Employment dynamics in the rural nonfarm sector in Ethiopia Do the poor have time on their side?

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Employment dynamics in the rural nonfarm sector in Ethiopia
Do the poor have time on their side?

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Abstract

We study rural employment transitions in Ethiopia between farming and both low- and high-return nonfarm employment. We find that initial asset holdings and access to saving and credit are important factors for transition into high-return rural nonfarm employment and that households' participation in high-return rural nonfarm activities is robust to their experience of health shocks. However, shocks that affect their wealth or liquidity may trigger descents into low-return nonfarm employment. On the other hand, shocks that reduce agricultural income motivate transitions into high-return rural nonfarm employment.

Key words: rural nonfarm, income diversification, employment transitions, Ethiopia, shocks

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1. Introduction

Rural nonfarm employment (RNFE) evolves over time as households try to adjust their employment portfolio to changing opportunities, capacities and challenges, including experience of shocks. An understanding of the dynamics of nonfarm employment is, therefore, imperative for any policymaker who seeks to improve households' access to and income from nonfarm employment.

An extensive RNFE literature has focused on the determinants and patterns of diversification (Reardon 1997, Ellis 1998, Corral and Reardon, 2001; da Silva and del Grossi, 2001; de Janvry and Sadoulet, 2001; Kung and Lee, 2001; Woldenhanna and Oskam, 2001; Barrett et al., 2005) and the impact of RNFE on investment, poverty and inequality (Reardon et al., 2000; Matsumoto et al., 2006; Nargis and Hossain, 2006; van den Berg and Kumbi, 2006; Lay et al., 2008). Many studies identify shocks and greater expected returns as major drivers of diversification into RNFE (Dercon and Krishnan, 1996; Lanjouw, 2001; Lay et al., 2008). But while there are some studies that examine micro and small firm dynamics in developing countries (Liedholm et al., 1994; Mead and Liedholm, 1998; Maloney, 2004; Deininger et al., 2007) and several that examine the transition from wage to self employment in middle-income and developed countries (Carrasco, 1999; Fairlie, 1999; Bruce, 2000; Dunn and Holtz-Eakin, 2000; Mandelman and Montes-Rojas, 2009), studies of the household-level dynamics of RNFE participation in developing countries remain rare.

Barrett *et al.* (2001) found that currency devaluation in Côte d'Ivoire increased the returns to skilled nonfarm activities and depressed real returns to low-wage non-farm activities. However, entry into the high return activities was low and the poor were not able to seize opportunities created by the macroeconomic shock. Block and Webb (2001) studied factors associated with changes in household RNFE income diversification over time in rural

Ethiopia, finding that household risk perceptions guide subsequent RNFE diversification and that greater initial income diversification was associated with higher subsequent consumption levels.

While Block and Webb (2001) yields important insights, it has some limitations as a study of nonfarm dynamics. First, the data used are not very representative since the survey sites include only villages from drought prone regions and the two surveys used to compare diversification are collected immediately after famine (1989) and early in the reform period (1994). Second, they use share of crop income as a measure of diversification, a lower crop share indicating higher diversification. But the share of crop income may decline due to decreased crop prices or increased profitability of non-crop activities rather than as a result of increased diversification of activities or assets. Finally, the regression model explaining change in diversification included only perceptions, initial income level and the diversification index as covariates and did not control for other important factors such as initial resource endowments.

In this study we contribute to the limited RNFE dynamics literature by analysing rural households' engagement in nonfarm employment over time using the Ethiopian Rural Household Survey (ERHS) data from 1999 and 2004. This paper uses a more representative data set than Block and Webb (2001) and controls for initial asset endowments and shock experiences in a multinomial regression of employment transitions. Moreover, this paper evaluates changes in households' rural nonfarm employment (RNFE) status there by avoiding the problem associated with price changes when one uses nonfarm income shares or crop shares. By disaggregating nonfarm employment into high-return and low-return activities, we are also able to examine not only movement to and from rural nonfarm employment but also movement within rural nonfarm employment.

The focus of the analysis is on employment transitions involving high-return RNFE, the sub-sector offering most households the greatest prospect for upward mobility (Dercon and Krishnan, 1996; Lanjouw, 2001; Lay et al., 2008). In this paper we assess whether poor households are able to access the high-return employment over time through accumulation of capital. The paper also examines how high-return RNFE is affected by different types of shocks. Our findings suggest that low-return RNFE participants who accumulated capital were subsequently more able to access high-return RNFE. Increases in adult labor and in access to credit and saving options were also positively correlated with transitions from farming or low-return RNFE to high-return nonfarm employment. Shocks that diminish the wealth and liquidity of the household lead to transition out of high-return RNFE. The regression results show that high-return participant households who were exposed to pests and disease that affect crop and livestock holdings were more likely to transition from farming to low-return RNFE. On the other hand, shocks that reduce the risk-adjusted returns from agriculture such as agricultural demand and price shocks motivated transition into high-return RNFE. Surprisingly, none of the health shocks triggered transitions out of high-return RNFE. On the contrary, households who experience illness of household head or spouse were less likely to move to either low-return RNFE or pure agriculture.

2. Conceptual framework

The dynamics of nonfarm diversification refers to entry into and exit from the nonfarm sector as well as movement between different activities within the nonfarm sector. We analyze household decisions in a simple conceptual model with two types of nonfarm activities that have different investment requirements. Although this is a static model of activity choice, it can be used to illustrate movement into, out of and within nonfarm employment as underlying conditions change.

The households in our model, as in our sample, are all farm households and as such they are involved in agricultural activities regardless of their nonfarm employment decision. We assume they have a pre-established amount of capital and land. Their capital holdings can be broadly classified into agricultural and non-agricultural. The agricultural capital refers to farm tools and equipment that are illiquid and of no use for other activities. The non-agricultural capital includes four types of assets: non-farm tools and equipment that cannot be used in agricultural production; dual purpose assets that can be used in either agriculture or nonfarm activity (such as carts); non-productive, liquid assets such as jewelry and household durables; and skilled labor. The capital relevant for decision on nonfarm employment is the non-agricultural capital.

There are two types of nonfarm activities the households may engage in: high-return (N_H) or low-return (N_L). The horizontal axis of Figure 1 reflects non-agricultural capital and the vertical axis, the risk-adjusted income associated with each level of capital. Y_H and Y_L show the risk-adjusted income function of activities N_H and N_L, respectively. In both functions income grows at a diminishing marginal rate as capital increases, given a fixed amount of other inputs. The two activities differ both in their risk-adjusted rates of returns and their startup capital requirements. Activity N_H does not yield positive risk-adjusted income below capital investment K_{min} and yields risk-adjusted income less than activity N_L until investment of $\hat{K}$, after which it yields more. The cost of capital, which reflects the risk-adjusted rate of return in agriculture given the households' labor, land and agricultural capital endowments, is given by r. We assume constant returns to capital in agriculture.
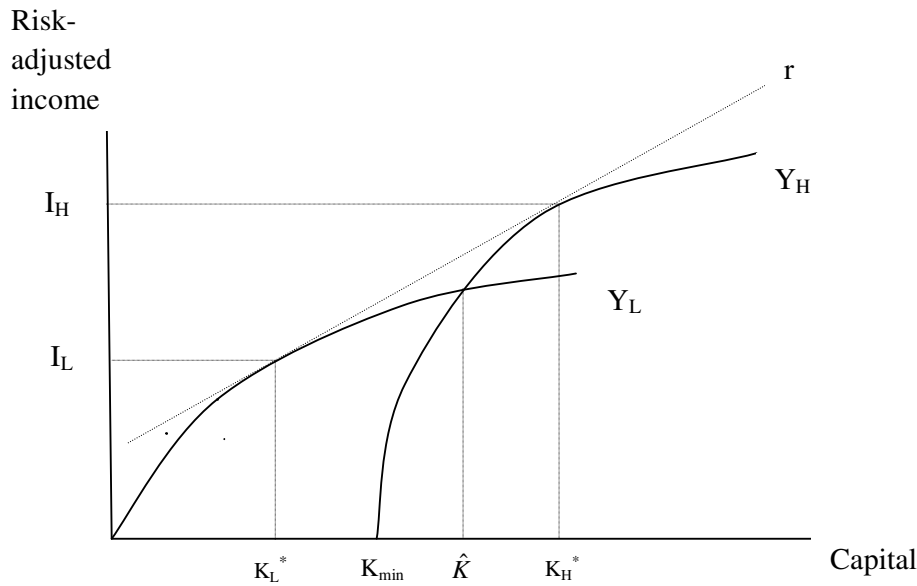
Figure 1: Income from alternative rural nonfarm activities

The asset endowments of the household, the relative risk-adjusted rates of return to different activities, and the correlation among returns jointly determine whether or not the household participates in nonfarm employment and which, if either, of the two activities it chooses. A household with a risk-adjusted agricultural rate of return r and capital endowment less than $\hat{K}$ chooses the low paying activity, optimally invests capital K_L* if it has access to at least that much capital, and earns risk-adjusted income I_L from the nonfarm sector. A household that faces the same rate of return but who can access nonfarm capital greater than $\hat{K}$ may optimally choose to invest up to K_H* in the high-return nonfarm activity and earn up to income I_H from nonfarm sector[1]. As the relative riskiness of agriculture falls, the upward slope of the r function steepens, potentially driving optimal RNFE investment to zero. And as the income streams from different activities become less correlated, the household has greater incentive invest in diversification so as to reduce its total income risk exposure.

The above framework carries implications about possible RNFE dynamics. First, ceteris paribus, households who save and accumulate capital beyond $\hat{K}$ should move from the low-return nonfarm employment to high-return nonfarm employment. Second, greater agricultural shocks will encourage diversification from pure agriculture into nonfarm activities. Third, for households with significant agricultural capital, low agricultural risk and limited non-agricultural capital, the low-return activity N_L may never be attractive. And if such households choose to engage in nonfarm activity, they will likely skip N_L entirely and enter N_H if they can access the necessary capital. Finally, capital shocks such as loss of assets may push households from the high-return activity N_H to low-return activity N_L as capital holdings contract. Cumulatively, this framework yields the following hypotheses.

H1: Households who are engaged in low-return RNFE must possess – or accumulate –a capital in order to enter high-return RNFE. Since movement from low-return to high-return nonfarm employment is welfare improving (see section 3.2), households seek to accumulate capital in order to access high-return RNFE. This hypothesis relates to their success in doing so.

H2: Agricultural shocks trigger transitions from pure agriculture to high-return RNFE. Shocks that adversely affect the risk-adjusted returns to farming make RNFE more attractive, triggering resource reallocation from farm to nonfarm activities. The initial endowment of capital influences which nonfarm activity the household undertakes. Only households with sufficient capital move from pure agriculture to high-return RNFE.

H3: Shocks knock households out of high-return RNFE. Loss of assets erodes the capital of high-return participants. Lack of access to insurance also means that households may have to liquidate assets to meet their financial needs in time of shocks. The impact of shocks may

thus go beyond the transitory reduction of income and force high-return RNFE participant households move into low-return employment.

3. Data and descriptive statistics

3.1 Data

The analysis in this paper uses Ethiopian Rural Household Survey (ERHS) data from the 1999 and 2004 surveys. 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. ERHS covers 15 villages selected to represent the main farming systems in the country. The sample in this study includes 1275 households who were observed in both 1999 and 2004. The Appendix offers more information on the data, the questionnaires and the construction of variables.

3.2 Terms and definitions

Rural nonfarm activities

A household is said to participate in nonfarm employment if any member of the household is engaged in a nonfarm activity, as all the households engage in some agricultural production. We use employment at the household level rather than at an individual level because the ERHS sampling units are farm households, not individuals. Thus a household that had any member working in a particular non-farm activity is classified as being in that activity that year. Household-level attrition was very low, just 5%, and seemingly random.

We identify four types of activities in the ERHS data: skilled wage employment, unskilled wage employment, high-investment business and low-investment business. The returns to skilled wage employment are about three times as high as that from unskilled wage labor.

The return from high investment business is twice that of low investment business. Unskilled wage employment is the lowest paying job; its return is the same as the return for labor in farm wage employment.

Figure 2 plots the cumulative frequency distribution of income from each of the nonfarm activities[2]. Skilled wage employment offers the highest level of income throughout the distribution. Both skilled wage employment and high investment business first order stochastically dominate unskilled wage employment and low investment business. There is no clear ranking between incomes from the two low paying nonfarm activities based on first-order stochastic dominance tests. Although they have a close distribution to farm wage income, they slightly first order stochastically dominate it.
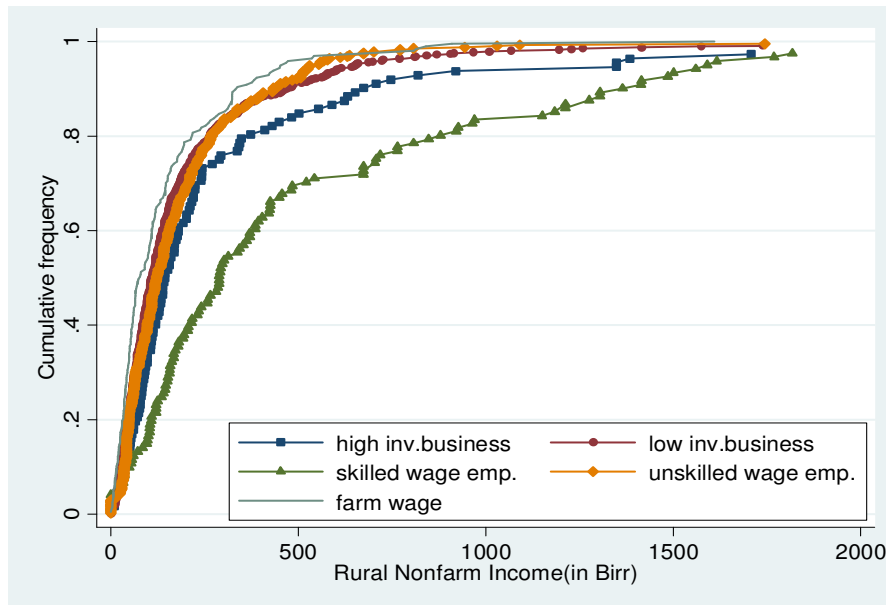

Figure 2: Cumulative income distributions from off-farm activities and farm work

Based on these differences and similarities in returns across activities, we identify two groups of nonfarm employment: high-return nonfarm employment and low-return nonfarm employment. High-return nonfarm employment includes skilled wage employment such as

teaching, civil service jobs and masonry and high-investment businesses such as cattle trade, transportation, etc. The low-return nonfarm employment includes unskilled wage employment such as working as a guard, maid or a casual labor and low investment business activities such as homemade food and beverage production.

Shocks

The information on the shocks households experienced is based on recall data from the 2004 survey. We grouped the main shocks according to their similarity and relevance for the analysis. In the econometric estimation we present later, the shock variables are included as dummies that take the value one if the household experienced the shock at least once between 1999 and 2004. The idiosyncratic (i.e., household specific) shocks we included are: theft or destruction of assets, illness or death of household members. We distinguish illness or death of a household head or spouse from that of other members of the household. The covariate (i.e., common to all households in a village) shocks we include are climatic shocks such as drought, flood, frost and hail storm; pests and diseases that affect crop or livestock; market shocks that affect inputs, including large increases in input prices or lack of access to inputs[3]; market shocks that affect sales, including large decreases in output prices or decline in demand for produce.

For households who were initially engaged in pure agriculture, shocks that reduce the returns to agriculture should induce nonfarm diversification. On the other hand, the impact of illness or death on rural nonfarm employment transitions may be either positive or negative. The financial cost of illnesses and funeral expenses may force farm households to engage in nonfarm employment while the resulting decline in labor supply may discourage it. For households already participating in RNFE, idiosyncratic shocks may be more important in affecting movement within and exit from the sector. We would expect loss of nonfarm assets

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to increase the likelihood of exit from rural nonfarm employment and to decrease transitions from low-return to high-return RNFE.

Key explanatory variables

The human and physical capital variables included in the regression are education, labor, livestock, land, farm tools and equipment, nonfarm and dual purpose tools and equipment and non-productive assets such as household durables and jewelry. ERHS village studies show that livestock and household durables such as radios, tape recorders, modern furniture and the like are important indicators of wealth (Bevan and Pankhurst, 1996).

Assets that increase the capacity of households to participate in nonfarm employment should positively influence entry into nonfarm employment and the transition from low-return to high-return nonfarm employment. Hence, education, adult labor and nonfarm tools and equipment are expected to positively influence entry into nonfarm employment and the transition from low-return to high-return RNFE. The number of children in 1999 aged 5 to 14 years reflects prospective increases in labor endowments as children typically begin working between 10 and 14 years of age in rural Ethiopia. Livestock and non-productive assets, indicating household wealth, are likewise expected to positively influence the transition from low-return RNFE to high-return RNFE. Land holdings can also be an indicator of wealth, but higher land holdings may also increase the marginal returns to a farm labor. Therefore, the impact on the transition from pure agriculture into high-return RNFE is ambiguous and depends on the wealth effect relative to labor returns effect.

Financial access also affects households' human and physical capital accumulation. One variable takes a value one (zero) if the household was (not) a member of an *Equib*, a traditional rotating saving/credit association, in 1999. Members of *Equib* are more likely to

have access to savings and credit instruments that allow households to finance business investments. Household characteristics include age, gender and literacy of the household head and the proportion of short-to-medium term dependents in the household. The latter refers to household members, aged 65 or above or less than five in 1999.

The regression analysis below cannot firmly establish causal relations, merely statistical associations. Households aspiring to move into high-return RNFE could conceivably join an *Equib*, have more children or acquire land expressly for that purpose, rendering those explanatory variables endogenous.

3.3 Descriptive statistics

Nonfarm employment transitions, 1999-2004

More than 40% of the households participated in rural nonfarm employment in both 1999 and 2004. However, not all households remained in the same type of nonfarm activity. Some moved from low-return RNFE to high-return RNFE while other made the opposite transition. Moreover, households who were not engaged in RNFE in 1999 diversified by 2004 while others exited the nonfarm sector. The top panel of table 1 presents the 1999-2004 transition frequencies between different nonfarm employment statuses. P_{ij} refers to the frequency that the household engaged in employment j in 2004 given that it was engaged in employment i in 1999 based on a discrete Markov process. The row percentages sum to 100 percent; the column totals refer to the share of households that ended up in employment situation j in 2004. The frequency of participant households exiting nonfarm employment is higher than the frequency of pure agriculturalists entering the nonfarm sector; the frequency of exiting high-return nonfarm activities was especially high. If high-return employment dominates low-return employment, we should see households routinely trying to enter and maintain

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high-return employment. Households who exited will therefore typically be those who experienced a shock that knocked them out of high-return RNFE.

However, this pattern may reflect the small scale of high-return nonfarm employment which makes transition into that sector less likely. To control for this difference, the bottom panel of table 1 reports the standardized transition frequencies ($[p_{ij}/p_j] / [p_{jj}/p_j]$) which show the likelihood of moving into activity j, given one's starting position, relative to staying in the incumbent employment. Unlike the simple transition frequencies reported in the top panel of table 2, the standardized frequencies show that stasis (no change in status) is the norm, especially in the high-return RNFE sector.

Shock experiences

The most common idiosyncratic shock ERHS households experienced was the death of a household member. One-third of the sample households lost a member over the five years, 1999-2004. The main covariate shock was climatic; 63% of households experienced some kind of climatic shock: drought, flooding, frost or hail storm. Table 2 reports the proportion of households affected by different shocks, disaggregated by their nonfarm participation status in 1999.

There is no meaningful difference between RNFE participants, taken as a whole, and non-participants with regard to their exposure to shocks. However, when disaggregated by type of nonfarm employment, more high-return RNFE participants reported asset or market shocks and fewer reported climatic shocks. Of course, high-return RNFE participants had more assets to lose than did either pure agriculturalist or low-return RNFE participants and high-return nonfarm activities are less subject to climatic variation than are agricultural or low-return nonfarm jobs. So these modest differences are unsurprising.

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Capital endowments and accumulation

Table 3 reports the mean initial human and physical capital by nonfarm employment status. High-return RNFE participants have higher elementary education and physical capital holdings (land, livestock and assets) than low-return RNFE participants and they have higher labor, elementary education and asset endowments than pure agriculturalists, with the differences significant at the 5% level. Low-return RNFE participants have significantly higher labor endowments but less physical capital than pure agriculturalists.

Table 4 contrasts the initial endowment and subsequent accumulation of capital for households who transit into high-return RNFE in 2004 with those who stayed in their initial activity. Compared to those who stayed in the sector, low-return RNFE participants who move to high-return RNFE had higher mean initial endowment of secondary education and livestock and lower mean land holdings. They also accumulated significantly more assets and labor between 1999 and 2004, although accumulation is likely to be endogenous to the transition. Pure agriculturalists that moved to high-return nonfarm employment also had initially more human capital and wealth and accumulated more labor than those who stayed in pure agriculture.

The descriptive statistics suggest that households that are able to move to high-return RNFE are well placed in terms of their initial asset endowment or accumulated capital and labor over time. Especially noticeable is the economically and statistically significant difference in asset accumulation between low-return RNFE participants who move to high-return employment and those who stayed. The change in assets between 1999 and 2004 is four times higher for those who move to high-return RNFE than those who did not.

4. Econometric model and results

To examine households' transitions from each of the initial states of employment into a different employment status in 2004, we estimated multinomial logit models based on the familiar random utility model (Maddala, 1983). Households are assumed to choose the activity – pure agriculture, low-return or high-return RNFE – that maximizes expected utility associated with participation, given initial human and physical capital, shocks the households experienced between the two periods, and controlling for household characteristics such as age and gender of household head.

We estimated three multinomial logit models, one for each initial employment status: pure agriculture (no RNFE), low-return RNFE and high-return RNFE. We estimated three specifications of this model to progressively expand the covariates. Model 1 includes only the initial asset endowments. In the second specification (Model 2) we add the shock variables and finally we added the interaction between some of the shocks and assets in Model 3.

Tables 5-7 report the estimation results for households initially in low-return RNFE, high-return RNFE and pure agriculture, respectively[4]. The results are generally consistent across the different specification. In each model, the specifications that included the shock variables yield much better fit than those with only initial asset/capital endowments, indicating that shocks are important in explaining employment transition decisions. We therefore focus on results from models 2 and 3.

4.1 Transitions into high-return RNFE

Because entry into or continuation in high-return RNFE is most desirable, we focus our discussion on movements into and from high-return RNFE. As expected, asset holdings are positively associated with transition from low-return RNFE to high-return RNFE (Table 5).

Livestock holdings are strongly positively correlated with transitions from low-return to high-return RNFE. The variable indicating potential labor accumulation, number of children aged five to 14 in 1999, is also positive and significant, showing the importance of labor endowments for high-return RNFE. High-return RNFE typically demands more capital, time, skill and experience than low-return activities. Although children 10-19 years old may not themselves engage in high-return RNFE, they may release adult labor and also increase the human capital of the household through their educational attainment. Membership in a rotating saving/credit association likewise significantly increases the probability of transiting from low-return to high-return RNFE, signaling the importance of access to capital to engage in high-return nonfarm activities.

Market shocks that affect the prices and demand for produce positively influence transitions from low-return to high-return RNFE. Such shocks decrease the return to agriculture relative to nonfarm activities, resulting in resource re-allocation from agriculture to rural nonfarm employment. For households who already combined agriculture and low-return nonfarm activities, resource re-allocation implies more flow of capital to nonfarm employment which enables movement from low-return RNFE to high-return RNFE. Similar patterns hold for movements from pure agriculture into high-return RNFE, although now non-farm asset holdings also positively affect transition probabilities (Table 6).

The death of a non-head household member decreases the likelihood of transition to high-return RNFE from pure agriculture (Table 6). This may be explained by the resulting decline in household labor endowment and possibly an increase in expenditures associated with a death in the household. Households who experience an agricultural shock in the form of pests or diseases are, on the other hand, more likely to enter high-return RNFE than to stay in pure agriculture, because nonfarm employment has grown more attractive.

In the specification with interaction terms, we find that wealthy households with large livestock holdings are less likely to move from pure agriculture to high-return RNFE. However, the positive coefficient estimate on the interaction term between asset shock and initial livestock holding shows that for those households who experience a shock that negatively affects their asset endowment, higher initial livestock holding is positively correlated with transition to high-return RNFE.

4.2 Transitions out of high-return RNFE

Households with higher educational endowment are less likely to transit out of high-return RNFE (Table 7). This is consistent with the importance of skill in high-return RNFE activities. On the other hand, households with older household heads and with a higher share of dependents are more likely to exit high-return RNFE.

Initial land and non-productive asset holdings are positively correlated with transitions out of high-return RNFE and into pure agriculture, with the impact of land holdings both statistically and economically more significant than non-productive assets. With large land holdings, farming labor returns may be higher. The negative relation may also indicate competition between agriculture and high-return RNFE. The fact that high-return activities demand commitment of significant time, skill and management makes them difficult to combine with agricultural activities for those households with greater land holdings and hence more demanding farm work.

Agricultural shocks in the form of pests and diseases increase the likelihood of transition from high-return to low-return RNFE. This may be explained by liquidity constraints that result from cash expenditures, loss of revenue or reduction of productive wealth following such shocks, given that all ERHS engage in at least some agriculture. Surprisingly, health

shocks did not trigger exit from high-return RNFE. On the contrary, illness of household heads or their spouses negatively affects transition from high-return to low-return RNFE.

4.3 Other employment transitions

Households with female or older household heads and households with a high share of dependents are more likely to move out of low-return RNFE to take up a purely agricultural livelihood. Wealthy households are also more likely to exit low-return RNFE, although the coefficient estimate is not economically significant. Households with more education are less likely to move to pure agriculture relative to staying in low-return nonfarm employment. In the specification with interaction terms, households with more nonfarm assets are also less likely to move to pure agriculture. But for most of these variables, the estimated relation is significant only at 10%.

Households who experience death of household head or spouse are less likely to exit low-return RNFE, probably because such a shock leads to a decline in income from agriculture, which makes nonfarm employment even more important. In the specification with interaction terms, low-return RNFE participant households who lost non- head/spouse are more likely to exit RNFE because it implies contraction in available labor. In the model with interaction terms, farm asset holdings also positively influence exit from low-return RNFE to pure agriculture consistent with the incentive effect, but shocks on asset holding reduce this impact.

Wealth, as given by livestock holdings, decreases the likelihood of transition to low-return RNFE relative to staying in pure agriculture. As is the case for contemporaneous participation decision, wealthy households have less incentive to combine farming with low-return RNFE over time. On the other hand, nonfarm asset and land holdings positively influence transition

into low-return RNFE. Land holdings indicate access to capital that increases the likelihood of entry into RNFE and since there may not be high competition between low-return nonfarm activities and farming, the capacity effect may outweigh the negative incentive effect of land holdings.

Shocks in access and prices of inputs negatively affect transition to low-return RNFE. This is contrary to our expectation since shocks in agriculture are expected to push farm households into nonfarm diversification (Reardon, 1997). One possible explanation is a potential correlation between input prices for agriculture and input price for non-farm goods production. The most common low-return nonfarm activities such as food and beverage production and petty trade depend very much on agricultural output. An increase in agricultural input prices makes such production unprofitable, and hence unattractive.

5 Conclusions

The literature on nonfarm employment diversification routinely identifies human and physical capital as the main constraints for access to high-return employment and shocks as the main incentive for low-return nonfarm diversification. Our findings suggest that low-return RNFE participants with capital eventually managed to transit into high-return RNFE. The descriptive statistics show that, compared to those who stayed in the low-return RNFE, households who move to high-return RNFE accumulated significantly more assets and benefit from a stochastically dominant livelihood. The regression results confirm this finding. Wealth, access to saving and labor improve the likelihood of transition to high-return nonfarm employment.

Our results also indicate that shocks that affect liquidity are more important than shocks that affect labor. We found that pests or diseases that affect crop and livestock holdings are more likely to trigger movement from high-return RNFE into low-return RNFE as they may result

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in loss of wealth and revenue as well as increase cash expenditure requirements which intensifies liquidity constraints. On the other hand, none of the health related shocks trigger transition out of high-return RNFE. On the contrary, illness of the household head or their spouse decreases the likelihood of transition out of high-return RNFE. Death of a household head or spouse have a similar negative effect on low-return RNFE participants indicating that the financial cost of such shocks are more important than the negative impact on labor supply. Moreover, for farm households, health shocks on household head may result in decline in agricultural income.

For nonfarm employment to serve as a way out of poverty, the poor need instruments to gradually accumulate assets and access high-return activities. In this regard, local saving and credit associations in rural Ethiopia seem to play an important positive role. Improving financial access reduces the need for personal wealth and savings to access high-return employment and allows households to maintain their activity in the face of shocks that otherwise affect their liquidity.

Table 1: Disaggregated transition probabilities for RNFE participants (in %)

1999 RNFE status	2004 RNFE status			Total %
	Pure agriculture	Low-paying RNFE	High-paying RNFE	(N)
Pure agriculture	65	29	6	100(679)
Low-return RNFE	45	50	5	100(504)
High-return RNFE	54	34	12	100(92)
Total %(p_j)	56	38	6	100(1275)
Standardized probability (p_{ij}/p_j) / (p_{jj}/p_j)				
Pure agriculture	1.00	0.67	0.82	
Low-pay RNFE	0.60	1.00	0.66	
High-pay RNFE	0.47	0.44	1.00	

Table 2: Household shock experiences by initial RNFE participation status (proportion of households)

Type of shock	All Households	RNFE participants		
		All types	Low-return	High-Return
Idiosyncratic Shocks				
Death of a household member	0.33	0.31	0.31	0.32
Illness of a household member	0.28	0.26	0.25	0.28
Loss of assets (theft or destruction)	0.17	0.18	0.18	0.22
Covariate Shocks				
Climatic shocks	0.63	0.65	0.67	0.50
Pests and diseases that affect livestock	0.12	0.12	0.12	0.09
Pests and diseases that affect crops	0.23	0.24	0.23	0.25
Erosion	0.10	0.10	0.10	0.10
Market shock on inputs	0.25	0.24	0.23	0.32
Market shock on outputs	0.23	0.24	0.23	0.32

Table 3: Initial human and physical capital endwoments by employment status in 1999

| | Employment status in 1999 | | | | | |
| | Pure agriculturalist | | Low-return RNFE | | High-return RNFE | |
	Mean	Se	Mean	Se	Mean	Se
Number of adult HH members	2.83	0.06	3.05	0.07	3.16	0.18
Adult education(share): Elementary	0.25	0.01	0.25	0.01	0.32	0.03
Adult education: Above elementary	0.12	0.01	0.11	0.01	0.12	0.02
Livestock (tropical livestock unit)	0.85	0.03	0.68	0.03	0.96	0.13
Land holding (hectars)	0.38	0.02	0.35	0.02	0.45	0.07
Assets owned (in Birr)	105.7	5.8	83.7	7.7	146.2	21.5

+ All asset/capital endowments except education are expressed per adult equivalent unit. Education of adults is given as a share to total adults

Table 4: Initial capital endwoments and accumulation by transition into high-return RNFE

	Transition into high-return RNFE							
	Pure Agriculturalist				Low-return RNFE participant			
	Stay		Move		Stay		Move	
	Mean	Se	Mean	Se	Mean	Se	Mean	Se
Capital endowments in 1999								
Number of adult HH members	2.78	0.08	3.16	0.23	3.23	0.11	3.27	0.27
Adult education(share): Elementary	0.24	0.01	0.28	0.05	0.26	0.02	0.23	0.06
Adult education: Above elementary	0.11	0.01	0.16	0.04	0.12	0.01	0.20	0.06 [b]
Livestock (tropical livestock unit)	0.96	0.04	0.72	0.11	0.62	0.04	0.83	0.17 [c]
Land holding (hectars)	0.40	0.02	0.31	0.04	0.36	0.02	0.25	0.07 [c]
Tools and equipments (in Birr)	112.5	7.5	119.3	29.7	74.3	6.2	76.9	13.8
***Changes* in relevant assets (1999-2004)**								
Adult labor	-0.04	0.07	0.32	0.24	-0.21	0.09	0.27	0.34 [c]
Education: Elementary	0.02	0.02	0.05	0.07	0.06	0.02	0.02	0.06
Education: Above elementary	0.03	0.01	0.06	0.04	0.00	0.01	0.04	0.04
Tools and equipments	-15.0	10.8	6.5	27.7	28.0	10.0	130.6	67.0 [a]

a, b , c refer to statistically significant difference between the mean values for those who move to high-return RNFE and those who stay in their respecive employment at 1%, 5% and 10% respectively

Table 5: Multiniomal logit estimation of determinants of transition for households who were engaged in **Low-Return RNFE in 1999**

	Transit to pure agriculture vs. Stay in low-return RNFE						Transit to high-return RNFE vs. Stay in low-return RNFE					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	Coef.	Robust Std.Err	Coef.	Robust Std.Err	Coef.	Robust Std.Err	Coef.	Robust Std.Err	Coef.	Robust Std.Err	Coef.	Robust Std.Err
Characteristics of household												
Age of household head	0.01	0.01	0.01 *	0.01	0.02 *	0.01	0.00	0.02	0.00	0.02	0.00	0.02
Female headed household	0.47 **	0.21	0.39 *	0.23	0.47 **	0.22	-0.78	0.58	-1.04	0.64	-0.98	0.65
Literate household head	0.19	0.35	0.16	0.31	0.27	0.33	-0.17	0.63	-0.32	0.75	-0.21	0.76
Share of HH members aged<5 and aged>65	1.20 *	0.64	1.30 *	0.76	1.22	0.81	-0.68	1.07	-0.22	1.19	0.14	1.18
Initial asset/capital endowments												
Adult education(share): Above elementary	-0.31	0.48	-0.42	0.48	-0.35	0.52	0.86	1.01	0.76	0.71	0.54	0.87
Adult education: Elementary	-0.75 *	0.41	-0.80 *	0.43	-0.83 *	0.45	-1.55	1.05	-1.61	1.41	-1.94	1.40
Tropical livestock units	-0.13	0.19	-0.18	0.19	-0.27	0.79	1.41 ***	0.42	1.30 ***	0.43	3.45 ***	1.14
Land holdings (hectares)	0.16	0.57	0.07	0.58	-0.01	0.64	0.81	1.81	0.90	1.62	1.18	1.50
Farm equipments and tools (Birr)	0.01	0.01	0.01	0.01	0.08 ***	0.03	-0.03	0.02	-0.02	0.02	-0.02	0.07
Non farm and dual purpose tools and equipments(Birr)	-0.01	0.01	-0.01	0.01	-0.07 *	0.04	-0.02	0.03	-0.02	0.04	-0.02	0.04
Non-productive assets (Birr)	0.00 ***	0.00	0.00 ***	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01
Number of adult HH members	0.00	0.08	-0.02	0.08	-0.03	0.08	-0.10	0.11	-0.12	0.14	-0.13	0.13
Number of HH members aged 5-14 yrs	0.04	0.08	0.05	0.08	0.05	0.09	0.23 **	0.12	0.27 **	0.12	0.28 **	0.12
HH is member of rotating credit association	-0.06	0.31	-0.07	0.33	-0.14	0.31	0.88 *	0.51	1.12 *	0.58	1.09 *	0.64
Shock experience (yes=1)												
Illness of HH head/spouse			-0.10	0.29	-0.13	0.29			-0.36	0.87	-0.13	0.87
Illness of other HH member			-0.04	0.53	-0.05	0.53			-0.69	0.76	-0.64	0.85
Death of HH head/spouse			-0.79 **	0.31	-0.79 **	0.32			-0.09	1.24	-0.01	1.33
Death of other HH member			0.38	0.23	0.43 **	0.22			0.74	0.97	1.02	0.92
Theft or destruction of assets			-0.08	0.25	-0.10	0.25			0.41	0.97	0.28	0.92
Climatic shock (drought, flood, frost …)			-0.28	0.34	-0.11	0.42			-0.41	0.74	0.15	0.91
Pest or disease affecting crop or livestock			0.05	0.22	0.08	0.21			-0.68	0.55	-0.47	0.61
Large increase in prices of inputs or reduced access to inputs			0.23	0.40	0.26	0.40			-0.14	1.00	-0.04	1.03

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Large decrease in prices or demands for produced goods			0.45	0.39	0.54	0.40			2.57 ***	0.68	2.48 ***	0.68
Farm asset * Shocks that affect asset endowment					-0.07 ***	0.03					0.00	0.07
Non farm asset * Shocks that affect asset endowment					0.06	0.04					-0.01	0.05
Non-productive asset * Shocks that affect asset endowment					0.00	0.01					0.00	0.01
Livestock* Shocks that affect asset endowment					0.04	0.80					-2.19 *	1.23
Constant	0.93 **	0.47	1.12 *	0.61	0.83	0.67	-2.11 **	0.96	-1.99	1.60	-2.59	1.84
Number of observations	494		494		494		494		494		494	
McFadden's (Pseudo) R^2	0.23		0.26		0.28		0.23		0.26		0.28	
Log likelihood	-325.9		-314.69		-307.66		-325.9		-314.69		-307.66	
Proportion of correct predictions	0.70		0.71		0.70		0.70		0.71		0.70	
Control for interaction terms	No		No		Yes		No		No		Yes	

*, **, *** refer to significance at 10%, 5% and 1% respectively. Standard errors are adjusted for village level clustering

+ All asset/capital endowment except education is expressed in adult equivalent unit. Education of adults is given as a share to total adults.

Table 6: Multinomial logit estimation of determinants of transition for households who did **not participate in any RNFE in 1999**.

	Enter High-return RNFE vs. Stay in pure agric.						Enter Low-return RNFE vs. Stay in pure agric.					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	Coef.	Robust Std.Err	Coef.	Robust Std.Err	Coef.	Robust Std.Err	Coef.	Robust Std.Err	Coef.	Robust Std.Err	Coef.	Robust Std.Err
Characteristics of household												
Age of household head	-0.01	0.02	-0.01	0.02	-0.01	0.02	-0.01	0.01	-0.01	0.01	-0.01	0.01
Female headed household	0.45	0.37	0.43	0.50	0.39	0.48	0.25	0.31	0.19	0.30	0.17	0.30
Literate household head	0.52	0.66	0.45	0.73	0.51	0.76	0.19	0.34	0.18	0.33	0.18	0.33
Share of HH members aged<5 and aged>65	0.66	1.45	0.55	1.57	0.52	1.54	0.08	0.82	0.03	0.92	0.03	0.88
Initial asset/capital endowments+												
Adult education(share): Above elementary	-0.85	1.08	-0.76	1.12	-0.82	1.21	0.51	0.48	0.58	0.49	0.58	0.50
Adult education: Elementary	-0.42	0.91	-0.19	0.92	-0.21	0.92	0.14	0.48	0.18	0.47	0.17	0.46
Tropical livestock unit	-0.49	0.33	-0.49	0.34	-1.44 ***	0.48	-0.62 ***	0.18	-0.63 ***	0.19	-0.81 ***	0.22
Land holdings (hectares)	-0.26	0.44	-0.06	0.35	-0.07	0.39	0.40 *	0.24	0.44 *	0.26	0.47 *	0.24
Farm equipments and tools (Birr)	-0.02	0.02	-0.02	0.02	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Non farm and dual purpose tools and equipments(Birr)	0.01 ***	0.00	0.01 ***	0.00	0.01	0.09	0.01 ***	0.00	0.01 ***	0.00	0.01	0.01
Non-productive assets (Birr)	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Number of adult HH members	0.05	0.11	0.04	0.12	0.04	0.12	0.00	0.09	-0.01	0.09	-0.01	0.09
Number of HH members aged 5-14 yrs	0.06	0.14	0.06	0.16	0.07	0.16	0.02	0.05	0.02	0.05	0.02	0.05
HH is member of rotating credit association	1.21 ***	0.34	1.57 ***	0.32	1.67 ***	0.34	0.29	0.47	0.36	0.49	0.40	0.49
Shock experience (yes=1)												
Illness of HH head/spouse			-0.46	0.37	-0.56	0.43			-0.33	0.28	-0.37	0.29
Illness of other HH member			0.27	0.43	0.22	0.43			-0.19	0.27	-0.20	0.27
Death of HH head/spouse			0.09	1.06	-0.02	1.05			0.08	0.37	0.02	0.38
Death of other HH member			-1.02 **	0.42	-1.09 **	0.45			-0.03	0.28	-0.10	0.30
Theft or destruction of assets			0.57	0.50	0.58	0.54			0.26	0.22	0.27	0.22
Climatic shock (drought, flood, frost …)			0.14	0.40	-0.35	0.70			-0.10	0.27	-0.25	0.25
Pest or disease affecting crop or livestock			0.86 **	0.35	0.80 **	0.36			0.15	0.24	0.11	0.24
Large increase in prices of inputs or reduced access to inputs			-0.43	0.43	-0.36	0.45			-0.43 **	0.21	-0.42 **	0.22

	(1) coef	(1) SE	(2) coef	(2) SE	(3) coef	(3) SE	(4) coef	(4) SE	(5) coef	(5) SE	(6) coef	(6) SE
Large decrease in prices or demands for produced goods			-0.74	0.75	-0.73	0.76			-0.25	0.17	-0.26	0.18
Farm asset * Shocks that affect asset endowment					-0.02	0.02					0.00	0.01
Non farm asset * Shocks that affect asset endowment					0.00	0.09					0.00	0.01
Non-productive asset * Shocks that affect asset endowment					0.00	0.01					0.00	0.00
Livestock* Shocks that affect asset endowment					1.08 **	0.49					0.25	0.24
Constant	-3.02 ***	0.85	-2.88 ***	0.97	-2.35 **	1.02	-1.35 ***	0.50	-1.17 **	0.50	-1.00 *	0.55
Number of observation	666		666		666		666		666		666	
McFadden's (Pseudo) R2	0.17		0.19		0.20		0.17		0.19		0.20	
Log likelihood	-443.44		-433.84		-431.78		-443.44		-433.84		-431.78	
Proportion of correct prediction	0.69		0.72		0.72		0.69		0.72		0.72	
Control for interaction terms	No		No		Yes		No		No		Yes	

+ All asset/capital endowment except education is expressed in adult equivalent unit. Education of adults is given as a share to total adults*, **, *** refer to significance at 10%, 5% and 1% respectively. Estimation includes village fixed effects.

Table 7: Multiniomal logit estimation of determinants of transition for households who were engaged in **High-Return RNFE in 1999**.

	Transit to pure agriculture vs. stay in high-return RNFE				Transit to Low-return RNFE vs. stay in high-return RNFE			
	Model 1		Model 2		Model 1		Model 2	
	Coef.	Robust Std.Err	Coef.	Robust Std.Err	Coef.	Robust Std.Err	Coef.	Robust Std.Err
Household characteristics								
Age of household head	0.203 ***	0.069	0.343 ***	0.107	0.177 ***	0.064	0.325 ***	0.104
Literate household head	2.019	1.365	2.775	2.351	1.640	1.466	2.413	2.199
Share of HH members aged < 5and aged>65	8.112 *	4.791	18.716 **	7.947	2.544	4.798	13.404 **	6.667
Initial asset/capital holdings[+]								
Adult education(share): Above elementary	-5.522 **	2.642	-9.801 **	4.467	-3.780	2.664	-8.099 **	4.086
Adult education: Elementary	-6.486 ***	1.644	-8.055 **	3.466	-2.589	1.778	-3.606	3.970
Tropical livestock units	0.353	0.856	0.599	0.858	-0.906	0.932	-0.773	0.776
Land holdings (hectares)	2.741 ***	1.050	3.403 **	1.588	1.243	0.997	1.740	1.596
Farm equipments and tools (Birr)	-0.005	0.050	-0.059	0.047	0.011	0.035	-0.038	0.033
Non farm and dual purpose tools and equipments(Birr)	-0.002	0.005	-0.011	0.010	0.000	0.006	-0.009	0.009
Non-productive assets (Birr)	0.007 **	0.004	0.012 *	0.007	0.004	0.003	0.010	0.006
Number of adult HH members	0.134	0.225	-0.022	0.380	-0.330	0.244	-0.558	0.392
Number of HH members aged 5-14 yrs	-0.197	0.356	-0.028	0.563	-0.661 *	0.353	-0.506	0.600
HH is member of rotating credit association	0.600	1.162	0.329	1.666	1.041	1.061	0.638	1.709
Shock experience (yes=1)								
Illness of HH head/spouse			-2.879 *	1.557			-3.045 *	1.801
Illness of other HH member			0.087	1.834			0.154	1.635
Death in the household			-0.771	1.345			-1.483	1.685
Theft or destruction of assets			0.805	1.548			1.038	1.402
Climatic shock			-0.193	1.114			-0.131	1.496
Pest or disease affecting crop or livestock			3.227	1.983			3.419 *	1.805
Large increase in prices of inputs or reduced access to inputs			0.525	1.398			0.356	1.382
Large decrease in prices or demands for produced goods			0.026	1.458			-0.020	1.090
Constant	-7.445 **	3.372	-12.502 ***	4.176	-3.658	3.273	-8.789 **	3.918
Number of observations	87		87		87		87	
McFadden's (Pseudo) R^2	0.32		0.37		0.32		0.37	

Log likelihood	-55.26	-51.07	-55.26	-51.07
Proportion of correct predictions	0.66	0.66	0.66	0.66
Control for interaction terms	No	No	No	No

*, **, *** refer to significance at 10%, 5% and 1%, respectively. Standard errors are adjusted for village level clustering

+ All asset/capital endowment except education is expressed in adult equivalent unit. Education of adults is given as a share to total adults

Notes

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[1] It is possible also that a household who owns enough capital may optimally invest in both types of activities. We ignore this possibility for the sake of simplicity

[2] Because we want to describe how the returns are in general in the study areas, we use the pooled data from the six surveys.

[3] The questionnaire does not distinguish between agricultural and non-agricultural goods with regard to price shocks and lack of access to inputs. We assume these are mainly agricultural goods.

[4] The smaller number of observations for the subsample initially in high-return RNFE meant we could not include interaction terms. We also tested the key assumption of independence of irrelevant alternatives to confirm the data do not violate the core assumptions of the multinomial logit estimator (Maddala 1983). The Hausman-McFadden test does not reject the null hypothesis of IIA, confirming the validity of the multinomial logit estimator

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