercile of the distribution earn 75% more per capita than those in the bottom. However, unlike the case for several other African countries, the *share* of income from nonfarm employment is not higher for the rich.

The results from our parametric and non-parametric analysis suggest that participation in nonfarm activities accelerates income growth and hence enable upward mobility. Our regression results exploring the impact of nonfarm participation on consumption expenditure growth indicate that households who participate in RNFE experience higher growth in expenditure with the growth rate increasing as one engage in nonfarm employment more intensively. We also find that RNFE has more impact on consumption expenditure growth of wealthier households. Our decomposition analysis indicates to the source of better growth for nonfarm employment participants. The analysis shows that rural nonfarm employment participants enjoy higher rates of return to their human and physical capital than do non-participants.

The remainder of the paper proceeds as follows. Section 2 discusses the data and the macroeconomic conditions in Ethiopia during the study period. Sections 3 and 4 present the conceptual framework and empirical model, respectively. Results are discussed in section 5. The final section presents concluding remarks.

2. Background, data and descriptive statistics

2.1. Background: Ethiopia 1994-2004

The 1990s brought important macroeconomic policy and political changes to Ethiopia that had tremendous impact on the incentives and opportunities available to households (Dercon, 2006). There was a transition of power in 1991/1992 when the decades old civil war ended with the overthrow of the socialist Derg regime. Although a modest liberalization had already started in 1989, significant changes were made in the early 1990s. The new government agreed on a policy framework paper with the International Monetary Fund (IMF) and the World Bank in September

1992, which led to the structural adjustment program of 1993-1996 (ADB, 2000). In the period 1994-2004, the economy performed reasonably well. The average per capita annual income over this period was 126 US dollars. Total real GDP grew by an average of five percent per year and GDP per capita by two percent (see Table A in the appendix).

2.2. Data

The analysis is based on the Ethiopian Rural Household Survey (ERHS) data. The ERHS is a unique longitudinal data that was launched in 1994 by the Department of Economics at Addis Ababa University and the Centre for the Study of African Economics (CSAE) at Oxford. This data were collected in six rounds over the span of ten years, from 1994 to 2004. There are 15 villages in the sample from different parts of the country. The villages were selected to represent the main farming systems in the country. However, the sample does not include villages from pastoralist regions[2].

We use data from 1994, 1999 and 2004 surveys to compute two growth rates over five years each. The panel data are unbalanced covering 1792 households in these three surveys. Eighty percent of these households were observed at least twice while 65% were observed in all the three years. The descriptive statistics is computed based on the full sample (1792 households) while for the growth model we used only those households who were observed in at least two consecutive periods.

Consumption expenditure include both food and non-food expenditures. The monetary value of food consumed from own production, food aid and in-kind payments are computed using prices collected in the village markets at the time of the survey. To make comparison across time

possible, we report real values using the national consumer price index with December 2000 as a base period. The average monthly consumption expenditures per adult equivalent[3] for the three years are reported in Table 1. Consumption expenditures increased from 108 Birr in 1994 to 136 Birr in 2004, giving an annual growth rate of 2.6%. Table 1 also reports the average monthly income for comparison. Total rural income is composed of rural nonfarm income (RNFI), agricultural income (including crop income, livestock income and agricultural wage) and income from transfers (including aid and remittances). Consumption expenditure per adult equivalent is higher than that of income per adult equivalent indicating income under reporting in our sample[4]. Because expenditure data are typically considered more reliable than income data in rural areas of developing countries, growth analysis in this paper will be based on the expenditures data.

Rural nonfarm income (RNFI) includes income from all types of wage and self-employment activities in the non-agricultural sector. For self-employment, respondents were asked to report net income or alternatively, the cost of raw materials and the proceeds from sale of products, from which we computed the net income. The questionnaire elicits the details of nonfarm activities and income from the nonfarm activities for the four preceding months. A four months recall period had advantage over a full year recall period for a better report of labor supply and income but it has also a limitation in that there may be under reporting for those households whose main nonfarm engagement is seasonal and falls outside the four months covered by the survey.

Share of nonfarm income (RNFsh) refers to total monthly RNFI expressed as a share of total monthly consumption expenditure. It is always zero for non-participants. For participants it could

be negative, since some households incur losses from self employment activities, or more than one, when there is saving.

2.3. Descriptive statistics: 1994-2004

Participation and income in RNFE

Close to half of the sample households (48%) participated in RNFE in these periods. Most were engaged in the low-return, unskilled wage employment and in business activities with low capital requirements. Only 7% of households participated in high-return, skilled wage employment or high investment self-employment. A quarter of the nonfarm participants are female headed, which is the same as their share in the sample. However, only 14% of the high-return RNFE participants are female headed.

The income from nonfarm activities accounts for 21% of consumption expenditure for households engaged in RNFE. Table 3 reports the share of income from RNFE disaggregated by expenditure and asset terciles. The share of rural nonfarm income declines across expenditure terciles. For the poor, it accounts for one-third of household consumption expenditure, while for those in the top tercile, it is barely 10%. This indicates that RNFE is an important source of income for the poor, although they are typically involved only in low-return activities because of entry barriers. This is unlike the findings for several African countries where the average reported share of income from nonfarm activities for households in upper income tercile is twice that of households in the lower income tercile (Reardon, 1997).

However, the high share for the poor in Ethiopia seems to be a result of lower total income from other sources rather than greater involvement in and income from RNFE. The average nonfarm income of households in the upper income tercile is 75% higher than those in the lower tercile. Classifying households based on assets, a more robust measure of wealth status, we found that the share of income from RNFE is almost the same for all participant households but the rich still get considerably higher income from RNFE sources.

Total Income, expenditures and capital

RNFE participants have higher total expenditures and income levels than do non-participants and the difference is statistically significant. However, they also have larger households. Hence, the average income and expenditure per adult equivalent are not statistically significantly different between participants and non-participants.

Nonfarm participants have significantly more labor endowment and more nonfarm equipment, while the RNFE non-participants have more farm equipment. RNFE participants and non-participants have effectively the same endowment of land, livestock and education. Non-participants earned higher income from crop sale although the participants cultivated more land.

3. Conceptual framework and some evidence

3.1. How does RNFE participation influence income dynamics?

Here we discuss some of the most important channels through which rural nonfarm employment can potentially influence households' income realization from their human and physical assets.

a) *High return nonfarm activities lead to accelerated income growth*

Participation in nonfarm employment activities that yield high returns such as skilled wage employment or livestock trade generate higher contemporaneous income and also lead to better capacity to accumulate and reinvest. Such livelihood strategies have higher potential to pull households out of poverty. The main problem with these kinds of activities is access. Typically, the poor do not have the necessary resources to be able to enjoy the superior returns and hence wealthy households are the ones most able to enjoy the benefits of high return activities (Lanjouw and Lanjouw, 2001, Woldenhanna and Oskam, 2001, Dercon and Krishnan, 1996).

b) RNFE offer an additional source of employment

One of the salient features of agriculture is its seasonality. Even households who have labor scarcity during the planting and harvest periods may have excess labor in the slack season. In the absence of RNFE options, this labor may not be productive. This is particularly true in areas with little or no irrigation and migration. Nonfarm activities can be an important source of off-season employment and income. Nonfarm employment also provides economic security for members of the society that may have restricted access to agricultural employment (Lanjouw and Lanjouw, 2001). For example in the villages under this study, one of the main agricultural activities, ploughing, is considered men's domain (Bevan and Pankhurst, 1996), hence women's employability in the farm sector is restricted. Thus, the nonfarm sector can serve as the residual employer. Even if it offers lower hourly returns to labor than other activities, it still can make a positive contribution towards total returns for those resources that would have been, at least partially, idle otherwise.

c) RNFE help relax households' liquidity constraints

Given financial market imperfections in rural economies, farm households face liquidity constraints to invest in agricultural inputs and human capital (Reardon, 1997). Earnings from nonfarm employment may thereby have added value if it enables farmers to purchase agricultural inputs that are complementary with other inputs. For example, Bezu and Holden (2008) show that, controlling for plot and household level characteristics, food-for-work participants in Tigray were more likely to use fertilizer on their farm than non-participants, presumably because the transfer relaxed households' liquidity constraints. In Honduras, Ruben and Van den Berg (2001) showed that the amount of purchased inputs increases with households' nonfarm income. A relaxation of the liquidity constraint also means that households may be able to pay for their children's school fees and books, thereby accumulating human capital that will eventually yield high returns. RNFE participation may even open the door to credit access. Lenders may use the evidence of steady pay in the non-farm market as collateral for loans (Collier and Lal, 1984, Reardon et al., 2000).

d) RNFE and risk

In the face of a virtually nonexistent rural insurance markets, even moderate shocks may have long term impacts on households' welfare, especially if households have to sell their productive assets or significantly reduce consumption to an extent that compromises human capital. For example, Dercon (2004) documents that rainfall shocks in Ethiopia have an impact on consumption growth that persists for several years. Participation in nonfarm employment can serve as a safety net for households facing income shocks thereby protecting their productive assets. Kijima et al. (2006) showed that Ugandan households' nonfarm labor supply increases if they experience agricultural shocks in the previous harvest, especially if they are asset poor

households. A similar labor supply response was also observed in India (Kochar, 1995). The RNFE is, however, probably more effective as a safety net in the face of idiosyncratic as opposed to covariate shocks such as due to rainfall or prices. This is because many nonfarm activities are linked with agricultural activities for input supply and output demand and also because the market may be saturated quickly if many households in the same village enter the RNFE simultaneously in response to a shock.

Related with the safety net function of the rural nonfarm employment is its impact on the willingness of households to adopt technologies that give higher average returns but may also entail higher risk. Compared to households who depend only on farming, households who participate in nonfarm activities may be relatively less worried about the worst outcome of an investment or input use decisions because they have alternative income to fall back on. Collier and Lal (1984) demonstrate that in Central Kenya, poorer households who have access to nonfarm employment were able to invest in tree planting and hybrid livestock, which are considered to be high-return, high-risk activities often undertaken by the rich.

3.2. The evidence on RNFE and income dynamics

The existing evidence tends to suggest a positive correlation between the share and level of income from RNFE and total income in Africa. In a review of 23 field studies in Africa, Reardon (1997) found that the rich not only earn higher nonfarm income but also get a higher share of their income from nonfarm activities. On average, the share of nonfarm income for the upper income tercile households was twice as much as the share for households in the lower income tercile. A study looking at nonfarm employment in Ghana and Uganda (Canagarajah et al., 2001)

also found that the shares of nonfarm income were larger in higher income brackets. But the direction of causality is not clear. Do the rich earn higher nonfarm income because of their preferential access to it or is it nonfarm participation that has enriched them?

The literature on rural nonfarm employment has focused on identifying the determinants of participation and nonfarm income (Ellis, 1998, Lanjouw and Lanjouw, 2001, Reardon, 1997). Few studies have systematically examined the impact of participation on households' welfare dynamics. Barrett et al. (2001) showed that households who participate in skilled nonfarm employment experience increase in income in Cote d'Ivoire following exchange rate reform. Holden et al. (2004) used a dynamic non-separable bio-economic household models to assess the impacts of access to nonfarm employment on household welfare and land management decisions in Ethiopia. Although they examine only access to low-wage employment, their results show that access to nonfarm employment has a significant positive impact on households' total income as such sources of income are constrained. Another study on Ethiopia that is closely related to our own is Block and Webb's (2001) evaluation of the dynamics of livelihood diversification. They found that higher diversification is associated with higher subsequent welfare outcome. Other studies show the impact indirectly. For example, Nargis and Hossain (2006) show that the returns on adult labor and education used in nonagricultural activities were higher than those used in agriculture and increased over time. Canagarajah et al. (2001) show that the contribution of growth to poverty reduction was higher for nonfarm participant households in Uganda and Ghana.

3.3. A simple model of income growth

This conceptual discussion can be captured in a relatively straightforward model. Following Barrett (2005) we write the income equation as the product of households' capital and the returns to capital.

$$Y_{it} = K_{it} r_{it} \qquad (1)$$

Where K_{it} refers to a vector of human and physical capital and r_{it} refers to a vector of net returns to capital. We assume that households do not have financial capital such as cash, stocks and bonds. Instead we assume that part of the physical capital is held, at least partially, for insurance and wealth accumulation purposes. These assumptions are not far from the reality in rural Ethiopia where the financial sector is almost nonexistent.

From total differentiation of the income equation we derive growth in income as a function of changes in capital and in returns to capital:

$$dY_{it} = dK_{it} r_{it} + dr_{it} K_{it} \qquad (2)$$

Where dK_{it} refers to change in capital i.e, investment and dr_{it} refers to change in returns to the capital owned. For households with little potential to increase their resource endowments, changes in the rate of returns are the only source of income growth.

In well functioning factor markets, households allocate their resources among different activities until the marginal returns from the respective activities are equal. However, this is not often the case in the rural economy of a developing country. Markets routinely fail, with the implication

that households may not have access to some activities that yield marginal and average returns higher than the ones in which they are currently engaged. For example, we find that skilled wage employment and relatively high-investment businesses yield higher average and marginal returns than farming or other nonfarm activities; but they are not accessible by poorer households. The returns to households' capital holdings in such markets will then be highly influenced by the types of activities in which the household engages. To capture the different combinations of farm and nonfarm activities, we define a variable AC_{it} as an index indicating the share of capital employed in the nonfarm economy. Returns may then be written as a function of AC:

$$r_{it} = f(AC_{it}, K_{it}, E_{it}) \qquad (3)$$

The inclusion of K_{it} in the return function allows for variable returns to scale. E_{it} refers to a vector of exogenous variables such as prices, infrastructure and policies that may lead to different rates of returns across time or place for the same level of capitals and activity index. We now express growth as a reduced form function of initial human and physical capital, the activity index and changes in the capital and the activity index as well as the initial exogenous conditions and changes in these conditions.

$$dY_{it} = f(K_{it}, AC_{it}, dK_{it}, dAC_{it}; E_{it}, dE_{it}) \qquad (4)$$

In this paper, we want to test the hypothesis that participation in nonfarm employment accelerates income growth. This follows from our theoretical argument that in the absence of fully functioning markets, as is the case in rural Ethiopia, the nonfarm activities will improve the returns to the resources owned and hence the household's welfare dynamics .

The second issue this paper examines is whether rural nonfarm employment has different impact on the poor versus richer households. Because the poor are more liquidity constrained, more risk averse and potentially more abundant in labor, the impact of participation on their production decision and efficiency may be higher. Alternatively, since poorer households have diminished access to nonfarm activities that yield higher returns, the welfare impact of their participation may be lower than that of the rich.

4. Empirical model

In the theoretical model growth in income is mainly a function of initial capital holdings, the activities those resources are employed in and the changes in capital and activities. However, in the empirical model, we run into econometric difficulty if we want to include all the change variables. While the pre-determined initial level of capital holdings and activity may be considered to be exogenous, the same cannot be said of the changes in those variables. Hence the reduced form of our growth model does not include these change variables.

$$\Delta Y_{it} = \beta_0 + \beta_1 AC_{it-1} + \beta_2 \boldsymbol{K}_{it\text{-}1} + + \beta_3 \boldsymbol{H}_{it\text{-}1} + \beta_4 \boldsymbol{V}_{it} + \beta_5 \Delta R_{it} + \gamma_1 \boldsymbol{Z}_i + \alpha_i + \varepsilon_{it} \qquad (5)$$

Where ΔY_{it} refers to growth in expenditure between period *t* and *t-1*, $\boldsymbol{K_{it-1}}$ refers to a vector of initial levels of human capital (labor supply and education) and physical capital (farm and nonfarm assets, livestock and land) and AC_{it-1} refers to the activity index in the initial period. If households can choose employment in any sector and all markets function without friction, then they will allocate their resources to equalize their marginal returns across activities, and activity composition will not affect the returns. In that case, the coefficient estimates associated with *AC* would not be statistically significantly different from zero. Ideally we would want *AC* to be the

share of capital employed in the nonfarm activities. However, because it is difficult aggregate different types of capital and to distinguish between different uses of indivisible assets such as land, we use the share of nonfarm income instead.

Similar resource endowments and activity portfolios may lead to different income growth patterns for different households. Observed and unobserved characteristics of households may affect their income growth. $\boldsymbol{H_{it-1}}$ is a vector of observed household characteristics in the initial period, such as age and gender of household head, while α_i refers to unobserved household-specific effects. Examples of unobserved household heterogeneity are the inherent ability and work ethics of household heads and members. The exogenous variable $\boldsymbol{E_{it}}$ discussed in the theoretical model is captured through a set of village level characteristics ($\boldsymbol{Z_i}$) that indicate agroecological and market conditions and year dummies to control for policy changes. About 3/4th of income in rural Ethiopia is obtained from Agriculture (CSA, 2001). And since Ethiopia's agriculture is mainly rain-fed, weather conditions are important determinants of income dynamics. The vector $\boldsymbol{V_{it}}$ is included in the regression to control for total annual rainfall in the base period and the variations in seasonal and annual rainfall. We also control for changes in total rainfall ΔR between the survey years. All continuous values are expressed in logarithmic terms. The term ε_{it} *i*s a mean zero, identically and independently distributed random error which is assumed uncorrelated with all the explanatory variables. We estimated our growth model using fixed effects model, random effects model and Hausman-Taylor estimator[5].

Decomposition analysis

To examine the growth differential due to differences in returns to assets owned by RNFE participants and non-participants, we perform Blinder-Oaxaca decomposition[6] (Blinder, 1973, Oaxaca, 1973). We write the growth equation separately for RNFE partcipants and non-participants and compute the growth differential.

Growth equation for RNFE participant: $G_i^P = \alpha_0^P + \sum_{j=1}^{n} \alpha_j^P X_{ji}^P + u_i$

Growth equation for non- participants: $G_i^N = \alpha_0^N + \sum_{j=1}^{n} \alpha_j^N X_{ji}^N + u_i$, then:

$$\overline{G^P} - \overline{G^N} = \underbrace{\sum \alpha_j^P (\overline{X}_j^P - \overline{X}_j^N)}_{E} + \underbrace{\sum \overline{X}_j^N (\alpha_j^P - \alpha_j^N)}_{C} + \underbrace{(\alpha_0^P - \alpha_0^N)}_{U} \qquad (6)$$

If the growth equation of the RNFE participant is the high growth equation, as we hypothesize, the first part ***E*** in the decomposition refers to growth difference due to participants having higher endowments while the second part ***C*** refers to growth difference due to participants having higher marginal returns (coefficient estimates). The component ***C*** would be non-zero only if returns to assets differ by participation status. ***U*** refers to the growth difference unexplained by endowments or efficiency.

5. Results and Discussion

5.1. Non-parametric regression

Comparison of the mean consumption growth rate for RNFE participants and non-participants show that households who participate in RNFE grow faster, although significant only at 10%. However, mean comparison by participation status reveal very little. We have argued in the conceptual discussion that the activity index may affect the growth path. Using the share of nonfarm income in total expenditure as an activity index, Figure 1 presents the nonparametric regression of expenditure growth on activity index[7]. The Kernel-weighted polynomial regression shows a positive relationship between expenditure growth and nonfarm share. Households who engage more intensively in nonfarm employment experience higher consumption growth, especially in the range where (positive) nonfarm income constitutes up to half of consumption expenditure. The result seems to confirm our hypothesis that nonfarm participation accelerates income growth.

5.2. Econometric estimation

Following our theoretical discussion earlier, the econometric estimation explores the relationship between growth and the activity index in a multivariate regression setting. We regress the change in the logarithm of expenditure per adult equivalent on initial share of nonfarm income. To allow for the nonlinear relation we include a third order polynomial in the nonfarm share. Because a very small percentage of households participated in high-return nonfarm activities, of whom half also participated in low-return employment, there is not enough observation and variation for disaggregating nonfarm income share by type of employment. The other regressors are: human

and physical capital variables, household characteristics and village characteristics. We include village median expenditure per adult equivalent to control for initial level expenditure in the community[8]. Except for the variable indicating change in rainfall between the growth periods, all other variables are in level form and refer to the base period. The estimation from the three methods shows that there is no fixed effect. Hence we report and discuss here the estimation result from the random effects estimator[9].

As shown in Table 5, there is a positive correlation between the share of income from RNFE and expenditure growth[10]. The coefficients on the linear and squared terms are positive and significant and the coefficient on cubic term negative and also significant giving a highly nonlinear relationship. We compute the marginal effect of nonfarm share on growth at its mean value using the **Stata** command **nlcom**. The result shows that a 0.1 increase in the share of nonfarm income increases expenditure growth by 6%. We also compute the predicted growth from the model and plot the result in Figure 2 for nonfarm share in the range of -1 and 1. This range includes 97% of the sample. The plot shows a strongly positive relationship between the initial expenditure share of income from rural nonfarm employment and subsequent expenditure growth.

The strongly positive relation between household's nonfarm income share and its subsequent expenditure growth indicates that, controlling for other differences, households who participate in RNFE experience higher growth in expenditure with the growth rate increasing as one engage in nonfarm employment more intensively. This may be an indication of higher returns to resources employed in rural nonfarm economy as opposed to agriculture. For some activities such as skilled wage employment, labor returns are typically much higher than the average or

marginal returns to farming. Moreover, given market conditions in rural Ethiopia, one or more of the possible channels through which nonfarm participation increases contemporaneous income (as discussed in section 3) may also lead to higher subsequent growth. For example, almost all the survey sites are characterized by rainfed agriculture with only one major rainy season. Households that participate in nonfarm employment, even if it was a low-return activity, get better total income from their endowments than those households who use their full resource only during agricultural season. Given that the credit markets function poorly, participation in nonfarm employment may also improve households' capacity to invest in agriculture and subsequently improve their income.

Turning to the other regressors in Table 5, age, dependency ratio, labor and asset holdings also have statistically significant effect on expenditure growth. Households with older heads experience lower growth. Households that started out with higher levels of human and physical capital grow faster. Note that the coefficients in the growth model reflect changes in returns to capital. Hence the positive coefficients imply increasing returns to both male and female labor, with the returns to female labor higher than male labor. Physical assets, on the other hand, exhibit decreasing returns over time.

5.3. Growth impact by poverty status

Because of risk, insufficient farm income and lack of investment capital for agriculture, the poor may have higher incentive to participate in nonfarm employment. But they are also typically less able to choose among alternative nonfarm activities because of lack of the necessary resources such as skill or capital. As a result, the poor households in our sample tend to engage more in

low-return activities while the relatively rich are far more likely to engage in the high-return activities such as salaried or skilled wage employment and high-investment self-employment. This suggests that nonfarm participation might lead to greater expected returns and income for ex ante better-off households than for the poorest. But do they also enjoy faster growth?

On the one hand, because the rich are less liquidity constrained and less risk averse than the poor, participation in nonfarm employment may lead to higher contemporaneous income but does not affect their input use and consumption decisions in a way that influences their production and income dynamics. Nonfarm participation may, thereby, have more impact on the growth of the poor than of the non-poor. On the other hand, if the rich participate more in nonfarm activities that offer superior returns, they are more likely to accumulate resources rapidly and enjoy higher growth than the poor.

To test for growth differences by wealth status, we estimate the preceding growth model separately for households in the lower and upper tercile of the initial livestock holdings. The village studies for this sample reveal that livestock is the most common indicator of wealth in all the survey sites. The estimation results (Table 6) show that growth increases with an increase in nonfarm share both for poor and rich households. However, households who are in the upper wealth tercile have much higher growth elasticity than the poor. Compared to poor households, the coefficient of nonfarm share is more than three times higher for the livestock rich households.

The plots of predicted growth in Figure 3 show that the rich have higher growth rate at each level of nonfarm share. This may be because the rich are more engaged in high return activities as

compare to the poor households who do not have capacity to participate in these activities. The effect could also result from complementarities between nonfarm participation and agricultural activities. For example, those who have donkeys and camels earn income from RNFE by providing transport service. But their farm also benefits from the animals' manure. It is also easier to transport inputs from and output to markets. Crop residuals in turn are used as fodder for their livestock, generating important economies of scope.

Of course there is a possibility of endogeneity here. Households with more wealth may simply be better farmers who are also more productive in nonfarm employment. The difference we observe between rich and poor in the estimated growth effects of nonfarm participation may thus merely reflect unobserved productivity differences between two groups. However, because we have used a random effect model, we expect that some of this effect, if not all, is controlled for[11].

5.4. Nonfarm employment participation and its impact on asset returns

Although the regression results discussed above show a positive correlation between growth and the share of nonfarm income, and that the growth effects of rural nonfarm employment are greater among the relatively wealthy, they do not establish that the returns to assets owned by RNFE participants are in fact different from the returns to assets owned by non-participants. In this section we explore this possibility and also see whether higher returns (if any) accrue for all assets or only for some asset classes.

We estimate the same function as before except that nonfarm share is no longer an explanatory variable. Rather, we estimate the growth model separately for RNFE participants and non-participants using village fixed effects. We then perform Blinder-Oaxaca decomposition to see

how much of the growth difference between RNFE participants and non-participants is attributable to differences in resource endowments and how much is due to differences in the returns to their respective assets.

Table 7 reports estimation results from the village fixed effects regressions that are used to compute the decomposition and table 8 shows the decomposition analysis. RNFE participants enjoy a 29 percent higher total growth than non-participants. The decomposition analysis shows that this is composed of a +74% growth differential attributable to differences in endowments and coefficient estimates (E+C) and a -35% growth differential due to differences in the intercepts (U)[12].

More than two-third of the explained difference is due to higher estimated returns on resources owned by RNFE participants; the rest is due to higher endowments. This result indicates that RNFE participants enjoy higher rates of return than do non-participants. Hence, it is possible to argue that higher growth rate associated with nonfarm participation results from nonfarm participants earning higher returns to their endowments.

Higher average aggregate return for RNFE participants does not mean that each and every asset earns higher returns in the RNFE. The estimation result from the regression used for the decomposition analysis shows that the significant variables are labor and assets. RNFE participants enjoy higher returns on asset holdings. Participants' higher returns to assets explain 37% of the growth differential in their favor. This may be explained by higher earnings for assets employed in nonfarm economy. It may also imply higher return for farm equipments employed in farming because of households' ability to buy complementary inputs which improve the

productivity of these assets, consistent with the argument that nonfarm participation help relax households' liquidity constraint.

RNFE participants enjoy higher estimated returns on female labor and lower estimated returns on male labor than non-participants. This is in line with our earlier argument that nonfarm employment increases the utilization of labor that is not fully used in agriculture. Female employment in agriculture in Ethiopia is constrained for cultural reasons. Participation in nonfarm employment enables households to utilize adult female labor more productively. On the other hand, male labor favors non-participants.

6. Conclusions

Several studies across Africa document a positive correlation between nonfarm participation and households' income and wealth status. However, there is limited evidence as to the direction of causality. This could reflect the preferential access of the rich to lucrative RNFE opportunities or the positive impact of rural nonfarm employment on earnings and investment. This paper examines the impact of participation in the rural nonfarm economy on welfare dynamics by using household panel data from rural Ethiopia.

The results of our analysis suggest that nonfarm economy offer a higher income path for participant households. The regression results show that growth in consumption expenditure increases with the household's ex ante share of nonfarm income. The positive relationship between share of nonfarm income and expenditure growth holds for both the poor and wealthy. However, relatively wealthy households benefit more from RNFE participation than do poorer ones. The Blinder-Oaxaca decomposition sheds some light on the source of this growth. Faster

growth among nonfarm participants results from higher returns to their physical assets and female labor.

The positive relationship between initial share of nonfarm income and subsequent consumption expenditure growth is encouraging. For a country like Ethiopia where land holding is very small and the population pressure is ever increasing, RNFE may offer a way out of poverty and into accumulation for poor rural households. However, the observed higher growth elasticity among wealthy households, suggests that RNFE may also aggravate rural income inequality as RNFE participants earn better returns and enjoy faster income growth, with the greater gains enjoyed by those who are better off to start with.

Table 1: Monthly expenditure and income of sample households in 1994, 1999 and 2004

	Consumption Expenditure per adult equivalent			Income per adult equivalent		
Year	Mean	Std. Dev	Median	Mean	Std. Dev	Median
1994	108	109	77	50	67	32
1999	131	224	82	71	188	41
2004	136	137	93	85	106	50

Table 2: Proportion of RNFE participant households

Year	RNFE*	High-return RNFE	Low-return RNFE
1994	0.57	0.06	0.53
1999	0.43	0.08	0.38
2004	0.44	0.06	0.41
Average	0.48	0.07	0.44

* Some households participated in more than one type of RNFE

*Table 3: Share of income from RNFE by expenditure and asset tercile**

	Expenditure Tercile			Asset Tercile		
	Lowest	Middle	Highest	Lowest	Middle	Highest
Share of income from RNFE	0.34	0.17	0.10	0.20	0.21	0.21
	(0.03)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Amount of income from RNFE (birr/month)	42.26	59.71	74.51	42.01	59.18	73.49
	(3.18)	(4.14)	(5.87)	(3.20)	(3.94)	(5.76)

*Standard deviations in parentheses.

Table 4: Total income, expenditure and assets by nonfarm participation status

Assets+ , income and expenditure	Not participate in RNFE		t-test	Participate in RNFE	
	Mean	Std. Err.		Mean	Std. Err.
Total monthly expenditure (in Birr)	496.8	14.20		513.3	16.8
Total monthly income(in Birr)	265.2	10.1	***	310.4	14.2
Monthly expenditure in adult equivalent	129.5	3.9		120.4	3.5
Monthly income in adult equivalent	67.1	2.9		71.0	3.0
Farm equipment owned (in Birr)	10.00	0.60	**	8.80	0.30
Nonfarm equipment owned (in Birr)	10.10	0.70	**	11.80	0.80
Nonproductive assets owned (in Birr)	81.80	10.50		70.90	4.50
Livestock owned (in Birr)	0.82	0.02		0.81	0.03
Land holding (in hectares)	0.41	0.01	**	0.39	0.01
Total cultivable land owned (in hectares)	1.30	0.03	***	1.42	0.05
Proportion of illiterate adults in the household	0.64	0.01		0.63	0.01
Proportion of adults with < 6 years of education	0.24	0.01		0.23	0.01
Proportion of adults with $\geq$ 6 years of educ.	0.13	0.01	**	0.14	0.01
Number of male adults	1.39	0.03	***	1.56	0.03
Number of female adults	1.45	0.02	***	1.69	0.03
Share of income from RNFE				0.21	0.01
Annual income from sale of crops (in Birr)	463.0	21.0	***	301.0	16.00
Monthly income from RNFE				58.40	2.93
Monthly income from High-return activities					
Monthly income from Low-return activities					
Number of observation		2287			2070

+ All assets are given in adult equivalent units. *, **, *** difference between RNFE participants and non-participants significant at 10%, 5% and 1% respectively

Table 5: Random effects regression estimates of expenditure growth

Dependent variable: ΔLn (Expenditure per adult equivalent)	Coefficients	Robust Std.err
Average per capita expenditure in the village	-0.732***	0.184
Age of household head	0.11	0.179
(Age of household head)^2	-0.12***	0.045
Female HH head	-0.056	0.058
HH head is literate	-0.027	0.065
Dependency ratio	0.236**	0.111
Adult education: Above elementary	0.092	0.205
Adult education: Elementary	-0.004	0.184
Distance to town	-0.017	0.112
Population density	-0.19	0.179
Kolla zone: Lowlands between 500-1500 meters	-0.243	0.239
Dega zone: Highlands between 2300-3200 meters	0.139	0.192
Number of male adult members	0.302***	0.078
Number of female adult members	0.483***	0.103
Land holdings	0.391	0.249
Assets owned (in Eth Birr)	-0.106***	0.033
Number of sheeps and goats owned	0.115	0.12
Number of cattle owned	0.051	0.079
Number of pack animals owned	-0.095	0.148
Change in annual rainfall (RFt-RFt-1)	-0.264	0.265
Annual rainfall in the initial period(RFt-1)	0.392	0.671
Annual Rainfall variability in the village	-1.051	1.01
Monthly rainfall variability (seasonality) in the village	0.135	1.702
Share of income from RNFE in total expenditure	0.591***	0.128
(Share of income from RNFE in total expenditure)^2	0.028***	0.01
(Share of income from RNFE in total expenditure)^3	-0.019***	0.005
Year dummy R1(growth 1994-1999)	-0.338**	0.169
Constant	1.426	5.708
Number of observations	2586	
Prob > χ2	0.000	
R^2-within	0.16	
R^2-overall	0.10	

*, **, *** refer to significance at 10%, 5% and 1% respectively. 1) All continuous variables are given in log form except share of income from RNFE and rainfall variation 2) All asset variables are given in adult equivalent terms. 3) All time varying variables, except change in rainfall and rainfall variation, refer to base period value

Table 6: Random effects regression estimates of expenditure growth by wealth status[+]

	Poorest households		Wealthiest households	
	Coeff.	Std.Err	Coeff.	Std.Err
Average per capita expenditure in the village	-0.006 **	0.003	-0.003	0.002
Age of household head	-0.257	0.244	0.108	0.150
Female HH head	0.119	0.160	-0.402 ***	0.138
HH head is literate	-0.038	0.149	-0.137 *	0.078
Dependency ratio	0.123	0.125	-0.133	0.167
Adult education: Above elementary	0.189	0.271	0.528 **	0.262
Adult education: Elementary	-0.134	0.285	0.059	0.179
Distance to town	0.035	0.102	-0.032	0.068
Population density	0.01	0.209	-0.271	0.388
Kolla zone: Lowlands between 500-1500 meters	0.096	0.208	-0.44 **	0.200
Dega zone: Highlands between 2300-3200 meters	0.402	0.379	-0.143	0.302
Number of male adult members	0.291 ***	0.109	0.029	0.105
Number of female adult members	0.544 ***	0.164	0.34 **	0.135
Land holding	0.366	0.514	0.212	0.294
Asset owned (in Eth Birr)	-0.105 *	0.056	-0.076 *	0.042
Number of sheeps and goats owned	-0.456 *	0.236	0.19	0.115
Number of cattle owned	0.385	0.523	-0.074	0.112
Number of pack animals owned	1.007	1.153	-0.346 *	0.201
Change in annual rainfall (RFt-RFt-1)	0.092	0.464	0.301	0.787
Annual rainfall in the initial period(RFt-1)	0.177	0.881	-0.656	1.332
Annual Rainfall variability in the village	-0.859	2.121	-3.584 **	1.413
Monthly rainfall variability (seasonality) in the village	0.962	2.788	-1.534	3.072
Share of income from RNFE in total expenditure	0.632 ***	0.176	1.979 ***	0.415
(Share of income from RNFE in total expenditure)^2	0.04 **	0.016	-0.594 *	0.354
(Share of income from RNFE in total expenditure)^3	-0.019 **	0.008	0.045	0.056
Year dummy R1(growth 1994-1999)	-0.262	0.292	-0.426 **	0.176
Constant	-0.803	8.003	7.26	11.937
Number of observations	858		866	
Prob > chi^2				
R^2-within	0.121		0.174	
R^2-overall	0.095		0.129	

+- wealth refers to livestock holding: Poor (bottom tercile), wealthy (top tercile)

*, **, *** refer to significance at 10%, 5% and 1% respectively. Note: 1) All continuous variables are given in log form except share of income from RNFE and rainfall variation 2) All asset variables are given in adult equivalent terms. 3) All time varying variables, except change in rainfall and rainfall variation, refer to base period value.

Table 7: Village fixed effects estimates of expenditure growth 1994-2004 used for decomposition analysis

	RNFE participant		RNFE non-participant	
	Coefficient	Std. Err	Coefficient	Std. Err
Age of household head	0.086	0.169	-0.053	0.199
Female HH head	-0.135	0.139	0.118	0.196
HH head is literate	0.064	0.126	-0.065	0.175
Dependency ratio	0.190	0.187	0.125	0.229
Adult education: Above elementary	-0.270	0.342	-0.223	0.424
Adult education: Elementary	-0.116	0.309	0.586	0.416
Number of male adult members	0.230	0.144	0.584***	0.185
Number of female adult members	0.371**	0.154	0.197	0.201
Land holding	-0.313	0.296	0.360	0.479
Asset owned (in Eth Birr)	-0.043	0.044	-0.160***	0.053
Number of sheeps and goats owned	0.174	0.214	0.377	0.253
Number of cattle owned	-0.140	0.142	0.094	0.185
Number of pack animals owned	0.363	0.383	0.083	0.399
Constant	-0.685	0.650	-0.333	0.818

*, **, *** refer to significance at 10%, 5% and 1% respectively. Note: 1) All continuous variables are given in log form 2) All asset variables are given in adult equivalent terms. 3) Village dummies included in estimation but not reported.

Table 8: Blinder-Oaxaca decomposition of growth difference by RNFE participation (as %s)

Variables	Amount attributable* (E+C)	Differential due to endowments (E)	Differential due to Coefficients (C)
Age of household head	52.6	-0.3	52.9
Female HH head	-5.0	-0.1	-4.9
Head is literate	4.6	-0.1	4.7
Dependency ratio	2.8	-0.4	3.2
Adult education: Above elementary	-0.8	-0.3	-0.5
Adult education: Elementary	-8.2	0.7	-8.9
Number of male adult	-25.9	6.1	-32.0
Number of female adult	19.3	2.3	17.0
Land holdings	-19.2	0.6	-19.8
Assets owned (in Eth. Birr)	39.5	2.1	37.4
Number of sheep and goats owned	-3.5	-0.5	-3.0
Number of cattle owned	-13.6	0.7	-14.2
Number of pack animals owned	4.6	0.3	4.2
Subtotal	*63.8*	*20.4*	*43.4*

Summary of decomposition results (as %)	
Total growth differential (E+C+U):	*29*
Amount attributable (C+E) :	*64*
Shift coefficient (unexplained portion)(U):	*-35*
Coefficients as % of attributable difference [*C/(C+E)]*	*68*

* Positive values show difference in favor of nonfarm participants. Note: 1) All continuous values are in log form. 2) All assets are given in adult equivalent.

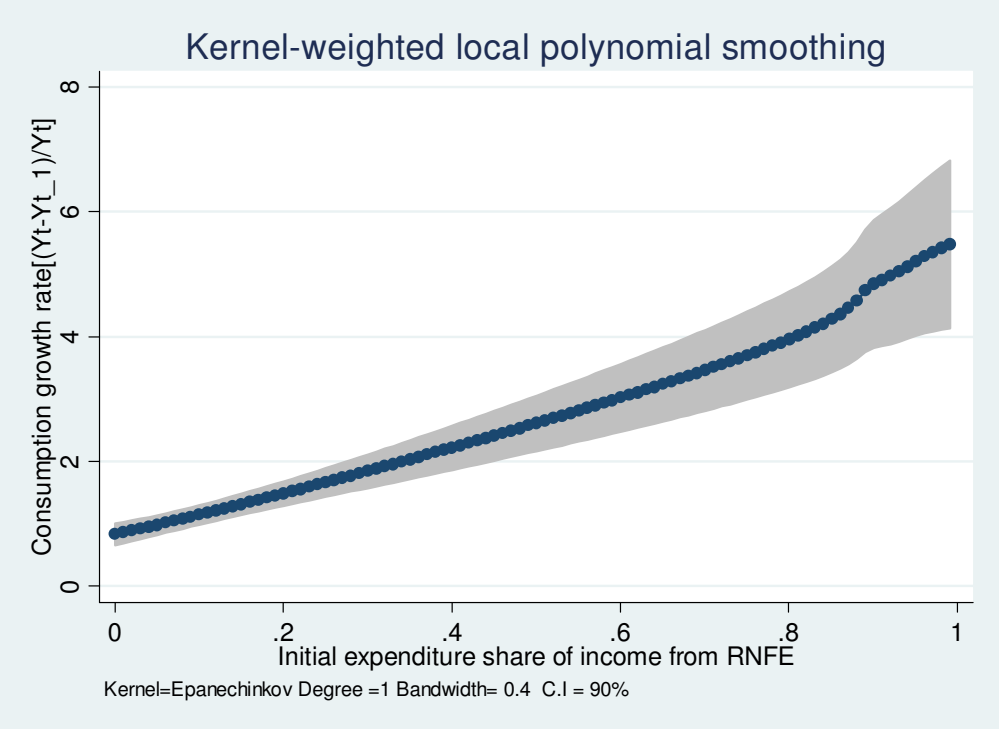

Figure 1: Non-parametric regression of expenditure growth on nonfarm income share

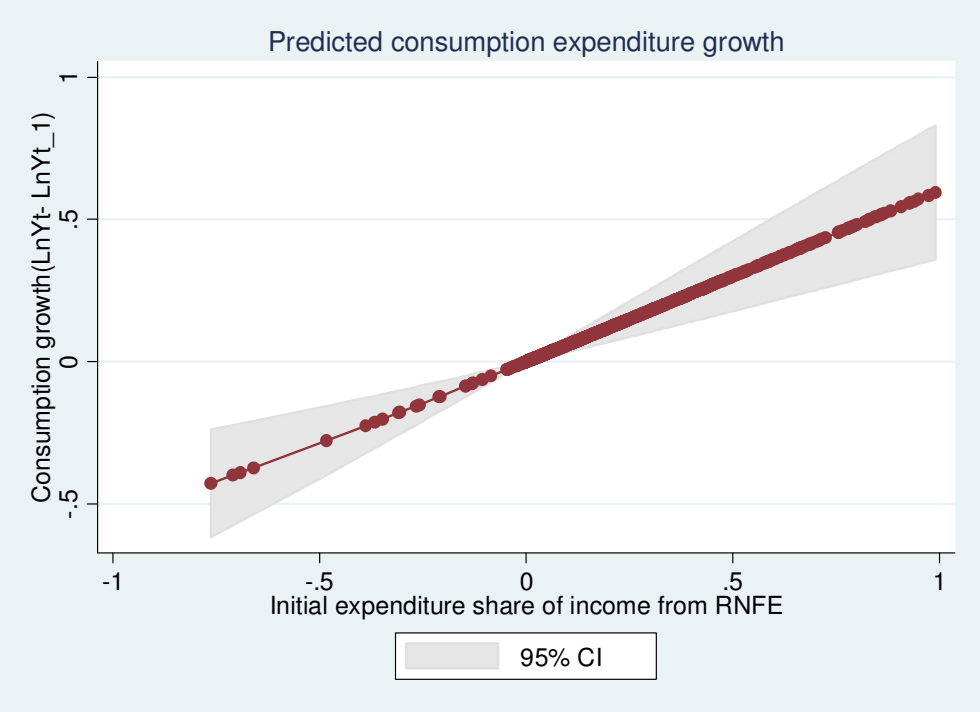

Figure 2: Plot of predicted consumption expenditure at different level of nonfarm share

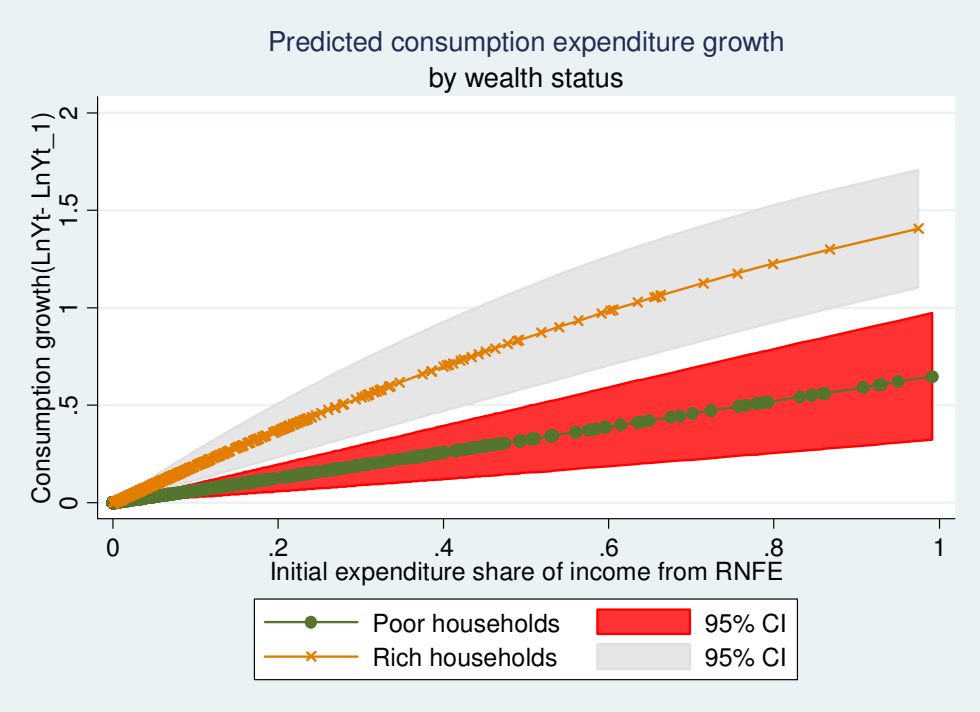

Figure 3: Plot of predicted consumption expenditure for poor versus wealthy households

Table A: GDP and growth in GDP in Ethiopia: 1994-2004

Year	Real GDP(in 2000 prices)			Growth rates		
	Total (in millions birr)	Per capita (birr)	Per capita (USD)	Real GDP	Real GDP per capita	Nominal GDP
1994/95	52254	971	116			
1995/96	58776	1059	127	12.48	9.04	12.16
1996/97	60939	1065	127	3.68	0.60	3.61
1997/98	58252	987	118	-4.41	-7.33	-4.02
1998/99	62284	1025	123	6.92	3.79	7.57
1999/00	65629	1048	125	5.37	2.31	11.64
2000/01	69361.8	1077	129	5.69	2.73	1.33
2001/02	70219.2	1060	127	1.24	-1.56	-3.39
2002/03	67755.1	993	119	-3.51	-6.30	8.57
2003/04	76652.5	1093	131	13.13	10.07	18.66
2004/05	84553.1	1174	140	10.31	7.40	14.24

Source: Compiled from Annual Reports on Macroeconomic Developments. Ministry of Finance and Economic Development

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[1] See also Reardon (1997) and Ellis(1998) for reviews of earlier studies.

[2] More information on the data collection , copies of the questionnaires and raw data for the first four rounds are available at http://www.csae.ox.ac.uk/datasets/Ethiopia-ERHS/ERHS-main.html

[3] To normalize using adult equivalent units we use a weight of 0.40 for children aged less than four and 0.50 for children aged from 5 to 14. All adults aged 15 or more have weight equal to one.

[4] This is also the case for the HICE data where 68% of rural households reported income that is lower than their expenditure (CSA, 2001).

[5] Like the random effect model, the Hausman-Taylor method (Hausman and Taylor, 1981) assumes that the latent individual effect is a time-invariant random variable, distributed independently across individuals. Unlike the random effect, however, the Hausman-Taylor specification assumes that some of the regressors are correlated with the latent variable α_i. To estimate the coefficients for both the time-varying and time-invariant variables consistently, this method use the time-varying variables that are uncorrelated with the latent variable to instrument the variables correlated with the latent variable α_i (see Hausman and Taylor, 1981; Baltagi et al., 2003).

[6] Blinder-Oaxaca decomposition is a method used to measure income differential between groups. It was initially designed to analyze wage differential between races and sexes

[7] The nonparametric regression is given for nonfarm share between 0 and 1. This domain covers 96% of the sample.

[8] Including households' own initial expenditure will introduce endogeneity

[9] The results from the other two estimators can be obtained from the authors

[10] The results from fixed effects and Hausman-Taylor estimators, not reported here, suggest an even stronger positive relation between share of income from RNFE and expenditure growth.

[11] The fixed effect estimation also gave the same result

[12] From the regression results we can see that both RNFE participants and non-participants have negative constants However, because the magnitude of the constant for RNFE participant households is much higher than that of the non-participants, the unexplained difference U (shift coefficient) favors the non-participants.