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POVERTY REDUCTION AND ECONOMIC LIVELIHOOD MOBILITY IN RURAL SUB-SAHARAN AFRICA

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Abstract: This article uses household panel data for six countries in rural sub-Saharan Africa to study the dynamics of off-farm diversification rather than the 'static' analyses common in the related literature. It identifies drivers of economic livelihood mobility and implications for poverty reduction. The results show that on-farm specialization imposes considerable welfare costs on rural households. In most of the countries, income poverty reduction was highest for households that became diversified and lowest for those that became specialized. Yet, off-farm diversification entry is hampered by living in a female-headed household, old age, low farm productivity and poor rural infrastructure. © 2020 John Wiley & Sons, Ltd.

Keywords: poverty; diversification; livelihood mobility; panel data; sub-Saharan Africa

1 INTRODUCTION

The latest available poverty figures show that sub-Saharan Africa (SSA) was home to more than half (56.3 per cent) of the world's extremely poor population as at the year 2015 (World Bank, 2018). Yet, the region held only about 13.7 per cent of the world's population at the time. Indeed, 26 of the 27 countries with the highest poverty rates were in SSA. Since the 1990s, however, there has been a surge in concerted policy and development efforts towards poverty reduction, with the available evidence suggesting that some progress has been made. For example, headcount poverty in SSA reduced from 58.9 per cent of the population in 1993 to 41.1 per cent in 2015 (World Bank, 2016, 2018).[1] However, given the relatively slow pace of poverty reduction in SSA compared with other

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[1]Poverty is defined here as living on less than $1.9 a day at 2011 purchasing power parity price.

regions of the world (Beegle, Christiaensen, Dabalen, & Gaddis, 2016), the search for efforts at driving down poverty rates faster continues.

There is a spatial dimension to poverty, with the phenomenon being relatively more widespread in rural than urban SSA (Kraay & McKenzie, 2014; Roser & Ortiz-Ospina, 2018). Therefore, although urban poverty should not be ignored, directing relatively more effort towards rural poverty reduction makes sense. To do so, however, it is important to understand the factors that drive rural poverty and their dynamics thereof.

One of the proximate correlates of poverty is employment status. Although agriculture remains the dominant source of employment in most of rural SSA, it is well known that most households straddle on-farm and off-farm economic activities (Davis, Di Giuseppe, & Zezza, 2017), meaning that pluriactivity is the norm. However, because livelihood diversification could be driven by either 'distress-push' (or copping) or 'demand pull' (or accumulation) factors (Reardon *et al*., 1998; Nagler & Naudé, 2017), the question of whether diversification is poverty reducing or not must be found in specific contexts. Using panel data for six SSA countries, this article seeks to contribute to understanding the association between diversification dynamics and poverty and to unravel the determinants of economic livelihood mobility (ELM) among rural farm households.

Several studies have explored the relationship between off-farm diversification and poverty (see e.g. Kijima & Lanjouw, 2005; Haggblade, Hazell, & Reardon, 2010; Dzanku, 2015; Van den Broeck & Maertens, 2017). My empirical point of departure is the focus on the 'dynamics' of off-farm diversification and the implications for poverty as opposed to the 'static' analyses common in the received literature. While some studies have examined poverty dynamics or transitions (Glewwe, Gragnolati, & Zaman, 2002; Justino, Litchfield, & Pham, 2008; Radeny, van den Berg, & Schipper, 2012), and more recently the dynamics of off-farm employment (OFE; Van den Broeck & Kilic, 2019), I am not aware of any study that has explicitly analysed the link between OFE dynamics and poverty reduction or transitions. Yet, evaluating the association between ELM and poverty transitions is useful because although some have long argued that OFE is not a temporary activity by rural households for overcoming momentary shocks (Timmer, 1988; Ellis, 2000), others have found temporal instability in rural off-farm diversification behaviour in some contexts (Saith, 1992; Dzanku, 2015), and it is not clear what the implications are for poverty transitions. Therefore, as Van den Broeck and Kilic (2019), I explicitly construct an indicator of ELM that identifies households that diversify and those that remain 'trapped' in on-farm work even if such a strategy is welfare decreasing. This approach helps to identify whether off-farm diversification has been pro-poor or not and to isolate factors that promote or hinder entry into off-farm diversification, which is particularly important for informing rural poverty reduction policy decisions and practices. This article therefore has two objectives: (i) to examine the association between off-farm diversification dynamics and poverty and (ii) to identify the determinants of ELM.

As noted by Davis *et al*. (2017), an area that is relatively less researched is how geography conditions diversification behaviour. Given the received wisdom of backward and forward farm–nonfarm growth linkages, one could conjecture that agricultural production potential influences off-farm diversification behaviour and outcomes. Factor endowments, which condition household resource allocation across livelihood activities, tend to be spatially dependent and so do the constraints facing entry into certain types of employment activities (Barrett, Reardon, & Webb, 2001; Deichmann, Shilpi, & Vakis, 2008). One would thus expect geography differences in the feasible set of livelihood opportunities from which households could choose. I therefore exploit the

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sampling strategy, which distinguishes between regions based on production potential and market access to identify spatial nuances, if any, in the association between poverty and diversification dynamics as well as the determinants of EL mobility.

The rest of this article is structured as follows. The next section presents a conceptual framework for the analysis. Section 3 describes the data and explains how key variables are measured. Section 4 presents the empirical models and estimation strategies. Descriptive statistical analyses are presented in Section 5. Regression results are reported and discussed in Section 6. Section 7 concludes and draws lessons for development policy and practice.

2 CONCEPTUAL FRAMING

In choosing an occupation, human capital theory suggests that the potential worker evaluates the potential benefits and costs (both pecuniary and nonpecuniary) of a set of employment alternatives and chooses the one with the highest present value of discounted potential benefits subject to labour and capital market constraints. However, due to incomplete factor markets that are more common and severe in rural SSA (Dillon & Barrett, 2017), employment opportunities are often ad hoc, uncertain and involve transient income generating activities with little labour specialization (Bryceson, 2002; Dzanku, 2015). Under these circumstances, rural household economic behaviour is more accurately represented within the 'livelihoods framework' (Carney, 1998; DfID, 1999; Ellis, 2000).

A livelihood in this context entails activities that enable individuals or households to make a living as well as access the means of generating income (Ellis, 2000). The livelihoods framework implies that a rural household's ability to pursue an economic activity depends on their access to and control over livelihood assets. Access and utilization of these assets or 'capitals' within a given institutional and policy environment yields observed livelihood activities and strategies with varying outcomes.

The primary assets of rural farm households in SSA are land and labour, the allocation of which has implications for rural employment and poverty. My primary point of departure from the existing literature on livelihood diversification and poverty relates to the transience or stability of rural livelihood activities (Ellis, 1998; Niehof, 2004; Dzanku, 2015). Limited occupational opportunities beyond farming and the lack of entrepreneurial skill development in rural SSA leads to livelihood instabilities, even if off-farm activities are pervasive in the population. Returns to land or labour could therefore be extremely time varying due to seasonality and evanescent off-farm opportunities.

To illustrate, take, for example, a rural household for whom labour is employed primarily for on-farm activities. Pluriactivity, being the norm, assumes further that the household supplies some labour for work in artisanal and small-scale mining during a first period. The allocation of available livelihood assets towards this bundle of livelihood activities yields a given level of welfare. During a second period, however, a slump in commodity prices or a government policy that places a ban on small-scale mining activities, for example, could lead to loss of off-farm income with an associated level of welfare.[2] The reverse scenario is plausible, where livelihood options that were not available to a household during an initial period become available during the next period, resulting in ELM between periods.

[2]For example, a ban was imposed on small-scale mining activities in Ghana between January 2017 and December 2018.

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In essence, the transience of economic livelihood options outside farming in rural SSA requires adjustment of livelihood portfolios by household. Because different livelihood portfolios are associated with varying livelihood outcomes, such adjustments or the lack thereof has implications for household welfare. The extent to which livelihood portfolio adjustments occur in response to changing circumstances within and outside rural areas is determined by a household's livelihood capital position. Differences in endowments and constraints thus influence diversification behaviour. Because endowments and constraints vary over time and space, one would expect diversification behaviour to be spatially and temporally dynamic rather than static.

3 DATA AND INDICATORS

3.1 Data

This article employs data from the Afrint household surveys which begun in 2002 in rural areas of nine SSA countries.[3] The number of countries reduced to eight during the second round of the surveys and then to six (Ghana, Kenya, Malawi, Mozambique, Tanzania and Zambia) during the third round because of limited funding (Figure 1). The sampling of countries, regions and villages followed a multistage purposive approach. The strategy in each country was to select a region or regions considered by national experts as having above or below average agricultural production potential and infrastructure (including market access). The regions are categorized as 'poor' (low agricultural potential region) and 'rich' (high agricultural potential region). The aim was to achieve variation in agroecological potential and market infrastructure endowments.

This sampling strategy was necessary because there were no enough resources to draw nationally representative samples. Across all the six countries included in this article, 15 regions were chosen purposively in 2002 based on the defined poor versus rich region dichotomy. I exploit this sampling strategy—the distinction between rich and poor regions—for studying possible spatial nuances in the relationships of interest. To achieve further dynamism, villages within each region were chosen using the same criteria of 'low' versus 'high' production potential, yielding 56 villages across the 15 regions. Table A1 (Appendix) provides the list of regions and number of villages sampled. Finally, at the village level, a representative random sample of 17–71 households per village (depending on village population size) was drawn using a household list as sample frame.

The last two surveys (2008 and 2013/2015) collected detailed information on all income sources. The realized sample size was 2476 households in 2008. During the next period, 2091 households were successfully resurveyed, yielding an attrition rate of approximately 8 per cent. I found no significant differences when I compared results that account for potential nonrandom attrition bias with results using the balanced sample, concluding that attrition is ignorable.[4] I therefore focus the analysis on the balanced panel of 4182 observations. The distribution of observations across the countries and region types is presented in Table A1 (Appendix).

[3]The Afrint studies were led by the faculty at Lund University: https://www.keg.lu.se/en/research/research-projects/current-research-projects/afrint.
[4]I used inverse probability weights to account for attrition as described in Baulch and Quisumbing (2011). Detailed attrition analysis is available on request. However, Table A2 contains more information on attrition, showing that ignorable attrition (on observables) is a reasonable assumption.

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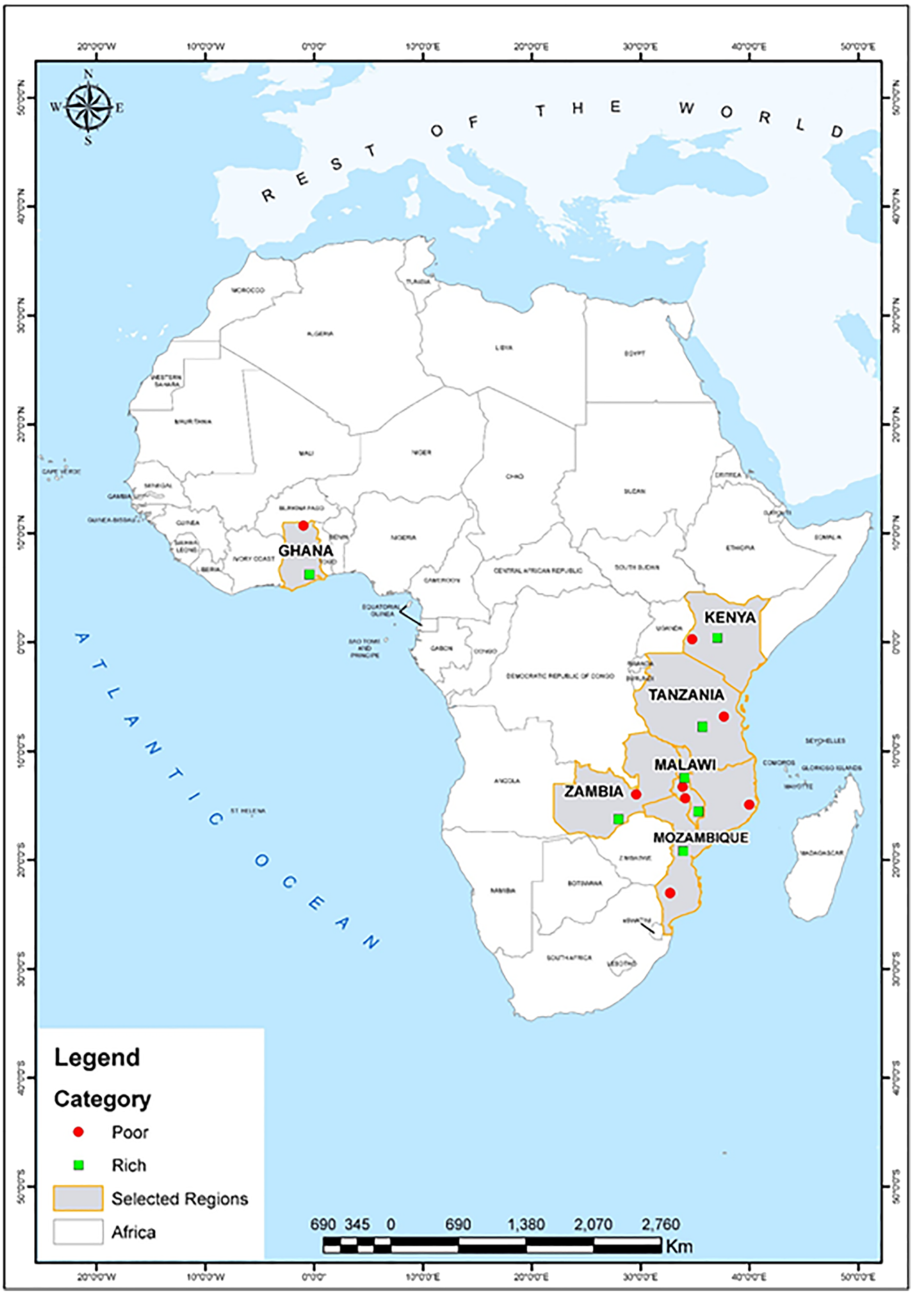

Figure 1. Map of Africa showing the study countries and regions [Colour figure can be viewed at wileyonlinelibrary.com]

3.2 Indicators

The main variables of interest are measures of household welfare and ELM. Because poverty is a multidimensional phenomenon, it is measured here using two indicators.

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The first is adult equivalent household income in constant 2011 international dollars ($). While income and consumption are the most common measures of poverty, they do not capture the multidimensionality of welfare. For example, they do not account for inputs such as public goods and services, which contribute to household utility. Besides, income is particularly sensitive to volatile shocks and may not capture long-term well-being. With this in mind, I also measure welfare using a composite asset index (CAI) motivated by Filmer and Pritchett (2001). The CAI is constructed using the principal component technique to aggregate household dwelling characteristics (type of material for floor, walls and roof), household durable assets (ownership of a cooking stove, radio, home theatre and television) and availability of electricity. A possible drawback with the asset measure of welfare is that changes in well-being may not manifest immediately through changes in asset accumulation. Using both income and assets thus helps distinguish between short-term shocks that drive households into poverty and long-term poverty traps (Carter & Barrett, 2006).

The ELM indicator is constructed as follows. First, let OFE income (*OFEI*) represent earnings from off-farm employment (i.e. income from all economic activities outside crop and livestock farming).[5] Further, let *OFEID* represent an indicator variable that equals unity if $OFEI > 0$, and zero otherwise. I can then define the following quantities:

$$P\left(OFEID_{i,t=1} = 0 \mid OFEID_{i,t=2} = 1\right) \tag{1a}$$

$$P\left(OFEID_{i,t=2} = 1 \mid OFEID_{i,t=1} = 0\right) \tag{1b}$$

where Equation 1a represents the proportion of households that specialized in on-farm work at time $t1$ but became diversified at time $t2$ by supplying labour to off-farm activities in addition to agriculture. Similarly, Equation 1b represents the proportion of households that diversified at time $t1$ but became specialized in on-farm work at time $t2$. Based on the above, households can be categorized into four mutually exclusive groups, which I describe as (i) *stayout* (specialized in both periods), (ii) *stepinn* (specialized at $t1$ but diversified at $t2$), (iii) *stepout* (diversified at $t1$ but specialized at $t2$), and (iv) *stayinn* (diversified in both periods).

4 ANALYTICAL APPROACH

My first objective is to examine the association between ELM and poverty. The dependent variables are the income and asset poverty indicators (adult equivalent household income and CAI) described in the previous section. For a two-period panel data, first differencing is equivalent to applying a fixed effects estimator (Wooldridge, 2002, p. 284).[6] Therefore, my first objective is achieved by estimating the following first-differenced household welfare equations:

[5]This includes salaried employment, off-farm self-employment, and casual wage employment. It excludes unearned income such as transfers (remittances and pensions).
[6]In this case, first differencing basically means taking the difference or the change in a time-varying variable for household i between time $t1$ and $t2$. If the variable is y_{it}, then first differencing involves $y_{it} = y_{it1} - y_{it2}$, which is commonly written as $y_{it} = y_{it} - y_{it-1}$.

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$$\Delta ln(AEI_i) = \alpha_1 + \varphi_1 stayout_i + \varphi_2 stepout_i + \varphi_3 stayinn_i + {\beta_1}' \Delta X_i + {\gamma_1}' V_i + \Delta\varepsilon_{1i}, \quad (2a)$$

$$\Delta CAI_i = \alpha_2 + \delta_1 stayout_i + \delta_2 stepout_i + \delta_3 stayinn_i + {\beta_2}' \Delta X_i + {\gamma_2}' V_i + \Delta\varepsilon_{2i}, \quad (2b)$$

where indicates change in time-varying variables for household *i* between time *t*1 and *t*2. The ELM categorical variable defined by the quantities in Equations 1a and 1b is represented as *stayout*, *stepout* and *stayinn*, meaning that *stepinn* is the reference group. X_i is the vector of time-varying covariates (household composition, social networks, transfers, livestock and other time-varying endowments), V_i is the vector of time-invariant control variables (sex, age, education and location dummies), and ε_i is the error term that captures random shocks and other unobserved factors.

The parameters φ_k and δ_k (for $k = 1$, 2 and 3) measure the association between the ELM positions and household welfare. If the same factors that influence ELM also affect household welfare, then the estimates of φ_k and δ_k will be biased, meaning that the ELM indicator is potentially endogenous in Equations 2a and 2b. There are at least two sources of bias. The first is time-constant unobserved heterogeneity. With panel data, first differencing takes care of endogeneity operating through omitted heterogeneity (Wooldridge, 2002). The second is the possibility that time-varying unobserved factors that influence ELM could also affect household welfare, in which case, the estimated association between ELM and household welfare will be inconsistent.

My approach for dealing with the second source of endogeneity is the use of instrumental variable approach for identification and, at least, mitigate the potential bias in the estimates of δ_k and φ_k. This approach requires an identifying variable that affects household welfare exclusively through their influence on ELM. Because the exogeneity of such identifying variables cannot be tested directly, I rely on knowledge of the phenomenon being examined and the related literature. I proceed as follows. As Harou, Walker and Barrett (2016), I first estimate a multinomial logit model to predict ELM. That is, I obtain inverse Mills ratios from regressing ELM on all exogenous variables, including instruments. The inverse Mills ratios are then entered into Equations 2a and 2b to correct for endogeneity bias in the spirit of (Heckman, 1979).

The first instrument is distance from household dwelling to the village centre. In the study villages, nonfarm self-employment activities (particularly commerce) tend to be clustered around the village centre or close to the main roads. I found that the distance variable is highly correlated with participation in off-farm activities. After controlling for other exogenous factors, I argue that there is no explicit channel through which living near the village centre influences poverty except through off-farm participation.[7]

The second instrument is an intergenerational indicator that influences ELM in a rural setting. This is a binary variable indicating whether a parent of the household head was engaged in OFE. This assumes that after controlling for intergenerational transfers (e.g. inherited land, livestock, social network capital and other off-farm assets), the only channel left though which a parent's off-farm activity could influence a household's current welfare is through the household's own diversification behaviour (Fafchamps & Quisumbing, 1999; Scharf & Rahut, 2014). While there are channels through which parent's off-farm participation could influence welfare (e.g. through education and intergenerational transfers), the fact that such factors enter as control variables in the welfare equation means that this instrument is conditionally exogenous.

[7]As Scharf and Rahut (2014), I also explored using distance to market as an instrument but found it to be directly correlated with welfare and thus did not satisfy the exclusion restriction assumption.

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Third, I use the proportion of the village population engaged in off-farm economic activities as instrument. This is because village-level diversification behaviour is not directly under the control of an individual household (Scharf & Rahut, 2014). In the cross-country regressions, village averages of the first two instruments are also good instruments for the same reason.

Apart from estimating the average association between poverty reduction and ELM, I am also interested in the hypothesis that the association differs by agroecological potential. I examine this possibility using the interactions approach by specifying

$$\Delta ln(AEI_i) = \alpha_1 + \lambda_0 G_i + \varphi_1 stayout_i + \varphi_2 stepout_i + \varphi_3 stayinn_i + \lambda_1(G_i \times stayout_i) + \lambda_2(G_i \times stepout_i) + \lambda_3(G_i \times stayinn_i) + \beta_1{}' \Delta X_i + \gamma_1{}' V_i + \Delta u_i \quad (3a)$$

$$\Delta CAI_i = \alpha_2 + \omega_0 G_i + \delta_1 stayout_i + \delta_2 stepout_i + \delta_3 stayinn_i + \omega_1(G_i \times stayout_i) + \omega_2(G_i \times stepout_i) + \omega_3(G_i \times stayinn_i) + \beta_2{}' \Delta X_i + \gamma_2{}' V_i + \Delta \varepsilon_i \quad (3b)$$

where G is the binary geography indicator variable that equals unity for poor region households and zero for rich region households. Equations 3a and 3b allows testing the null hypothesis that the poverty reduction premium for becoming diversified between $t1$ and $t2$, for example, is identical for poor and rich region households, other factors remaining identical.

I now turn to the second objective, which is to identify the determinants of ELM. The multinomial logit and probit models are the two main approaches for estimating nominal dependent variables. Choice between the two is guided mainly by whether the independence of irrelevant alternatives (IIA) assumption, which the multinomial logit model assumes, is empirically valid or not.[8] I tested this assumption empirically using a robust Small–Hsiao test (Small & Hsiao, 1985). Because I found evidence against the null hypothesis that the IIA assumption is valid (Appendix Table A3), I model the determinants of ELM using the multinomial probit model.

Because my primary objective is to identify the correlates off-farm diversification entry relative to remaining specialized in on-farm work, it makes sense to let *stayout* (ELM = 1) be the base outcome. The probability that household i is in the jth ELM position is

$$\text{Prob}(ELM_i = j|X_i) = \frac{\exp\left(X_i\beta_j\right)}{1 + \sum_{k=2}^{4} \exp(X_i\beta_k)} \quad (4)$$

where X_i is the vector containing all the covariates for the ith household and β_k is the coefficient vector for outcome k. The vector X contains household and village-level covariates. The household level controls include household demographic and human capital indicators and the availability of factors of production such as land, labour and financial resources. The vector X also contains lagged agricultural output per worker, which is expected to increase the probability of off-farm diversification.

5 SAMPLE DESCRIPTIVE ANALYSIS

Table 1 presents mean summary statistics of the cross-country sample and by region type. As could be expected, farming (crop and animal production) is the primary livelihood

[8] It must be noted that the statistical tests for the IIA assumption are not always reliable because they could give contradictory results even when IIA is known to be violated (Long & Freese, 2014).

Table 1. Mean summary statistics of the main indicators, over time and by region type

	Total	Poor Region (PR)	Rich Region (RR)	RR − PR
Farm income share	0.649	0.648	0.649	0.001
Farm income share	0.002	0.020	−0.019	**−0.039**
Share of household who received OFEI	0.518	0.514	0.523	0.009
Share of household who received OFEI	0.089	0.097	0.080	−0.017
Share of household who received OFI	0.623	0.627	0.617	−0.010
Share of household who received OFI	0.074	0.071	0.076	0.005
Share of income from OFE	0.273	0.254	0.296	**0.042**
Share of income from OFE	−0.002	−0.009	0.005	0.014
Off-farm diversification dynamics:				
stayout	0.277	0.269	0.286	0.017
stepinn	0.249	0.265	0.230	**−0.035**
stepout	0.160	0.168	0.151	−0.018
stayinn	0.314	0.298	0.333	**0.035**
Income per AE (PPP constant 2011, $)	346	224	495	**270**
Income per AE (PPP constant 2011, $)	130	116	148	31.96
Share of seasonal food insecurity (SFI) households	0.547	0.650	0.422	**−0.228**
Share of SFI households	−0.069	−0.125	−0.002	**0.122**
Normalized composite asset index	0.320	0.260	0.392	**0.132**
Normalized composite asset index	0.053	0.053	0.052	−0.001

Figures in bold font represent statistically significant difference at 0.05 level or better. AE, adult equivalent; OFE, off-farm employment; OFEI, off-farm employment income; OFI, off-farm income; PPP, purchasing power parity.

activity for households in the Afrint sample—all households are involved in food crop production even if some do not earn cash income from the activity. On average, about 65 per cent of cash income in the pooled sample is derived from on-farm work, but there is variation across countries—ranging between approximately 55 per cent in Mozambique and about 72 per cent in Zambia (Table A4, Appendix). Although the share of income derived from on-farm work remained largely constant over the panel period in the cross-country sample, there are country-specific nuances whereby the share declined in Ghana, Kenya and Mozambique but increased in Malawi, Tanzania and Zambia (Table A4). While these high rates of specialization in on-farm activities might appear striking, the phenomenon is an empirical regularity in rural SSA. Using nationally representative household surveys for 22 countries Davis *et al*. (2017) show that 52 per cent of African households specialized in on-farm activities compared with 21 per cent of households in Asia and Latin America.

Aside the farm-based livelihood activities, about 62 per cent of the cross-country sample received off-farm income, whether earned or unearned.[9] However, only about 52 per cent of this sample earned off-farm employment income by supplying labour for agricultural wage employment (17 per cent of the sample), nonagricultural wage employment (13 per cent of the sample) and off-farm self-employment (32 per cent of the sample). Table A5 (Appendix) shows some variations in these off-farm income sources across the six countries. For example, agricultural wage work is nearly three times more common in Malawi than in the rest of the countries. In the cross-country sample, participation in off-farm employment income seemed more common in poor regions than in rich regions,

[9]The off-farm activities include working on others' farms for wages, leasing out machinery, nonfarm salaried work, petty trading (or commerce in general) and artisan jobs.

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but the difference is not significant (p-value = 0.670).[10] At the mean, however, households in rich regions derive a significantly higher share of income from off-farm employment (about 4 percentage points more) than those in poor regions (p-value = 0.001). The degree of on-farm specialization defers significantly by agroecological potential within all countries except Zambia (Table A4), but the differences are not unidirectional. Whereas those living in the rich regions of Ghana, Kenya and Tanzania had higher rates of on-farm specialization than those living in the poor regions, the opposite is true for Malawi and Mozambique. These differences primarily relate to the degree of agricultural growth linkages in the various rural economies.

A central question in this article relates to household mobility between off-farm diversification and on-farm specialization. About 41 per cent of the sample could be described as exhibiting transitory off-farm diversification behaviour, with about a quarter (25 per cent) of those who specialized in on-farm activities at time $t1$ becoming diversified at time $t2$, and about 16 per cent of those that were diversified at time $t1$ becoming specialized at time $t2$. The rest of the households did not change position between on-farm specialization and off-farm diversification—about 28 per cent and 31 per cent were persistent in on-farm specialization and off-farm diversification, respectively, over the panel. Transitory diversification—whether upward mobility (specialization → diversification) or downward mobility (diversification → specialization)—is more common in poor regions (about 43 per cent of households) than in rich regions (about 38 per cent of households). Table A6 presents the country-specific ELM positions, showing that diversification behaviour is most stable in Malawi (48 per cent) and least so in Zambia (25 per cent). A considerable share of households exhibited transitory diversification behaviour in all countries (from 38 per cent of households in Malawi to 43 per cent in Kenya), but there are also significant differences between region types as the last column of Table A6 shows. The Van den Broeck and Kilic (2019) article included nationally representative samples from Malawi (2010 and 2013) and Tanzania (2011 and 2013). Comparing their rural sample results with mine, I see that on-farm specialization is even more pervasive in their samples than it is in ours (18 and 16 percentage points more in Malawi and Tanzania, respectively). However, the rate of transient diversification behaviour in their rural Malawi sample (37 per cent) is identical to the rate in our sample (38 per cent), but 10 percentage points less in their rural Tanzania sample.

Both income and asset poverty reduced significantly over the panel period. At the mean, adult equivalent income and asset wealth grew by approximately 46 per cent and 18 per cent, respectively (Table 1). The poverty indicators all show significantly large spatial differences in favour of rich regions, as could be expected, and this is true for all countries (Table A7, Appendix).

Table A8 (Appendix) shows the mean summary statistics of variables by the ELM positions. I find significant variation in both income and asset poverty across the ELM positions. Regardless of welfare measure, Figure 2 shows that poverty reduction was fastest for households who entered off-farm diversification (*stepinn*) and slowest for those who specialized in on-farm work (*stepout*). The country-specific results showing the relationship between poverty reduction and ELM can be found in Table A9 (Appendix). The F-statistic values suggest a significant association between income poverty reduction

[10]Throughout this article, the word 'significant' or 'significantly' is used in the statistical sense, unless otherwise specified.

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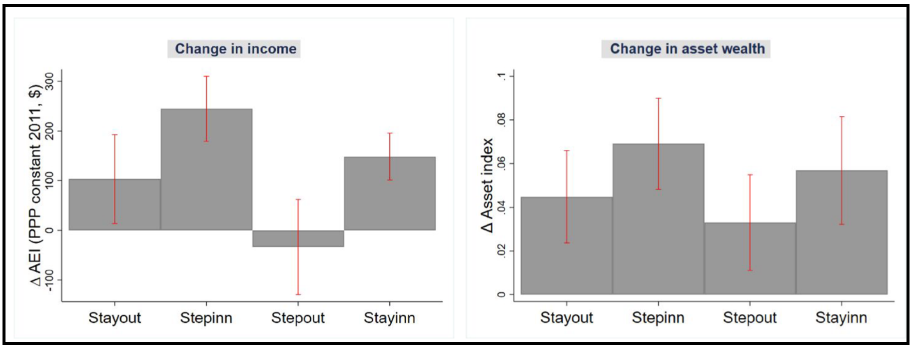

The error bars represent 95 per cent confidence intervals.

Figure 2. Economic livelihood mobility and welfare change. The error bars represent 95 per cent confidence intervals. [Colour figure can be viewed at wileyonlinelibrary.com]

and ELM in all countries except Ghana. Regarding asset poverty, only Malawi and Tanzania show no evidence of a significant association with ELM. Thus far, the descriptive analysis shows a significant association between ELM and household welfare change, with poverty reduction being fastest for households who exited on-farm specialization. The ELM positions also seems to differ by resource endowments including labour, land and infrastructure. Next, I explore the relationships further using regression methods.

6 REGRESSION RESULTS AND DISCUSSION

In this section, I first present results from estimating the household welfare equations, which allow us to answer the first research question. I then explore the presence of geography differences in the relationships of interest. Having established the nature of the relationship between welfare and ELM, I move on to identify the determinants thereof.

6.1 The Welfare Effect of Economic Livelihood Mobility

Results from the instrumented first-differenced household welfare models (Equations 2a and 2b) are reported in Table 3. Table A10 (Appendix) reports the first stage fixed effects linear probability regression results together with statistical tests for the relevance, validity and strength of the instruments. As the results show, the test for overidentifying restriction fails to reject the null hypothesis that the instruments are exogenous, meaning that they are statistically valid. Because the instruments could be irrelevant even if exogenous, I also report tests for instrument strength and relevance from the first stage regressions. The null hypothesis that the excluded instruments are uncorrelated or only weakly correlated with the endogenous variable is easily rejected as shown by the *F*-tests. Moreover, the *F*-statistic values are larger than the suggested threshold of 10 required to avoid the weak identification problem (Staiger & Stock, 1997). The uninstrumented welfare regression results, which are similar to the instrumented results, are reported in Table A11 (Appendix). I also report country-specific results (both instrumented and uninstrumented) in Tables A12–A15. In all cases, my interest is in the two related null hypotheses:

Hypothesis 1. *Poverty reduction (or welfare change) is identical across households irrespective of their ELM position.*

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Table 2. Household welfare change and instrumented economic livelihood mobility

Covariates	Change in AE income (log)			Change in composite asset index		
	Overall (1)	Poor region (2)	Rich region (3)	Overall (4)	Poor region (5)	Rich region (6)
ELM (ref. = *stepinn*):						
stayout	−0.358*** (0.083)	−0.311** (0.126)	−0.388*** (0.090)	−0.133* (0.076)	−0.029 (0.091)	−0.254** (0.116)
stepout	−0.915*** (0.106)	−0.760*** (0.140)	−1.052*** (0.155)	−0.235*** (0.088)	−0.130 (0.121)	−0.357*** (0.118)
stayinn	−0.353*** (0.077)	−0.248*** (0.089)	−0.470*** (0.134)	−0.060 (0.078)	0.001 (0.119)	−0.164 (0.109)
Female-headed household	−0.175** (0.078)	−0.170 (0.109)	−0.203* (0.104)	0.037 (0.072)	−0.003 (0.077)	0.112 (0.135)
Age of household head	0.002 (0.002)	0.004 (0.003)	−0.000 (0.003)	−0.001 (0.002)	−0.001 (0.002)	0.001 (0.004)
Share of members under 15	−1.061*** (0.118)	−0.995*** (0.135)	−1.129*** (0.214)	0.175** (0.080)	0.122 (0.090)	0.221 (0.152)
No. of working-age women	−0.173*** (0.021)	−0.144*** (0.026)	−0.214*** (0.027)	0.034** (0.017)	0.027 (0.023)	0.046* (0.025)
No. of working-age men	−0.131*** (0.022)	−0.132*** (0.028)	−0.135*** (0.036)	0.073*** (0.022)	0.079*** (0.025)	0.068 (0.042)
Head's years of schooling	0.033*** (0.009)	0.042*** (0.012)	0.017 (0.013)	0.036*** (0.009)	0.037** (0.014)	0.036*** (0.013)
Social network capital	0.186*** (0.052)	0.144* (0.074)	0.231*** (0.077)	0.136** (0.056)	0.189*** (0.065)	0.097 (0.096)
Monthly transfers	—	—	—	0.002 (0.002)	0.003 (0.002)	0.001 (0.002)
Livestock assets	0.058*** (0.014)	0.077*** (0.017)	0.036** (0.017)	0.049*** (0.012)	0.057*** (0.014)	0.039** (0.017)
Land available per adult	0.239*** (0.039)	0.291*** (0.050)	0.198*** (0.056)	0.096*** (0.029)	0.068* (0.037)	0.120** (0.044)
Land constraint	0.023 (0.048)	0.029 (0.072)	−0.000 (0.066)	−0.037 (0.037)	−0.076 (0.062)	0.007 (0.046)
Endogeneity correction terms:						
IMR 1	−0.007 (0.005)	−0.011*** (0.002)	0.024 (0.026)	0.002 (0.003)	0.003 (0.002)	−0.019 (0.019)
IMR 2	0.006 (0.004)	0.006 (0.003)	0.003 (0.020)	0.013*** (0.002)	0.013*** (0.003)	−0.002 (0.014)
IMR 3	−0.001 (0.005)	−0.003 (0.005)	−0.007 (0.022)	0.000 (0.002)	−0.001 (0.002)	0.021 (0.020)
Intercept	0.070 (0.246)	−0.037 (0.161)	0.494 (0.395)	0.108 (0.117)	0.486*** (0.134)	−0.275 (0.304)
Region fixed-effects included	Yes	—	—	Yes	—	—
Country fixed-effects included	—	Yes	Yes	—	Yes	Yes
Number of households	2,091	1,148	943	2,091	1,148	943
R^2	0.256	0.211	0.318	0.095	0.087	0.113
F-statistic for joint test that all ELM coefficients = 0	26.250 [0.000]	12.626 [0.000]	15.416 [0.000]	2.656 [0.058]	0.440 [0.726]	3.876 [0.020]

Standard errors (in parentheses) are robust to household clustering at the village level. AE, adult equivalent; ELM, economic livelihood mobility; IMR, inverse Mills ratios.
*Statistical significance at the 10 per cent level;
**Statistical significance at the 5 per cent level;
***Statistical significance at the 1 per cent level.

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Table 3. Geography differences in the association between economic livelihood mobility and poverty reduction

	AE income (log)	Composite assets
G1: *stepinn* (PR − RR)	0.130 (0.156)	−0.096 (0.117)
G2: *stayout* (PR − RR)	0.268* (0.145)	0.092 (0.130)
G3: *stepout* (PR − RR)	0.419** (0.171)	0.069 (0.160)
G4: *stayinn* (PR − RR)	0.279** (0.116)	0.027 (0.120)
G5: PR[*stepinn–stayout*] − RR[*stepinn–stayout*]	−0.137 (0.171)	−0.188 (0.158)

The standard errors (in parentheses) are robust to households clustering at the village level. AE, adult equivalent; PR, poor region; RR, rich region
*Statistical significance at the 10 per cent level;
**Statistical significance at the 5 per cent level;
***Statistical significance at the 1 per cent level.

Hypothesis 2. *Poverty reduction is identical for households who became diversified (stepinn)* relative to the other ELM positions.

Hypothesis requires test of the null that all the coefficients on the ELM indicator jointly equal zero. There is evidence against Hypothesis if the estimates of φ_k and δ_k (for $k = 1$, 2 and 3) are each different from zero at conventional levels. Hypothesis (particularly the sub null that compares the rate of poverty reduction between *stepinn* and *stayout* households) is the most instructive from the development policy perspective.

The evidence shows that the outcome of Hypothesis depends on how welfare is measured. As the *F*-tests in the bottom row of Table 2 show, Hypothesis is overwhelmingly rejected for income poverty reduction but not asset poverty reduction in the cross-country sample, except in rich regions (column 6). Thus, as could be expected, asset wealth changed slowly over time, particularly for those in the poor regions. All the country-specific estimates (Tables A12–A15) tell a similar story with respect to Hypothesis, except for the Ghana sample where Hypothesis can also be rejected in the asset wealth equation (Table A14, column 1).

As the descriptive analyses suggested, Table 2 shows strong evidence against Hypothesis in the income poverty equations for the cross-country sample—income poverty reduction is highest for *stepinn* households relative to the other three ELM positions, even after adjusting for a wide array of other factors.[11] In the overall cross-country sample, for example, AE income increased by about 30.1 per cent, 60.0 per cent and 29.7 per cent less for *stayout*, *stepout* and *stayinn* households, respectively, compared with *stepinn* households.[12]

For asset poverty reduction on the other hand, the only evidence against Hypothesis in the cross-country sample is in respect of the rich region sample (column 6), where asset wealth growth was significantly slower for *stayout* and *stepout* households than for their *stepinn* counterparts. As Finan, Sadoulet, and de Janvry (2005), I divide the estimated coefficients from the composite asset regression by the monthly transfer coefficient for ease of interpretation.[13] Doing so shows that the monthly average value of asset wealth growth over the panel period was about \$194 and \$272 less for *stayout* and *stepout*

[11]It is important to clarify that *stepinn* households are not better off than *stayinn* households, on average. The analysis here relates to income growth (or poverty reduction), not average welfare in absolute terms.
[12]Because the dependent variable is the logarithm of AE income, [exp (φhat) − 1] × 100 gives the exact percentage difference in poverty reduction between the ELM positions, where φhat is the estimated coefficient on an ELM position dummy.

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households, respectively, compared with *stepinn* households in rich regions; *stepinn* and *stayinn* households had identical rates of asset poverty reduction.

There are country-specific nuances in the outcome of Hypothesis. Concerning asset wealth growth, Hypothesis can be rejected only for the Ghana sample (Table A14, column 1). Here, the average monthly value of asset growth was approximately \$457 and \$172 less for *stepout* and *stayinn* households, respectively, than for *stepinn* households. Regarding income growth, the stories from the Tanzania and Zambia samples are similar to that of the cross-country sample (Table A12, columns 5 and 6). That is, mean income growth was significantly higher for *stepinn* households than for those in the other three ELM positions, which is evidence against Hypothesis. For all the six country samples, income poverty reduction was slower for *stepout* households than for *stepinn* households (Table A12). Such welfare losses beg the question why do some households become specialized in on-farm employment over time? The most plausible reason is the transience of some rural off-farm employment activities. In four of the six countries (Kenya, Mozambique, Tanzania and Zambia), households who become diversified (*stepinn*) achieved higher poverty reduction than those who remained specialized in on-farm activities (*stayout*)—on average, income growth was about 41.8 per cent, 44.2 per cent, 34.8 per cent and 35.2 per cent less for *stayout* households than for *stepinn* households in Kenya, Mozambique, Tanzania and Zambia, respectively. Figure A1 presents pairwise comparisons of AE income and asset wealth growth between all the four ELM positions for each country.

I ask two further questions before concluding this section. The first is whether the mean poverty reduction associated with an ELM position is identical for those living in rich and poor regions? The second is whether the poverty reduction premium associated with becoming diversified relative to remaining in on-farm specialization over time is identical across the region types. Both answers are obtained from estimating Equations 3a and 3b. Before reporting the results from estimating these equations, it is instructive to look at the estimated mean difference in poverty reduction between poor and rich regions. The results (not reported here for the cross-country sample in the interest of brevity) is obtained by including a region-type dummy in the estimated regression. In the cross-country sample, mean AE income growth over the panel period is approximately 29.7 per cent higher for those in poor regions (p-value = 0.014); the mean asset wealth growth difference (\$8.22 monthly) is also in favour of poor regions but is imprecisely estimated (p-value = 0.812). The country-specific results (Tables A12–A15) provide mixed results—mean AE income growth was significantly higher in poor regions of Ghana, Kenya and Malawi (Table A12, columns 1–3), but lower in the poor regions of Mozambique, Tanzania and Zambia, although imprecisely so (columns 4–6, Table A12). As for asset wealth growth, only two countries (Kenya and Tanzania) show statistically significant differences by region type, but in the opposite directions (Table A14, columns 2 and 5).

Table 3 compares the estimated mean differences in poverty reduction between poor and rich regions for each ELM position, after controlling for other covariates. The key hypothesis is that the poverty reduction effect of diversification entry (*stepinn*) is identical for comparable households in poor and rich regions. Irrespective of welfare indicator, this hypothesis (G1, Table 3) cannot be rejected. This means that, in the

[13]Because the dependent variable is measured as an asset index dividing by the monthly transfer coefficient (which is in \$US), it provides results that are akin to 'standardization' of coefficients of a regression model.

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cross-country sample, the mean poverty reduction effect of becoming diversified is identical in both region types.

For the country-specific regressions, however, Hypothesis G1 can be rejected in the income poverty reduction equation for the Ghana and Mozambique samples (Table A16). Whereas becoming diversified is associated with a statistically significantly higher poverty reduction effect in the poor region of Ghana (a difference of about 305.6 per cent), the same phenomenon is associated with less poverty reduction in the poor region of Mozambique (a difference of approximately 19.3 per cent). I also find mild evidence (statistically) that asset poverty reduction was higher in the poor region of Kenya, but lower in the corresponding region type in Mozambique (Table A17). The monthly value of the asset poverty reduction differences between the two region types are approximately \$497.70 and −\$143.95 in Kenya and Mozambique, respectively.

With the evidence in most of the country samples that income poverty reduction was higher for those who become diversified compared with those who remained in on-farm employment over time, I now turn attention to the determinants of off-farm diversification dynamics, particularly the key drivers of off-farm diversification entry.

6.2 Determinants of Economic Livelihood Mobility

The evidence that those who became diversified over time enjoyed significant welfare gains begs the question why do some households remain specialized in on-farm activities over time? In addition, if off-farm diversification is welfare increasing, then why do some households become specialized in on-farm activities over time? The answer to the first question could be entry barriers. As for the second, it could be indicative of the fleeting nature of off-farm activities or because of market-related ‘shocks’. This section addresses these questions by estimating Equation 4.

Table 4 presents the full cross-country sample results while Table 5 reports the region type-specific estimates. I also report country-specific regressions in Table A20. In the interest of brevity, I focus the discussion mainly on the determinants of off-farm diversification entry (*stepinn*) and stability (*stayinn*) relative to on-farm specialized (*stayout*) over the panel period. To show how the determinants of the static off-farm diversification analysis that is common in the received literature might differ from the ‘dynamic’ analysis presented in this article, I provide random effects linear probability estimates of the determinants of off-farm diversification in Tables A18 and A19.

For the cross-country sample results (Table 4), eight household-level variables (share of dependants, number of male adults, farm size, lagged farm output per worker, land constraint, social network capital, livestock wealth and crop commercialization) significantly increase the likelihood of *stepinn* relative to *stayout*. Aside these household level covariates, three village level variables (the availability of electricity, irrigation and the availability of an all-weather road to the village) also significantly increase the likelihood of *stepinn* relative to *stayout*. On the other hand, four household level variables [being female-headed household (FHH), age, lagged level of asset wealth and lagged agricultural credit] significantly decrease the likelihood of off-farm diversification entry relative to on-farm specialization. Spatial isolation from markets (distance to the main market) also lower the likelihood of off-farm diversification entry relative to on-farm specialization. Comparing the static diversification results (Table A18) with the dynamic results presented here shows that the two do not always tell the same story. Examples

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Table 4. Determinants of economic livelihood mobility: multinomial probit estimates (full sample)

Covariates	*stepinn* vs. *stayout*	*stepout* vs. *stayout*	*stayinn* vs. *stayout*
Household level:			
Female-headed household	−0.280*** (0.099)	0.005 (0.099)	−0.265*** (0.097)
Age of household head	−0.014*** (0.003)	−0.005 (0.004)	−0.021*** (0.003)
Share of dependants	0.364** (0.175)	0.119 (0.176)	0.392** (0.169)
No. of male adults	0.071** (0.033)	0.028 (0.036)	0.098*** (0.032)
No. of female adults	0.007 (0.032)	0.017 (0.034)	0.031 (0.031)
Years of schooling	0.005 (0.014)	0.025* (0.014)	0.040*** (0.014)
Farm size	0.056* (0.034)	0.018 (0.035)	0.112*** (0.033)
Output per worker (log)	0.145*** (0.041)	0.000 (0.043)	0.241*** (0.041)
Land constraint	0.227** (0.090)	0.054 (0.096)	0.151* (0.087)
Social network capital	0.227** (0.114)	0.171 (0.115)	0.320*** (0.107)
Received transfers	−0.050 (0.101)	0.029 (0.103)	0.477*** (0.096)
Lagged asset wealth	−0.755** (0.296)	0.361 (0.289)	0.046 (0.275)
Livestock wealth	0.054** (0.022)	0.005 (0.023)	0.019 (0.021)
Lagged ag. credit	−0.205* (0.123)	−0.194 (0.134)	−0.476*** (0.116)
Crop commercialization index	0.450*** (0.168)	−0.314* (0.185)	0.035 (0.167)
Village-level covariates:			
Electricity available in village	0.159** (0.070)	−0.146** (0.072)	0.106 (0.067)
Irrigation available in village	0.315*** (0.119)	−0.217** (0.109)	0.267** (0.109)
Village has all-weather road	0.245** (0.114)	−0.092 (0.121)	0.398*** (0.111)
Average distance to markets	−0.015*** (0.004)	−0.003 (0.003)	−0.013*** (0.003)
Intercept	0.751** (0.383)	0.148 (0.417)	0.176 (0.384)
Log-likelihood value	−4632		
McFadden's R^2	0.153		
Observations	4182		

Standard errors (in parentheses) are robust to household clustering at the village level.
*Statistical significance at the 10 per cent level;
**Statistical significance at the 5 per cent level;
***Statistical significance at the 1 per cent level.

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Table 5. Determinants of economic livelihood mobility: region type-specific multinomial probit estimates

Covariates		Poor region			Rich region	
	stepinn vs. *stayout*	*stepout* vs. *stayout*	*stayinn* vs. *stayout*	*stepinn* vs. *stayout*	*stepout* vs. *stayout*	*stayinn* vs. *stayout*
Household level:						
Female-headed household	−0.402*** (0.136)	−0.173 (0.139)	−0.418*** (0.137)	−0.145 (0.143)	0.223 (0.139)	−0.064 (0.137)
Age of household head	−0.013*** (0.005)	−0.002 (0.005)	−0.023*** (0.004)	−0.017*** (0.005)	−0.011* (0.006)	−0.020*** (0.005)
Share of dependants	0.472** (0.237)	0.215 (0.233)	0.616*** (0.227)	0.246 (0.260)	0.008 (0.273)	0.233 (0.257)
No. of male adults	0.078* (0.046)	−0.008 (0.049)	0.112** (0.045)	0.077 (0.052)	0.068 (0.054)	0.101** (0.050)
No. of female adults	0.036 (0.042)	0.020 (0.045)	0.033 (0.040)	−0.031 (0.052)	0.017 (0.056)	0.036 (0.052)
Years of schooling	−0.009 (0.020)	0.014 (0.021)	0.026 (0.019)	0.013 (0.021)	0.029 (0.020)	0.049** (0.019)
Farm size	0.069 (0.050)	0.011 (0.050)	0.157*** (0.046)	0.058 (0.046)	0.016 (0.051)	0.099** (0.047)
Output per worker (log)	0.167*** (0.056)	0.090 (0.060)	0.272*** (0.057)	0.118* (0.061)	−0.070 (0.064)	0.199*** (0.060)
Land constraint	0.154 (0.135)	−0.034 (0.140)	0.053 (0.131)	0.249** (0.121)	0.125 (0.132)	0.203* (0.117)
Social network capital	0.338** (0.157)	0.274* (0.166)	0.510*** (0.149)	0.102 (0.168)	0.100 (0.164)	0.092 (0.156)
Received transfers	−0.129 (0.132)	−0.006 (0.131)	0.281** (0.125)	0.075 (0.163)	0.136 (0.173)	0.817*** (0.155)
Lagged asset wealth	−0.629 (0.420)	0.201 (0.407)	−0.100 (0.379)	−0.878** (0.418)	0.616 (0.423)	0.335 (0.405)
Livestock wealth	0.068** (0.029)	0.000 (0.028)	0.042 (0.026)	0.037 (0.035)	−0.002 (0.038)	−0.022 (0.035)
Lagged ag. credit	−0.253 (0.185)	−0.534** (0.213)	−0.617*** (0.179)	−0.189 (0.167)	0.030 (0.178)	−0.382** (0.155)
Commercialization	0.421* (0.227)	−0.084 (0.252)	−0.038 (0.231)	0.535** (0.251)	−0.592** (0.277)	0.123 (0.237)
Village-level:						
Electricity	0.143 (0.096)	−0.175* (0.098)	0.110 (0.093)	0.147 (0.105)	−0.135 (0.110)	0.096 (0.099)
Irrigation	0.044 (0.127)	−0.224** (0.110)	0.100 (0.116)	0.449** (0.201)	−0.158 (0.196)	0.125 (0.185)
All-weather road	0.562*** (0.164)	−0.078 (0.171)	0.725*** (0.160)	0.017 (0.160)	−0.193 (0.176)	0.127 (0.155)
Distance to markets	−0.018*** (0.004)	0.000 (0.004)	−0.014*** (0.004)	−0.012 (0.008)	−0.022** (0.009)	−0.012* (0.008)
Intercept	0.390 (0.454)	0.093 (0.480)	0.552 (0.450)	1.170** (0.560)	0.654 (0.612)	0.263 (0.567)
Log-likelihood value	−2456.36			−2129.5		
McFadden's R^2	0.176			0.144		
Observations	2296			1886		

Standard errors (in parentheses) are robust to household clustering at the village level.
*Statistical significance at the 10 per cent level;
**Statistical significance at the 5 per cent level;
***Statistical significance at the 1 per cent level.

are electricity, irrigation and road infrastructure, which are insignificantly associated with off-farm diversification in the cross-country sample but are strong determinants of entry into off-farm diversification. The results also show region-type and country-specific nuances that, for ease of exposition, are summarized in Tables 6, 7 and A21.

In the static diversification literature, some have found gender gaps in nonfarm employment in favour of men in some rural African contexts (e.g., Ali, Deininger, & Duponchel, 2014), while others have shown the opposite (e.g., Andersson Djurfeldt, Djurfeldt, & Lodin, 2013) or no gender gaps at all (e.g., Rijkers & Costa, 2012). The cross-country static diversification analysis (Table A18) shows no gendered household headship-based differences in the likelihood of off-farm diversification in poor regions and in most of the individual countries (Table A19); but the probability of being in off-farm employment in rich regions is about 8.3 percentage points higher for FHHs than for male-headed households (MHHs). The dynamic diversification results tell a different story, however, showing that FHHs face stronger entry barriers than MHHs, and that this is particularly so in 'poor regions' where agricultural production potential is low and market infrastructure is limited (Table 4). The null hypothesis of no gendered entry barriers can also be rejected for the Ghana, Kenya, Malawi and Mozambique samples (Table A20). These results suggest that MHHs may be better able to take advantage of new off-farm diversification opportunities. In the full cross-country sample, the predicted probability of becoming diversified (relative to remaining specialized in on-farm work) is about 6.6 percentage points less for FHHs than for MHHs (Table 6 column 1). In poor regions where the hypothesis of no gendered entry barriers is overwhelmingly rejected, the gender gap against FHHs is about 9.2 percentage points (Table A21, column 1). The country-specific results (Table 6, columns 2–7) show gender gaps in favour of MHHs in the predicted probabilities of *stepinn* relative to *stayout* ranging between 7.4 percentage points (for Malawi) and 14.5 percentage points (for Mozambique). There are also significant gender gaps in favour of MHHs regarding continued diversification (*stayinn*) relative to on-farm specialization (*stayout*) in the poor region sample (Table 5) as well as in the Ghana and Mozambique samples (Table 7).

Diversification entry (relative to on-farm specialization) is decreasing with age in the cross-county sample and in Kenya, Malawi and Mozambique and so is sustained diversification decreasing with age in the cross-county sample and in all countries except Mozambique (Tables 6 and 7). The age effect is strongest in Kenya where increasing the household head's age by a year is estimated to decrease the mean predicted probability of entry (relative to on-farm specialization) by about a percentage point (Table 6, column 3); the effect on sustained diversification in the same context is about 1.4 percentage points for a unit increased in age of household head (Table 7, column 3). Comparing household heads below and above the sample median age of 48 years at baseline, I find that the younger cohort have about 7.1 percentage points higher mean probability of becoming diversified (relative to remaining in on-farm specialization) than those above the median age. In Kenya where the generation effect is the strongest, those below the median age have a 21.4 percentage points higher average probability of diversification entry than those aged below the median.

Household structural variables (dependency ratio, number of male and female adults) also influence diversification dynamics, but where they are statistically significant, the direction of effect differs by country. For example, an extra female adult in the household is estimated to increase the predicted probability of entry by 1.5 and 3.4 percentage points in Ghana and Tanzania, respectively, but decrease the probability of

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Table 6. Predicted probabilities of diversification entry relative to specialization (per cent)

	All (1)	Ghana (2)	Kenya (3)	Malawi (4)	Mozambique (5)	Tanzania (6)	Zambia (7)
Female-headed household	−6.6	−7.5	−14.9	−7.4	−14.5	not sig.	not sig.
Age	−0.3	not sig.	−1.0	−0.2	−0.6	not sig.	not sig.
Dependants	8.3	not sig.	not sig.	not sig.	Not Sig.	not sig.	16.7
No. of male adults	1.5	not sig.	3.5	not sig.	−4.5	not sig.	not sig.
No. of female adults	not sig.	1.5	−4.8	not sig.	not sig.	3.4	not sig.
Education	not sig.	not sig.	not sig.	0.8	not sig.	1.8	−1.4
Farm size	1.1	1.1	not sig.	not sig.	3.5	not sig.	3.6
Output per worker (log)	2.9	1.3	not sig.	4.5	17.4	not sig.	not sig.
Land constraint	5.6	7.8	not sig.	not sig.	9.2	not sig.	7.6
Social network capital	4.7	not sig.	not sig.	not sig.	25.2	7.6	8.9
Transfer	not sig.	not sig.	not sig.	not sig.	−18.7	not sig.	7.4
Lagged asset wealth	−20.5	−38.6	not sig.	not sig.	−41.5	not sig.	not sig.
Livestock wealth	1.4	2.4	not sig.	not sig.	not sig.	not sig.	not sig.
Lagged agricultural credit	−3.7	−2.0	not sig.	not sig.	not sig.	not sig.	−15.3
Crop commercialization	11.9	21.9	not sig.	19.8	31.0	26.1	not sig.
Geography	not sig.	not sig.	18.6	14.5	−24.0	9.8	−22.8

Estimated based on the results in Table 4 and Table A20. not sig. means that one cannot reject the null hypothesis that the association equals zero at conventional levels (i.e. at the 10 per cent level at most).

entry by about 4.8 percentage points in Kenya, reflecting the differing nature of off-farm employment in the countries.

In the five countries where the presence of a female adult member significantly influences continued diversification (Table 7), the association is positive with a meaningful magnitude of effect in four countries and negative only in one.[14] The finding that the presence of a female adult is mostly associated with increasing probability of becoming diversified is probably due to the dominance of off-farm self-employment in the sample (Table A5), which is more compatible with women's reproductive work (Tsikata, 2009).

Except in Malawi and Tanzania where education increases the probability of diversification entry relative to on-farm specialization (Table 6, columns 4 and 6), I find that an extra year of schooling by the household head is associated more with continued off-farm diversification, which is what one could expect given that education increases the chances of having a nonfarm occupation. The education effect is largest in Malawi where an extra year of schooling (holding other covariates constant) is estimated to increase the probability of *stayinn* relative to *stayout* by about 3.8 percentage points. Considering those educated above the basic level (i.e. more than 9 years of formal education) in Malawi, for example, I find that

[14]To see how important or meaningful these probabilities are, one could relate them to the mean ELM indicator summary statistics in Table A6. For example, an extra female adult in a household is associated with 6 percentage points higher mean predicted probability of remaining diversified (relative to on-farm specialization) in Tanzania (Table 7, column 6). This magnitude of association is about 19 per cent of the sample mean rate of continued diversification and thus of a meaningful magnitude.

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Table 7. Predicted probabilities of continued diversification relative to specialization (per cent)

	ALL (1)	Ghana (2)	Kenya (3)	Malawi (4)	Mozambique (5)	Tanzania (6)	Zambia (7)
Female-headed household	−7.2	−7.9	not sig.	not sig.	−14.6	not sig.	not sig.
Age	−0.6	−0.3	−1.4	−0.5	not sig.	−0.6	−0.6
Dependants	10.4	not sig.	not sig.	not sig.	not sig.	not sig.	not sig.
No. of male adults	2.7	not sig.	not sig.	not sig.	−2.5	5.3	not sig.
No. of female adults	not sig.	2.7	−4.5	5.2	not sig.	6.0	3.7
Education	1.2	1.1	not sig.	3.8	2.5	1.6	not sig.
Farm size	3.2	2.1	not sig.	8.2	not sig.	5.3	5.7
Output per worker (log)	6.9	9.0	−6.8	not sig.	21.3	8.1	9.2
Land constraint	3.6	not sig.	8.4	5.6	not sig.	9.1	not sig.
Social network capital	8.5	not sig.	−12.4	9.4	20.2	13.4	8.7
Transfer	15.7	12.6	not sig.	not sig.	not sig.	not sig.	41.2
Lagged asset wealth	not sig.	not sig.	not sig.	not sig.	not sig.	not sig.	not sig.
Livestock wealth	not sig.	0.2	not sig.	not sig.	not sig.	not sig.	not sig.
Lagged agricultural credit	−13.6	−12.7	−15.8	not sig.	−24.5	not sig.	−26.5
Crop commercialization	not sig.	not sig.	29.1	32.8	not sig.	not sig.	−40.4
Geography	12.1	24.8	not sig.	36.8	not sig.	28.0	−40.2

See notes under Table 6.

their predicted probability of remaining diversified (relative to on-farm specialization) is about 15 percentage points higher than those who have only basic education or no formal education at all.

One of the fundamental empirical regularities in development economics that leads to structural transformation is the shift of labour from agricultural to nonagricultural employment. This is referred to in the related diversification literature as the 'pull' factor (Haggblade *et al.,* 2010). The results show that, on average, the predicted probability of entering off-farm employment (relative to on-farm specialization) over time rises with farm output per worker in the cross-country sample, and in Ghana, Malawi and Mozambique (Tables 6). In Mozambique where the productivity effect is largest, I find that households with above median farm output per worker have 27 percentage points higher probability of entry into off-farm employment than those with below median productivity. Lagged farm output per worker also has a strong positive effect on continued off-farm diversification in the cross-country sample and in all countries except Kenya where there is a significant negative effect. The Kenya result is driven by higher levels of household participation in non-food cash crop production, which is associated with better welfare than low-return off-farm employment (Dzanku, 2019). Relatedly, the results suggest that scale of production (i.e. farm size) and off-farm diversification entry (or continued diversification) are counterparts rather than competitors in all countries except Kenya. Entering off-farm work is also driven by necessity in rich regions (Table A21) and in three of the six countries (Table 6). Being land constrained, ceteris paribus, increases the predicted probability of *stepinn* (relative to *stayout*) by about 7.8 , 9.2 and 7.6 percentage points in Ghana, Mozambique and Zambia, respectively.

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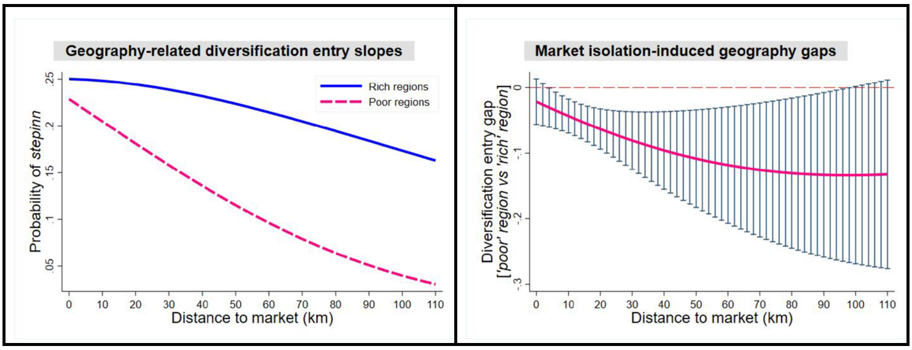

The spikes represent the 95 per cent confidence intervals.

Figure 3. Market isolation-induced geography gap in the probability of exiting on-farm specialization. The spikes represent the 95 per cent confidence intervals [Colour figure can be viewed at wileyonlinelibrary.com]

The village-level indicators highlight the role of infrastructure (electricity, irrigation, roads and market access) in rural off-farm diversification dynamics. The probability of off-farm diversification entry (relative to on-farm specialization) is about 3.8 percentage points higher for households living in villages connected to electricity than for those who live in villages without such infrastructure. The positive effect on off-farm diversification entry of living in a village that is linked by an all-weather road is concentrated in the poor regions where road networks are generally poorer—the difference in predicted probability of entry between those linked to such roads and those that are not is about 11 percentage points (Table A21, column 1). Similarly, being linked to an all-weather road has a large effect (approximately 19 percentage points difference in predicted probability) on the propensity of continuing in off-farm diversification in poor regions (Table A21, column 2).

Finally, spatial isolation from markets reduce the probability of diversification entry and continuity (relative to on-farm specialization). For example, living in a village that is an extra 10 km away from the main market reduces the mean probability of entering off-farm diversification by about 3.7 percentage points (p-value = 0.000). The average probability of entry is about 9.5 percentage points less at the 25th percentile distance from the main market (p-value = 0.026), but rises to about 14.7 percentage points less at the 75th percentile (p-value = 0.003). I show further in Figure 3 that the market isolation effect differs significantly by geography, as one could expect. The left panel shows a marked difference in slope: the probability of exiting the on-farm specialization strategy is sharply decreasing with physical distance to the main market in poor regions but less so in rich regions. The right panel shows that the market isolation-associated geography gap in the probability of off-farm diversification entry is significantly different from zero for mean distance between 8 and 92 km; thus, the distance effect seems to increase at a decelerating rate.

7 CONCLUSION

Progress at reducing poverty has been slower in SSA than other regions of the world. As the fight to alleviate, or at least reduce, poverty continues, there is the need for deeper

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understanding of the phenomena in order to design suitable approaches that help reduce poverty faster. Using case study panel datasets for six sub-Saharan African countries, this article has analysed the dynamic economic livelihood behaviour of a sample of rural smallholders and examined how such dynamics (or the lack thereof) correlates with household welfare. Although there is an extensive array of literature on rural livelihood diversification and outcomes, the off-farm livelihood mobility or dynamic analysis presented in this article and how such behaviour influences households welfare is an important empirical point of departure from the static analyses prevalent in the received off-farm diversification and poverty literature.

The results show that poverty reduction was slowest for households that dropped out of rural off-farm employment and fastest for those that moved from on-farm specialization to off-farm diversification over time. However, after adjusting for a wide array of poverty correlates, I find that how welfare is measured matters for the conclusion one might reach—the association between ELM and poverty reduction is more precisely estimated when I consider the money-metric dimension of poverty (i.e. household income per adult equivalent) than asset wealth; this is true for all the countries except Ghana and Malawi. This outcome could be expected because asset poverty status changes more slowly over time (Naschold, 2012).

Why do some households remain 'chronic specializers' in on-farm work over time? First, it must be noted that the determinants of static off-farm diversification and diversification dynamics are not always the same, and this is so for all the six country samples. For example, while the static analysis provided no strong evidence of household headship-based gender gaps in off-farm diversification in any of the six countries, the dynamic diversification analysis showed strong evidence that female-headed households that specialized in on-farm employment at baseline, ceteris paribus, tended to face more binding diversification entry constraints than their male counterparts in all the countries, except Tanzania and Zambia where entry probabilities appeared gender balanced. The finding that the presence of a female adult household member significantly raises the prospects of off-farm diversification in Ghana and Tanzania, as well as increases the probability of continued diversification in all countries except Kenya and Mozambique nuances the gendered headship-based off-farm diversification entry constraint, and reflects the important contribution of women to off-farm employment (particularly self-employment) within households in rural Africa.

My results provide evidence that some of the off-farm diversification entry decisions are driven by necessity as shown by the positive association with land shortage and the negative relationship with access to agricultural credit. This, coupled with the availability of agricultural credit being very strongly negatively correlated with remaining diversified in all countries except Malawi and Tanzania, has at least two possible implications. First, when farm investment constraints are relaxed, rural households may be 'pulled' into agriculture (Karlan, Osei, Osei-Akoto, & Udry, 2014). Second, although households who became diversified experience the highest rate of poverty reduction, it seems plausible that removing agricultural investment constraints could offer a more sustainable pathway to poverty reduction in most of the countries included in this study.

Other notable household level determinants of off-farm diversification entry and sustainability are old age (all countries except Mozambique), farm size (all countries except Kenya), social network capital (all countries except Ghana) and degree of agricultural commercialization (all countries). The finding that education is positively correlated with diversification entry in only two countries (Malawi and Tanzania) but important for sustained diversification in all countries except Kenya and Zambia suggests

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that the lack of formal education was not the most important entry barrier to the off-farm opportunities that arose; indeed, most of the new opportunities were in off-farm self-employment. The findings that lagged farm output per worker and diversification entry are positively correlated in Ghana, Malawi and Mozambique as well as the corresponding positive relationship between lagged farm output per worker and sustained off-farm diversification in all countries except Malawi are reminiscent of the classical empirical regularity in development macroeconomics that agricultural and nonagricultural productivity growth are counterparts. From the policy perspective, this result suggests that increasing farm productivity must continue to be at the core of policy discourses when discussing issues of rural livelihood diversification and economic transformation.

Looking beyond household-level factors, I have shown the importance of rural infrastructure (electricity, irrigation, roads and spatial proximity to markets) for off-farm diversification entry and continuity. While I am not the first to highlight the importance of infrastructure for boosting rural nonfarm employment in general, I have extended knowledge on how this plays out with respect to the dynamics of off-farm diversification and how different types of infrastructure could have differing effects on off-farm diversification and on-farm specialization.

Finally, my results highlight the importance of taking cognizance of agroecological potential and country-specific differences regarding the drivers of ELM vis-à-vis chronic on-farm specialization. As noted by Van den Broeck and Kilic (2019), the fact that only a few of the determinants of off-farm diversification dynamics tell the same story across all six countries points to the need for place and context-specific rural development strategies, policies and practices. Overall, however, the strong association between rural infrastructure variables and rural ELM reinforces the need for targeted rural infrastructure development, particularly markets, roads, irrigation and rural electrification in rural SSA.

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DATA AVAILABILITY STATEMENT

The data used for this article are available at: https://www.keg.lu.se/en/research/research-projects/current-research-projects/afrint

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The codes for replicating the results in this article are available from fdzanku@gmail.com.

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APPENDIX A: ONLINE APPENDICES FOR "POVERTY REDUCTION AND ECONOMIC LIVELIHOOD MOBILITY IN RURAL SUB-SAHARAN AFRICA"

Table A1. List of regions and number of villages sampled, by country

Country/region	Number of villages	Region type
Ghana		
Eastern	4	High or rich
Upper East	4	Low or poor
Kenya		
Kakamega	5	Low or poor
Nyeri	5	High or rich
Malawi		
Ntchisi RDP	2	Low or poor
Thiwi Lifidzi	2	Low or poor
Bwanje Valley	2	High or rich
Shire Highlands	2	High or rich
Mozambique		
North	4	Low or poor
Centre	5	High or rich
South	2	Low or poor
Tanzania		
Morogoro	5	Low or poor
Iringa	5	High or rich
Zambia		
Mkushi	5	Low or poor
Mazabuka	4	High or rich
Total	56	

Table A2. Estimates of the panel attrition probit model

Variables	Full sample	Poor region	Rich region
Income per adult equivalent	0.127* (0.076)	0.054 (0.162)	0.119 (0.095)
Composite asset wealth	0.012 (0.029)	−0.032 (0.036)	0.056 (0.042)
ELM (ref. = *stepinn*)			
stayout	−0.004 (0.087)	0.007 (0.124)	0.007 (0.118)
stepout	0.119 (0.091)	0.149 (0.146)	0.089 (0.100)
stayinn	0.004 (0.075)	−0.032 (0.120)	0.035 (0.089)
Female headed household	−0.046 (0.056)	−0.099 (0.085)	0.012 (0.079)
Age of household head	−0.001 (0.002)	−0.003 (0.002)	0.002 (0.002)
Share of dependants	−0.014 (0.138)	0.216 (0.213)	−0.331** (0.145)
Male adults	0.015 (0.019)	0.018 (0.030)	0.014 (0.025)

(Continues)

Table A2. (Continued)

Female adults	−0.001 (0.021)	0.013 (0.025)	−0.021 (0.034)
Head's years of schooling	−0.005 (0.009)	−0.012 (0.013)	0.004 (0.012)
Social network capital	−0.077 (0.065)	−0.028 (0.087)	−0.101 (0.118)
Livestock wealth	−0.000 (0.012)	0.004 (0.016)	−0.007 (0.016)
Farm size	−0.005 (0.026)	−0.021 (0.042)	−0.002 (0.032)
Farm output per worker	−0.050 (0.031)	−0.014 (0.043)	−0.069 (0.049)
Land constraint	0.012 (0.072)	−0.046 (0.136)	0.070 (0.096)
Electricity	0.020 (0.061)	−0.009 (0.083)	0.056 (0.088)
Irrigation	0.052 (0.060)	0.062 (0.046)	0.136 (0.124)
All-weather road	−0.037 (0.056)	−0.198*** (0.062)	0.113 (0.087)
Distance to market	0.001 (0.002)	0.001 (0.002)	0.002 (0.003)
Interviewer's subjective poverty	0.011 (0.057)	−0.029 (0.071)	0.066 (0.087)
Intercept	−0.945*** (0.247)	−0.760*** (0.285)	−1.185*** (0.397)
Region dummies included	Yes	—	—
Country dummies included	—	Yes	Yes
Observations	2476	1356	1120
Log likelihood value	−1061	−573.9	−480.1
Pseudo R^2	0.008	0.013	0.018

Judging from the Pseudo R^2 values, none of which is greater than 2 per cent, the model has a very low explanatory power, which is what one expects when attrition is ignorable. Second, the lack of statistical significance of nearly all the explanatory variables at the 5 per cent level suggests that ignorable attrition (on observables) is a reasonable assumption for this data.
ELM, economic livelihood mobility.
*$p < 0.10$;
**$p < 0.05$;
***$p < 0.01$.

Table A3. Small–Hsiao test result of the null hypothesis that independence of irrelevant alternative is valid

	lnL (full)	lnL (omit)	χ^2	df	*p*-value
stayout	−1467.75	−1446.69	42.107	60	0.962
stepinn	−1256.29	−1198.91	114.77	60	0.000
stepout	−1408.12	−1359.04	98.16	60	0.001
stayinn	−1051.63	−1002.82	97.61	60	0.002

Note: lnL (full) is the log-likelihood from the full model; lnL (omit) is the log-likelihood from the restricted model.

Table A4. Farm and off-farm employment, by country

	Full sample	Poor region (PR)	Rich region (RR)	Diff. (PR − RR)
Ghana				
Farm income share	0.630	0.529	0.758	**−0.229**
Δ Farm income share	**−0.111**	−0.068	−0.166	**0.098**
Participation in off-farm work	0.538	0.625	0.426	**0.199**
Δ Participation in off-farm work	0.228	0.214	0.247	−0.033
Kenya				
Farm income share	0.706	0.634	0.776	**−0.142**
Δ Farm income share	**−0.063**	−0.122	−0.008	**−0.114**
Participation in off-farm work	0.401	0.410	0.392	0.018
Δ Participation in off-farm work	0.147	0.293	0.007	**0.286**

(Continues)

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Table A4. (Continued)

Malawi				
Farm income share	0.624	0.754	0.497	**0.257**
Δ Farm income share	**0.066**	0.118	0.014	**0.104**
Participation in off-farm work	0.665	0.617	0.711	**−0.094**
Δ Participation in off-farm work	−0.006	−0.006	−0.006	0.000
Mozambique				
Farm income share	0.547	0.672	0.302	**0.370**
Δ Farm income share	−0.043	−0.063	−0.003	−0.060
Participation in off-farm work	0.482	0.354	0.733	**−0.379**
Δ Participation in off-farm work	0.187	0.212	0.139	0.073
Tanzania				
Farm income share	0.671	0.622	0.723	**−0.101**
Δ Farm income share	**0.079**	0.094	0.063	0.031
Participation in off-farm work	0.570	0.630	0.509	**0.121**
Δ Participation in off-farm work	−0.003	−0.040	0.035	−0.075
Zambia				
Farm income share	0.723	0.734	0.708	0.026
Δ Farm income share	**0.117**	0.174	0.041	**0.133**
Participation in off-farm work	0.457	0.446	0.472	−0.026
Δ Participation in off-farm work	−0.072	−0.145	0.028	**−0.173**

Note: Figures in bold font represent statistically significant difference at 0.05 level or better.

Table A5. Participation in off-farm employment income and transfers, by country

	Ghana	Kenya	Malawi	Mozambique	Tanzania	Zambia
Agricultural wage work	0.124	0.167	0.347	0.134	0.138	0.130
Agricultural wage work	0.126	0.033	0.029	0.154	0.075	0.009
Nonagricultural wage work	0.143	0.143	0.191	0.085	0.091	0.103
Nonagricultural wage work	0.049	−0.015	−0.012	0.050	−0.089	−0.110
Off-farm self-employment	0.368	0.167	0.337	0.329	0.381	0.303
Off-farm self-employment	0.145	0.180	−0.072	0.097	0.083	−0.009
Transfers	0.404	0.224	0.145	0.162	0.072	0.230
Transfers	0.161	0.162	−0.029	0.050	0.029	−0.036

Table A6. Economic livelihood mobility, by country

	Full sample	Poor region (PR)	Rich Region (RR)	Diff. (PR − RR)
Ghana (GHA)	(*n* = 982)	(*n* = 552)	(*n* = 430)	
stayout	0.248	0.159	0.363	**−0.203**
stepinn	0.328	0.322	0.335	−0.012
stepout	0.100	0.109	0.088	0.020
stayinn	0.324	0.409	0.214	**0.195**
Kenya (KEN)	(*n* = 544)	(*n* = 266)	(*n* = 278)	
stayout	0.382	0.361	0.403	−0.042
stepinn	0.290	0.376	0.209	**0.167**
stepout	0.143	0.083	0.201	**−0.119**
stayinn	0.184	0.180	0.187	−0.007
Malawi (MWI)	(*n* = 692)	(*n* = 342)	(*n* = 350)	
stayout	0.147	0.170	0.126	0.044
stepinn	0.185	0.211	0.160	0.051

(Continues)

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Table A6. (Continued)

stepout	0.191	0.216	0.166	0.051
stayinn	0.477	0.404	0.549	**−0.145**
Mozambique (MOZ)	(*n* = 598)	(*n* = 396)	(*n* = 202)	
stayout	0.328	0.434	0.119	**0.316**
stepinn	0.284	0.318	0.218	**0.100**
stepout	0.097	0.106	0.079	0.027
stayinn	0.291	0.141	0.584	**−0.443**
Tanzania (TZA)	(*n* = 696)	(*n* = 354)	(*n* = 342)	
stayout	0.259	0.209	0.310	**−0.101**
stepinn	0.218	0.215	0.222	−0.008
stepout	0.207	0.215	0.199	0.016
stayinn	0.316	0.362	0.269	**0.093**
Zambia (ZMB)	(*n* = 670)	(*n* = 386)	(*n* = 284)	
stayout	0.340	0.337	0.345	−0.008
stepinn	0.167	0.145	0.197	−0.052
stepout	0.239	0.290	0.169	**0.121**
stayinn	0.254	0.228	0.289	−0.061

Table A7. Household welfare, by country

	Full sample	Poor region (PR)	Rich region (RR)	Diff. (PR − RR)
Ghana				
Per capita income ($)	410.94	196.13	686.70	**−490.57**
Δ Per capita income ($)	251.44	137.18	398.12	**−260.94**
Asset index	0.38	0.31	0.46	**−0.15**
Δ Asset index	0.08	0.09	0.061	0.03
Kenya				
Per capita income ($)	759.97	380.25	1123.31	**−743.06**
Δ Per capita income ($)	−24.13	148.83	−189.62	**338.45**
Asset index	0.55	0.42	0.67	**−0.25**
Δ Asset index	−0.01	0.01	−0.03	0.04
Malawi				
Per capita income ($)	166.84	170.70	163.06	7.64
Δ Per capita income ($)	34.06	78.46	−9.33	**87.79**
Asset index	0.16	0.13	0.18	**−0.05**
Δ Asset index	0.02	0.04	0.01	**0.04**
Mozambique				
Per capita income ($)	154.49	84.39	291.91	**−207.52**
Δ Per capita income ($)	110.84	65.72	199.28	**−133.56**
Asset index	0.19	0.15	0.28	**−0.14**
Δ Asset index	0.05	0.04	0.06	−0.02
Tanzania				
Per capita income ($)	322.92	318.05	327.97	−9.92
Δ Per capita income ($)	157.89	113.21	204.14	**−90.93**
Asset index	0.33	0.31	0.35	**−0.04**
Δ Asset index	0.06	0.03	0.09	**−0.06**
Zambia				
Per capita income ($)	297.09	262.88	343.58	**−80.70**
Δ Per capita income ($)	167.92	151.40	190.38	−38.98
Asset index	0.33	0.25	0.41	**−0.14**
Δ Asset index	0.09	0.07	0.12	**−0.05**

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Table A8. Mean summary characteristics of the sample, by the economic livelihood mobility positions

	Total	*stayout*	*stepinn*	*stepout*	*stayinn*
Income per adult equivalent (PPP constant 2011, $)	346.4	342.5	346.5	309.1	368.8
Income per adult equivalent (PPP constant 2011, $)	130.6	102.9	244.5	−33.3	148.2
Normalized composite asset index	0.320	0.334	0.309	0.321	0.315
Normalized composite asset index	0.053	0.045	0.069	0.033	0.057
Gender of household head (binary; =1 if female)	0.218	0.227	0.227	0.225	0.198
Age of household head (years)	50.88	55.36	51.29	51.01	46.54
Share of members under 15 years of age	0.377	0.334	0.373	0.380	0.418
Share of members under 15 years of age	0.011	0.027	0.029	−0.022	−0.002
No. of working-age women	1.813	1.802	1.792	1.815	1.840
No. of working-age women	0.126	−0.012	0.063	0.107	0.308
No. of working-age men	1.722	1.674	1.778	1.743	1.710
No. of working-age men	0.117	−0.024	0.259	−0.054	0.216
Head's years of schooling	5.214	5.120	4.813	5.591	5.422
Farm size (hectare)	1.844	1.906	1.865	1.849	1.771
Farm size (hectare)	0.525	0.542	0.555	0.437	0.531
Land available per adult (hectare)	0.653	0.700	0.648	0.631	0.627
Land available per adult (hectare)	0.181	0.224	0.186	0.188	0.135
Land constrained (binary; =1 if yes)[a]	0.355	0.320	0.378	0.310	0.389
Land constrained	0.357	0.323	0.426	0.281	0.372
Livestock wealth (TLU)	1.526	1.662	1.416	1.499	1.505
Livestock wealth (TLU)	−0.013	0.036	−0.008	−0.085	−0.022
Value of farm output per worker ($)	156.60	185.73	163.00	150.08	129.13
Value of farm output per worker ($)	25.96	7.75	22.03	33.26	41.45
Lagged Value of farm output per worker ($)	25.96	7.75	22.03	33.26	41.45
Crop commercialization index (0–1)	0.346	0.410	0.342	0.354	0.287
Crop commercialization index (0–1)	0.024	0.009	−0.027	0.084	0.046
Social network (binary; =1 if connected)	0.218	0.241	0.209	0.260	0.183
Social network	0.026	0.043	0.031	0.084	−0.021
Received transfers (binary; =1 if yes)	0.217	0.217	0.255	0.191	0.200
Received transfers	0.058	0.026	0.073	0.012	0.099
Monthly transfers (PPP constant 2011, $)	4.934	5.495	5.768	4.488	4.005
Monthly transfers (PPP constant 2011, $)	2.004	0.802	1.083	2.364	3.612
Lagged agric. Credit obtained (binary; =1 if yes)	0.118	0.116	0.084	0.131	0.139
Electricity available in village (binary; =1 if yes)	0.404	0.381	0.430	0.375	0.419
Electricity available in village	0.327	0.316	0.326	0.272	0.366
Irrigation available in village (binary; =1 if yes)	0.248	0.238	0.240	0.281	0.245
Irrigation available in village	0.098	0.048	0.088	0.149	0.122
Village has all-weather road (binary; =1 if yes)	0.252	0.244	0.280	0.225	0.251
Distance from village to nearest market (km)	12.53	14.21	10.67	15.85	10.84
Instruments:					
Distance from dwelling to village centre (km)	0.930	1.083	0.861	0.908	0.862
Parent was in off-farm employment (binary; =1 if yes)	0.307	0.234	0.309	0.266	0.389
Share of village in off-farm employment	0.520	0.434	0.516	0.502	0.607
Share of village in off-farm employment	0.086	0.072	0.176	−0.027	0.085

Note: denotes change over time. PPP, purchasing power parity; TLU, tropical livestock units

[a]A household is described as land constrained if they answered 'no' to the question 'If market conditions improved, would you be able to put more land under cultivation to expand your farm?'

Table A9. Poverty reduction and economic livelihood mobility, by country

	Ghana	Kenya	Malawi	Mozambique	Tanzania	Zambia
Change per capita income ($)						
stayout	253.89	−139.83	59.35	45.59	155.27	190.33
stepinn	302.82	196.87	150.83	143.37	298.01	331.88
stepout	132.09	−404.05	−55.13	0.84	−3.68	24.99
stayinn	234.32	163.68	16.63	189.21	168.98	164.38
F-statistic	1.88	9.90	8.80	7.84	9.86	9.01
p-value	0.13	0.00	0.00	0.00	0.00	0.00
Change in assets wealth						
stayout	0.36	0.54	0.13	0.14	0.35	0.36
stepinn	0.36	0.50	0.15	0.15	0.31	0.31
stepout	0.42	0.58	0.18	0.25	0.33	0.27
stayinn	0.39	0.61	0.15	0.27	0.33	0.34
F-statistic	2.65	5.87	1.75	18.94	1.53	5.21
p-value	0.05	0.00	0.16	0.00	0.21	0.00

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Table A10. First stage fixed effects linear probability model with instrumental variables

	Dependent variable: off-farm diversification		
	Full sample (1)	Poor region (2)	Rich region (3)
Gender (female relative to male household head)	0.024 (0.036)	0.032 (0.047)	0.011 (0.058)
Age of household head	−0.005*** (0.001)	−0.004*** (0.001)	−0.007*** (0.002)
Share of members under 15 years	0.024 (0.043)	0.011 (0.059)	0.038 (0.064)
Number of working-age women	−0.017** (0.008)	−0.019* (0.011)	−0.012 (0.013)
Number of working-age men	0.018** (0.009)	0.022* (0.011)	0.014 (0.013)
Head's years of schooling	0.009** (0.004)	0.004 (0.005)	0.012** (0.005)
Social network capital	−0.010 (0.027)	−0.019 (0.038)	0.001 (0.038)
Livestock wealth	0.012** (0.005)	0.017*** (0.007)	0.007 (0.007)
Land available per adult	−0.019 (0.016)	−0.018 (0.026)	−0.022 (0.020)
Land constraint	0.030 (0.021)	−0.007 (0.031)	0.062** (0.029)
Time effect (2013 = 1)	0.014 (0.016)	0.017 (0.023)	0.021 (0.024)
Instruments:			
Distance from dwelling to village centre	−0.095*** (0.016)	−0.081*** (0.023)	−0.112*** (0.021)
Parents off-farm participation	0.126*** (0.027)	0.125*** (0.036)	0.140*** (0.041)
Share of village in off-farm employment	0.909*** (0.063)	0.957*** (0.085)	0.871*** (0.102)
Intercept	0.263*** (0.077)	0.206** (0.097)	0.350*** (0.129)
Statistical test for the IVs from the welfare equation:			
Over-identification test (Hansen *J* statistic)	0.855	1.103	0.019
p-value for Hansen *J* statistic	0.355	0.294	0.889
F-statistic for instrument	152.30	83.56	64.61
p-value for *F*-test	0.000	0.000	0.000
Exogeneity test (χ^2 statistic)	2.311	2.273	0.103
p-value for χ^2 test	0.129	0.132	0.748
Observations	4182	2296	1886
Households	2091	1148	943

IV, instrumental variable
***$p < 0.01$,
**$p < 0.05$,
*$p < 0.10$.

Table A11. Regressing household welfare change on uninstrumented economic livelihood mobility and other covariates

	Income per adult equivalent (log)			Composite asset index		
	Full sample (1)	Poor region (2)	Rich region (3)	Full sample (4)	Poor region (5)	Rich region (6)
ELM (ref. = *stepinn*)						
stayout	−0.338*** (0.084)	−0.273** (0.127)	−0.426*** (0.094)	−0.126 (0.077)	−0.025 (0.092)	−0.243* (0.123)
stepout	−0.890*** (0.108)	−0.723*** (0.142)	−1.091*** (0.158)	−0.211** (0.089)	−0.108 (0.121)	−0.333** (0.128)
stayinn	−0.339*** (0.080)	−0.219** (0.098)	−0.489*** (0.129)	−0.058 (0.079)	−0.001 (0.118)	−0.138 (0.104)
Female-headed household	−0.177** (0.078)	−0.170 (0.109)	−0.183 (0.110)	0.035 (0.072)	−0.008 (0.078)	0.094 (0.134)
Age of household head	0.002 (0.002)	0.005 (0.003)	−0.000 (0.003)	−0.001 (0.002)	−0.001 (0.002)	−0.000 (0.004)
Share of members under 15	−1.072*** (0.118)	−1.026*** (0.139)	−1.161*** (0.202)	0.172** (0.079)	0.128 (0.092)	0.240 (0.148)
No. of working-age women	−0.172*** (0.021)	−0.143*** (0.027)	−0.218*** (0.026)	0.036** (0.017)	0.027 (0.023)	0.048* (0.026)
No. of working-age men	−0.133*** (0.022)	−0.135*** (0.028)	−0.132*** (0.036)	0.071*** (0.022)	0.076*** (0.025)	0.063 (0.041)
Head's years of schooling	0.033*** (0.009)	0.043*** (0.012)	0.021 (0.013)	0.036*** (0.009)	0.038*** (0.014)	0.033*** (0.012)
Social network capital	0.190*** (0.053)	0.151* (0.076)	0.239*** (0.078)	0.140** (0.057)	0.191*** (0.067)	0.071 (0.098)
Monthly nonlabour transfers				0.002 (0.002)	0.004 (0.002)	0.001 (0.002)
Livestock assets	0.058*** (0.014)	0.075*** (0.017)	0.034* (0.019)	0.048*** (0.011)	0.054*** (0.013)	0.040** (0.017)
Land available per adult	0.241*** (0.039)	0.294*** (0.050)	0.195*** (0.056)	0.099*** (0.029)	0.070* (0.038)	0.120*** (0.042)
Land constraint	0.018 (0.047)	0.021 (0.069)	0.012 (0.065)	−0.043 (0.038)	−0.082 (0.063)	−0.009 (0.042)
Intercept	0.078 (0.240)	0.264 (0.260)	0.277 (0.272)	−0.002 (0.117)	0.350** (0.127)	−0.104 (0.206)
Village fixed-effects included	Yes	Yes	Yes	Yes	Yes	Yes
Number of households	2091	1148	943	2091	1148	943
R^2	0.255	0.206	0.317	0.091	0.082	0.111
F-statistic for joint test that all ELM	24.695	13.150	15.957	2.102	0.295	2.660
coefficients = 0	[0.000]	[0.000]	[0.000]	[0.111]	[0.829]	[0.068]

Notes: Standard errors (in parentheses) are clustered at the village level. ELM, economic livelihood mobility.
*Statistical significance at the 10 per cent level,
**Statistical significance at the 5 per cent level,
***Statistical significance at the 1 per cent level.

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Table A12. Regressing adult equivalent income change on instrumented economic livelihood mobility and other covariates

Covariates	Ghana (1)	Kenya (2)	Malawi (3)	Mozambique (4)	Tanzania (5)	Zambia (6)
ELM (ref. = *stepinn*):						
stayout	−0.169 (0.144)	−0.541*** (0.193)	−0.036 (0.238)	−0.584*** (0.188)	−0.427** (0.193)	−0.433** (0.182)
stepout	−0.846*** (0.207)	−0.916*** (0.255)	−0.649*** (0.227)	−0.903*** (0.254)	−1.121*** (0.198)	−1.126*** (0.201)
stayinn	−0.304** (0.133)	−0.103 (0.210)	−0.139 (0.212)	−0.382 (0.244)	−0.600*** (0.179)	−0.641*** (0.197)
Female headed household	−0.252 (0.160)	−0.650*** (0.168)	−0.046 (0.140)	−0.289 (0.194)	0.117 (0.206)	0.137 (0.156)
Age of household head	0.004 (0.004)	0.011** (0.006)	−0.002 (0.005)	0.009 (0.006)	0.008 (0.006)	−0.009* (0.005)
Share of members under 15	−0.710*** (0.204)	−1.553*** (0.421)	−1.382*** (0.236)	−0.721*** (0.230)	−1.134*** (0.255)	−1.551*** (0.260)
No. of working-age women	−0.178*** (0.033)	−0.198*** (0.054)	−0.337*** (0.076)	−0.122* (0.066)	−0.141** (0.063)	−0.100** (0.039)
No. of working-age men	−0.105*** (0.033)	−0.194*** (0.049)	−0.185*** (0.064)	−0.045 (0.060)	−0.067 (0.071)	−0.167*** (0.043)
Head's years of schooling	0.040*** (0.015)	0.004 (0.019)	0.004 (0.027)	0.051 (0.036)	0.045 (0.028)	−0.009 (0.019)
Social network capital	0.388*** (0.107)	−0.073 (0.147)	0.197 (0.191)	0.362 (0.346)	0.136 (0.237)	0.248** (0.107)
Livestock assets	0.048* (0.025)	0.081 (0.085)	0.151*** (0.035)	0.028 (0.052)	0.006 (0.035)	0.026** (0.012)
Land available per adult	0.217*** (0.054)	0.102 (0.144)	0.098 (0.102)	−0.039 (0.097)	0.272*** (0.082)	0.557*** (0.106)
Land constraint	−0.096 (0.089)	−0.262* (0.140)	0.036 (0.123)	0.099 (0.137)	0.013 (0.117)	0.180* (0.099)
Poor region (ref = Rich region)	1.119*** (0.183)	0.932* (0.554)	0.463*** (0.159)	−0.315 (0.240)	−0.156 (0.227)	−0.312 (0.197)
Endogeneity correction terms:						
IMR 1	0.129*** (0.046)	0.016 (0.053)	−0.018 (0.025)	0.081 (0.055)	0.014 (0.067)	0.092** (0.037)
IMR 2	0.060 (0.042)	−0.042 (0.047)	−0.019 (0.025)	−0.019 (0.064)	−0.038 (0.052)	0.063 (0.048)
IMR 3	−0.170* (0.089)	0.049 (0.097)	0.014 (0.037)	0.196*** (0.055)	−0.037 (0.108)	−0.066 (0.053)
Intercept	1.329** (0.628)	−1.231 (0.777)	−0.083 (0.514)	1.806* (0.921)	−0.291 (0.752)	2.073*** (0.673)
Number of households	491	272	346	299	348	335
R^2	0.248	0.423	0.250	0.256	0.228	0.357
F-statistic for joint test that all ELM coefficients = 0	5.961 [0.000]	5.700 [0.001]	4.745 [0.003]	5.156 [0.002]	10.931 [0.000]	11.548 [0.000]

Notes: Standard errors (in parentheses) are robust to white noise. ELM, economic livelihood mobility; IMR, inverse Mills ratios.
*Statistical significance at the 10 per cent level,
**Statistical significance at the 5 per cent level,
***Statistical significance at the 1 per cent level.

Table A13. Regressing adult equivalent income change on uninstrumented economic livelihood mobility and other covariates

Covariates	Ghana (1)	Kenya (2)	Malawi (3)	Mozambique (4)	Tanzania (5)	Zambia (6)
ELM (ref. = *stepinn*):						
stayout	−0.095 (0.146)	−0.518*** (0.190)	−0.048 (0.237)	−0.666*** (0.194)	−0.419** (0.192)	−0.389** (0.186)
stepout	−0.738*** (0.206)	−0.920*** (0.256)	−0.632*** (0.223)	−0.825*** (0.258)	−1.104*** (0.198)	−1.101*** (0.205)
stayinn	−0.227* (0.137)	−0.070 (0.208)	−0.119 (0.209)	−0.368 (0.249)	−0.549*** (0.177)	−0.578*** (0.197)
Female headed household	−0.152 (0.159)	−0.697*** (0.169)	−0.062 (0.140)	−0.349* (0.188)	0.136 (0.179)	0.077 (0.148)
Age of household head	0.007* (0.004)	0.011** (0.006)	−0.001 (0.005)	0.005 (0.005)	0.007 (0.006)	−0.007 (0.004)
Share of members under 15	−0.468** (0.196)	−1.699*** (0.298)	−1.409*** (0.233)	−0.811*** (0.241)	−1.205*** (0.252)	−1.590*** (0.258)
No. of working-age women	−0.162*** (0.032)	−0.183*** (0.053)	−0.341*** (0.075)	−0.176*** (0.061)	−0.135** (0.063)	−0.115*** (0.039)
No. of working-age men	−0.125*** (0.033)	−0.216*** (0.046)	−0.175*** (0.063)	−0.072 (0.067)	−0.064 (0.070)	−0.174*** (0.042)
Head's years of schooling	0.051*** (0.014)	−0.004 (0.016)	0.010 (0.024)	0.099*** (0.035)	0.062** (0.026)	0.017 (0.015)
Social network capital	0.312*** (0.105)	0.022 (0.145)	0.268* (0.148)	0.165 (0.349)	0.152 (0.145)	0.187* (0.105)
Livestock assets	0.067*** (0.020)	0.067 (0.050)	0.138*** (0.030)	0.103** (0.050)	0.025 (0.034)	0.033*** (0.012)
Land available per adult	0.191*** (0.050)	0.181 (0.148)	0.100 (0.099)	0.144* (0.086)	0.314*** (0.080)	0.561*** (0.106)
Land constraint	−0.096 (0.088)	−0.280** (0.140)	0.031 (0.123)	0.117 (0.142)	0.028 (0.118)	0.174* (0.103)
Poor region (ref = Rich region)	0.776*** (0.136)	0.909*** (0.157)	0.501*** (0.132)	−0.388* (0.205)	−0.207 (0.141)	−0.048 (0.125)
Intercept	0.386 (0.263)	−1.032*** (0.373)	0.168 (0.351)	0.472 (0.373)	0.044 (0.335)	0.972*** (0.267)
Number of households	491	272	346	299	348	335
R^2	0.219	0.413	0.248	0.213	0.217	0.336
F-statistic for joint test that all ELM	4.521	5.699	4.765	5.100	10.566	10.936
coefficients = 0	[0.004]	[0.001]	[0.003]	[0.002]	[0.000]	[0.000]

*Statistical significance at the 10 per cent level;
**Statistical significance at the 5 per cent level;
***Statistical significance at the 1 per cent level.

Table A14. Regressing change in asset wealth growth on instrumented economic livelihood mobility and other covariates

Covariates	Ghana (1)	Kenya (2)	Malawi (3)	Mozambique (4)	Tanzania (5)	Zambia (6)
ELM (ref. = *stepinn*):						
stayout	−0.239* (0.133)	−0.174 (0.194)	−0.034 (0.183)	0.097 (0.154)	−0.085 (0.193)	−0.248 (0.201)
stepout	−0.657*** (0.182)	0.093 (0.251)	−0.161 (0.162)	−0.043 (0.295)	−0.083 (0.194)	−0.309 (0.221)
stayinn	−0.247** (0.123)	0.176 (0.226)	−0.238* (0.133)	0.149 (0.167)	0.036 (0.181)	0.019 (0.232)
Female headed household	0.123 (0.128)	0.342* (0.185)	−0.215** (0.102)	−0.002 (0.157)	0.228 (0.204)	−0.151 (0.158)
Age of household head	0.002 (0.004)	0.006 (0.006)	0.001 (0.004)	−0.003 (0.005)	0.008 (0.006)	−0.015** (0.006)
Share of members under 15	0.157 (0.194)	1.537*** (0.452)	0.302* (0.161)	0.104 (0.207)	0.294 (0.262)	−0.318 (0.305)
No. of working-age women	0.069** (0.031)	−0.047 (0.053)	0.020 (0.050)	0.059 (0.058)	0.060 (0.057)	0.026 (0.049)
No. of working-age men	0.037 (0.030)	0.071 (0.053)	0.124*** (0.044)	0.151** (0.059)	0.117* (0.064)	0.080 (0.051)
Head's years of schooling	0.031** (0.015)	0.024 (0.020)	0.010 (0.021)	0.071** (0.028)	0.030 (0.029)	0.070*** (0.027)
Social network capital	0.064 (0.116)	−0.225 (0.160)	0.166 (0.140)	0.338 (0.273)	0.150 (0.260)	0.166 (0.127)
Monthly transfers	0.001 (0.002)	−0.002 (0.003)	−0.001 (0.004)	0.003 (0.004)	−0.003 (0.006)	0.003 (0.005)
Livestock assets	0.047** (0.023)	0.220** (0.086)	0.103** (0.041)	0.080 (0.054)	0.026 (0.041)	0.022 (0.018)
Land available per adult	0.141* (0.085)	−0.346* (0.196)	−0.002 (0.054)	0.080 (0.068)	0.075 (0.073)	0.177 (0.138)
Land constraint	0.159* (0.086)	−0.121 (0.143)	−0.151* (0.086)	−0.034 (0.113)	−0.075 (0.098)	−0.219 (0.137)
Poor region (ref = Rich region)	0.188 (0.216)	1.372** (0.640)	0.143 (0.129)	0.005 (0.177)	−0.511** (0.210)	−0.316 (0.261)
Endogeneity correction terms:						
IMR 1	−0.004 (0.049)	−0.070 (0.060)	0.003 (0.020)	−0.017 (0.052)	0.051 (0.069)	−0.039 (0.054)
IMR 2	−0.021 (0.048)	−0.166*** (0.052)	0.005 (0.022)	−0.035 (0.058)	−0.009 (0.052)	−0.009 (0.058)
IMR 3	−0.097 (0.085)	0.234** (0.100)	0.020 (0.028)	−0.018 (0.048)	0.070 (0.118)	−0.044 (0.077)
Intercept	−0.390 (0.628)	−2.403*** (0.924)	0.450 (0.394)	−0.006 (0.859)	0.702 (0.658)	0.948 (0.862)
Number of households	491	272	346	299	348	335
R^2	0.123	0.126	0.120	0.146	0.091	0.114
F-statistic for joint test that all ELM coefficients = 0	4.757 [0.003]	1.024 [0.383]	1.403 [0.242]	0.383 [0.765]	0.198 [0.898]	1.206 [0.308]

Notes: Standard errors (in parentheses) are robust to white noise. ELM, economic livelihood mobility; IMR, inverse Mills ratios.
*Statistical significance at the 10 per cent level,
**Statistical significance at the 5 per cent level,
***Statistical significance at the 1 per cent level.

Table A15. Regressing change in asset wealth on uninstrumented economic livelihood mobility and other covariates

Covariates	Ghana (1)	Kenya (2)	Malawi (3)	Mozambique (4)	Tanzania (5)	Zambia (6)
ELM (ref. = *stepinn*):						
stayout	−0.227* (0.134)	−0.124 (0.194)	−0.040 (0.182)	0.095 (0.154)	−0.076 (0.195)	−0.245 (0.201)
stepout	−0.647*** (0.181)	0.099 (0.249)	−0.157 (0.163)	−0.033 (0.295)	−0.073 (0.194)	−0.297 (0.217)
stayinn	−0.227* (0.123)	0.257 (0.234)	−0.241* (0.131)	0.160 (0.166)	0.074 (0.180)	0.024 (0.231)
Female headed household	0.150 (0.122)	0.251 (0.195)	−0.225** (0.101)	−0.013 (0.155)	0.221 (0.180)	−0.108 (0.150)
Age of household head	0.003 (0.004)	0.006 (0.006)	0.001 (0.004)	−0.003 (0.005)	0.007 (0.006)	−0.014*** (0.005)
Share of members under 15	0.195 (0.169)	0.704** (0.320)	0.296* (0.159)	0.131 (0.199)	0.217 (0.246)	−0.295 (0.297)
No. of working-age women	0.068** (0.029)	−0.012 (0.055)	0.017 (0.050)	0.059 (0.053)	0.069 (0.057)	0.025 (0.049)
No. of working-age men	0.037 (0.029)	0.006 (0.051)	0.125*** (0.042)	0.154*** (0.058)	0.133** (0.064)	0.087* (0.048)
Head's years of schooling	0.035** (0.015)	0.026 (0.019)	0.010 (0.019)	0.068** (0.027)	0.044 (0.028)	0.059*** (0.021)
Social network capital	0.071 (0.109)	−0.051 (0.150)	0.177 (0.112)	0.419* (0.245)	0.145 (0.142)	0.201* (0.117)
Monthly transfers	0.002 (0.002)	−0.001 (0.003)	−0.002 (0.003)	0.002 (0.004)	0.001 (0.006)	0.001 (0.004)
Livestock assets	0.058*** (0.019)	0.062 (0.055)	0.104*** (0.039)	0.088* (0.053)	0.040 (0.040)	0.020 (0.017)
Land available per adult	0.139* (0.076)	−0.033 (0.179)	−0.007 (0.054)	0.094* (0.055)	0.118* (0.071)	0.193 (0.133)
Land constraint	0.169** (0.085)	−0.150 (0.144)	−0.151* (0.086)	−0.034 (0.111)	−0.058 (0.099)	−0.214 (0.136)
Poor region (ref = Rich region)	0.187 (0.129)	0.328* (0.169)	0.173* (0.100)	−0.056 (0.156)	−0.456*** (0.137)	−0.227 (0.156)
Intercept	0.014 (0.230)	−0.691* (0.378)	0.322 (0.248)	0.497 (0.316)	0.191 (0.346)	1.363*** (0.329)
Number of households	491	272	346	299	348	335
R-squared	0.116	0.063	0.119	0.144	0.074	0.113
F-statistic for joint test that all ELM coefficients = 0	4.587 [0.004]	0.988 [0.399]	1.405 [0.241]	0.418 [0.740]	0.277 [0.842]	1.183 [0.316]

Table A16. Geography differences in the association between EL mobility and income poverty reduction

	Ghana (1)	Kenya (2)	Malawi (3)	Mozambique (4)	Tanzania (5)	Zambia (6)
G1: *stepinn* (PR − RR)	1.096*** (0.224)	0.859 (0.639)	−0.417 (0.376)	−0.860** (0.371)	0.057 (0.333)	−0.534 (0.335)
G2: *stayout* (PR − RR)	1.264*** (0.273)	0.964* (0.568)	0.320 (0.340)	−0.646 (0.410)	−0.226 (0.350)	0.041 (0.256)
G3: *stepout* (PR − RR)	0.911** (0.412)	1.791** (0.715)	0.912*** (0.280)	0.723 (0.481)	−0.428 (0.337)	−0.241 (0.312)
G4: *stayinn* (PR − RR)	1.115*** (0.239)	1.053* (0.595)	0.662*** (0.186)	0.070 (0.390)	−0.042 (0.314)	−0.475* (0.280)
G5: PR[*stepinn–stayout*] − RR[*stepinn–stayout*]	−0.168 (0.293)	−0.105 (0.368)	−0.736 (0.471)	−0.214 (0.534)	0.283 (0.403)	−0.575 (0.370)
Observations	491	272	346	299	348	335

Notes: PR, poor region; RR, rich region.

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Table A17. Geography differences in the association between EL mobility and asset poverty reduction

	Ghana (1)	Kenya (2)	Malawi (3)	Mozambique (4)	Tanzania (5)	Zambia (6)
G1: *stepinn* (PR − RR)	0.166 (0.245)	1.197* (0.723)	0.077 (0.248)	−0.434* (0.248)	−0.361 (0.325)	−0.564 (0.353)
G2: *stayout* (PR − RR)	0.443 (0.274)	1.316** (0.660)	0.301 (0.322)	−0.139 (0.395)	−0.492* (0.298)	−0.272 (0.356)
G3: *stepout* (PR − RR)	0.003 (0.392)	1.780** (0.839)	0.058 (0.232)	0.435 (0.573)	−0.456 (0.307)	−0.016 (0.414)
G4: *stayinn* (PR − RR)	0.056 (0.291)	1.702** (0.714)	0.152 (0.158)	0.371 (0.273)	−0.667** (0.309)	−0.308 (0.379)
G5: PR[*stepinn–stayout*] − RR[*stepinn–stayout*]	−0.277 (0.266)	−0.119 (0.401)	−0.225 (0.382)	−0.295 (0.456)	0.132 (0.365)	−0.291 (0.416)
Observations	491	272	346	299	348	335

Notes: PR, poor region; RR, rich region.

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Table A18. Random effects linear probability model of the determinants of off-farm participation

Covariates	Full sample	Poor region	Rich region
Household level:			
Female-headed household	0.042^{**} (0.019)	0.012 (0.028)	0.083^{***} (0.021)
Age of household head	-0.006^{***} (0.001)	-0.006^{***} (0.001)	-0.007^{***} (0.001)
Share of dependants	0.127^{***} (0.036)	0.152^{***} (0.044)	0.089 (0.061)
No. of male adults	0.015^{**} (0.006)	0.015^{**} (0.007)	0.009 (0.011)
No. of female adults	−0.004 (0.005)	−0.003 (0.006)	−0.009 (0.010)
Years of schooling	0.008^{***} (0.002)	0.008^{**} (0.004)	0.008^{**} (0.004)
Farm size	0.006 (0.007)	0.014^{*} (0.007)	0.003 (0.011)
Output per worker (log)	-0.050^{***} (0.010)	-0.054^{***} (0.014)	-0.051^{***} (0.013)
Land constraint	0.001 (0.017)	−0.005 (0.026)	0.007 (0.021)
Social network capital	−0.026 (0.023)	0.008 (0.028)	-0.065^{*} (0.036)
Received transfers	0.031 (0.029)	0.039 (0.029)	0.023 (0.059)
Lagged asset wealth	0.036 (0.052)	0.009 (0.079)	0.089 (0.068)
Livestock wealth	−0.002 (0.003)	−0.000 (0.004)	−0.003 (0.005)
Lagged ag. credit	-0.067^{***} (0.023)	-0.060^{*} (0.033)	-0.064^{**} (0.027)
Commercialization	0.035 (0.035)	0.056 (0.051)	0.016 (0.044)
Time effect (ref. = 2008)	0.113^{***} (0.032)	0.125^{***} (0.048)	0.100^{**} (0.046)
Village-level:			
Electricity	0.016 (0.021)	0.009 (0.030)	0.019 (0.026)
Irrigation	−0.041 (0.046)	−0.035 (0.056)	−0.030 (0.068)
All-weather road	0.029 (0.028)	0.021 (0.050)	0.037 (0.027)
Distance to markets	-0.002^{*} (0.001)	−0.002 (0.001)	−0.002 (0.001)
Intercept	0.805^{***} (0.091)	0.911^{***} (0.102)	0.840^{***} (0.132)
Region Fixed-effects included	Yes	—	—
Country Fixed-Effects included	—	Yes	Yes
Observations	4182	2296	1886
R^2	0.127	0.119	0.143

Notes: Standard errors (in parentheses) are clustered at the village level.
*Statistical significance at the 10 per cent level,
**Statistical significance at the 5 per cent level,
***Statistical significance at the 1 per cent level.

Table A19. Random effects linear probability model of the determinants of off-farm participation

Covariates	Ghana (1)	Kenya (2)	Malawi (3)	Mozambique (4)	Tanzania (5)	Zambia (6)
Female-headed household	0.043 (0.042)	0.035 (0.047)	0.075* (0.039)	−0.008 (0.042)	−0.047 (0.046)	0.032 (0.045)
Age of household head	−0.003*** (0.001)	−0.008*** (0.002)	−0.008*** (0.001)	−0.004*** (0.002)	−0.008*** (0.002)	−0.006*** (0.001)
Share of dependants	0.101 (0.067)	−0.011 (0.079)	0.119 (0.080)	0.027 (0.079)	−0.050 (0.065)	0.059 (0.086)
No. of male adults	−0.006 (0.010)	0.003 (0.014)	0.001 (0.014)	−0.020* (0.012)	−0.040** (0.018)	0.005 (0.009)
No. of female adults	−0.001 (0.009)	−0.023** (0.012)	0.031* (0.018)	0.008 (0.015)	0.020 (0.018)	0.001 (0.011)
Years of schooling	0.008** (0.004)	0.003 (0.005)	0.012** (0.005)	0.013 (0.010)	0.014* (0.008)	0.006 (0.006)
Farm size	0.006 (0.009)	0.015 (0.017)	0.029 (0.020)	0.004 (0.011)	0.026** (0.013)	−0.011 (0.012)
Output per worker (log)	−0.032** (0.014)	−0.051*** (0.017)	−0.130*** (0.022)	−0.017 (0.022)	−0.126*** (0.022)	−0.062*** (0.022)
Land constraint	−0.011 (0.027)	0.050 (0.039)	−0.015 (0.031)	−0.034 (0.034)	0.045 (0.029)	0.011 (0.038)
Social network capital	0.025 (0.045)	−0.094* (0.048)	0.048 (0.037)	0.090 (0.070)	0.023 (0.041)	−0.079** (0.040)
Received transfers	0.010 (0.033)	0.057 (0.052)	−0.122** (0.052)	0.026 (0.055)	−0.027 (0.076)	0.053 (0.047)
Lagged asset wealth	0.197** (0.085)	0.099 (0.113)	0.129 (0.119)	0.239** (0.119)	−0.090 (0.113)	−0.025 (0.101)
Livestock wealth	−0.005 (0.006)	0.005 (0.015)	−0.008 (0.011)	0.006 (0.011)	−0.001 (0.011)	0.009 (0.005)
Lagged ag. credit	−0.070 (0.044)	−0.081** (0.037)	−0.048 (0.045)	0.123 (0.093)	0.093* (0.048)	−0.139*** (0.040)
Commercialization	−0.018 (0.061)	0.146** (0.059)	0.137** (0.063)	0.090 (0.071)	0.061 (0.056)	−0.275*** (0.066)
Time effect (ref. = 2008)	0.258*** (0.035)	0.149*** (0.041)	−0.032 (0.034)	0.198*** (0.039)	0.055 (0.037)	−0.025 (0.035)
Region type (ref. = rich)	0.238*** (0.051)	−0.035 (0.058)	−0.066* (0.038)	−0.308*** (0.051)	0.076* (0.039)	−0.041 (0.050)
Intercept	0.452*** (0.116)	0.964*** (0.166)	1.417*** (0.131)	0.741*** (0.139)	1.312*** (0.135)	1.108*** (0.135)
Observations	982	544	692	598	696	670
R^2	0.134	0.135	0.176	0.214	0.128	0.130

Notes: Standard errors (in parentheses) are robust to households clustering.
*Statistical significance at the 10 per cent level,
**Statistical significance at the 5 per cent level,
***Statistical significance at the 1 per cent level.

Table A20. Determinants of economic livelihood mobility: multinomial probit estimates

	Ghana			Kenya	
	stepinn vs. *stayout* (1)	*stepout* vs. *stayout* (2)	*stayinn* vs .*stayout* (3)	*stepinn* vs. *stayout* (4)	*stepout* vs. *stayout* (5)
Female-headed	−0.872*** (0.328)	−0.928** (0.370)	−0.832*** (0.305)	−0.479** (0.241)	−0.162 (0.318)
Age of head	−0.009 (0.011)	−0.003 (0.012)	−0.017* (0.010)	−0.029*** (0.010)	−0.045*** (0.012)
Share of dependants	0.142 (0.627)	−0.358 (0.700)	0.209 (0.600)	−0.109 (0.440)	−0.254 (0.564)
Adults male	0.199 (0.139)	0.155 (0.144)	0.194 (0.134)	0.145** (0.073)	−0.381*** (0.113)
Adult female	0.249* (0.133)	0.256* (0.141)	0.271** (0.131)	−0.175*** (0.065)	0.267*** (0.089)
Years of schooling	0.045 (0.036)	0.038 (0.040)	0.072** (0.032)	−0.018 (0.032)	−0.040 (0.038)
Farm size	0.139** (0.066)	−0.049 (0.084)	0.144** (0.062)	−0.082 (0.121)	0.136 (0.126)
Output per worker (log)	0.351*** (0.114)	−0.102 (0.131)	0.510*** (0.107)	−0.033 (0.101)	−0.397*** (0.135)
Land constraint	0.598** (0.236)	0.397 (0.268)	0.265 (0.209)	−0.046 (0.207)	−0.394 (0.336)
Social capital	−0.359 (0.478)	−0.649 (0.566)	−0.074 (0.435)	0.054 (0.261)	0.349 (0.324)
Received transfers	0.051 (0.293)	0.551* (0.313)	0.623** (0.269)	0.057 (0.275)	0.194 (0.363)
Lagged asset wealth	−2.733*** (0.850)	−0.253 (0.863)	−1.079 (0.778)	−0.482 (0.648)	−0.303 (0.753)
Livestock wealth	0.185*** (0.054)	−0.002 (0.057)	0.096* (0.049)	0.041 (0.070)	0.016 (0.116)
Lagged ag. credit	−0.554* (0.333)	−0.070 (0.486)	−0.784** (0.324)	0.067 (0.191)	−0.118 (0.297)
Commercialization	1.371*** (0.491)	−1.393** (0.608)	0.448 (0.427)	−0.277 (0.304)	2.295*** (0.409)
Poor region	−0.199 (0.408)	−0.541 (0.494)	0.836** (0.387)	0.711** (0.301)	−1.714*** (0.420)
Intercept	0.136 (1.070)	0.371 (1.152)	−0.632 (1.011)	1.701* (0.911)	4.528*** (1.316)
Observations	−926.0			−604.8	
Log-likelihood	0.115			0.156	
McFadden's R^2	−926.0			−604.8	
	Mozambique			Tanzania	
	stepinn vs. *stayout* (10)	*stepout* vs. *stayout* (11)	*stayinn* vs. *stayout* (12)	*stepinn* vs. *stayout* (13)	*stepout* vs. *stayout* (14)
Female-headed	−0.692*** (0.251)	0.429 (0.262)	−0.916*** (0.337)	0.149 (0.299)	−0.200 (0.346)
Age of head	−0.031*** (0.010)	0.019* (0.010)	−0.015 (0.011)	−0.015 (0.011)	−0.026** (0.012)
Sh. of dependants	0.261 (0.532)	−0.052 (0.524)	−0.422 (0.647)	−0.212 (0.454)	0.220 (0.533)
Adults male	−0.198*** (0.073)	0.017 (0.083)	−0.128* (0.076)	0.121 (0.127)	−0.139 (0.126)
Adult female	0.084 (0.096)	−0.060 (0.101)	0.111 (0.104)	0.223* (0.120)	0.249* (0.130)
Years of schooling	−0.042 (0.062)	0.096 (0.073)	0.136* (0.070)	0.103** (0.050)	0.021 (0.050)

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Table A20. (Continued)

	Ghana			Kenya	
	stepinn vs. *stayout* (1)	*stepout* vs. *stayout* (2)	*stayinn* vs .*stayout* (3)	*stepinn* vs. *stayout* (4)	*stepout* vs. *stayout* (5)
Farm size	0.151* (0.078)	0.018 (0.093)	0.127 (0.083)	0.049 (0.115)	0.261** (0.112)
Output per worker (log)	0.732*** (0.149)	0.318** (0.154)	1.130*** (0.172)	0.092 (0.168)	0.053 (0.183)
Land constraint	0.382* (0.201)	0.084 (0.221)	0.212 (0.270)	0.339 (0.215)	0.065 (0.206)
Social network capital	1.158** (0.476)	−0.372 (0.592)	1.129** (0.492)	0.530* (0.322)	0.510 (0.335)
Received transfers	−0.674* (0.346)	−0.680* (0.348)	0.074 (0.367)	0.453 (0.460)	−0.132 (0.632)
Lagged asset wealth	−2.250** (0.874)	2.892*** (0.856)	−0.581 (0.841)	−0.670 (0.768)	0.277 (0.806)
Livestock wealth	0.135 (0.161)	0.101 (0.063)	0.197 (0.133)	0.082 (0.075)	−0.144** (0.062)
Lagged ag. credit	−0.507 (0.601)	−1.195*** (0.426)	−1.133* (0.681)	−0.139 (0.323)	−0.059 (0.376)
Commercialization	1.580*** (0.448)	−1.962*** (0.530)	−0.928 (0.600)	1.207*** (0.429)	−1.935*** (0.492)
Poor region	−1.021*** (0.293)	0.919*** (0.348)	0.191 (0.341)	0.710*** (0.262)	0.743** (0.293)
Intercept	−0.344 (0.818)	−4.071*** (0.964)	−4.382*** (0.990)	−0.689 (0.976)	0.146 (1.053)
Observations	598			696	
Log-likelihood value	−653.4			−800.7	
McFadden's R^2	0.190			0.117	

	Kenya	Malawi		
	stayinn vs. *stayout* (6)	*stepinn* vs. *stayout* (7)	*stepout* vs. *stayout* (8)	*stayinn* vs. *stayout* (9)
Female-headed	−0.374 (0.302)	−0.819** (0.375)	0.631* (0.333)	−0.332 (0.304)
Age of head	−0.066*** (0.012)	−0.028** (0.012)	−0.006 (0.012)	−0.030*** (0.011)
Share of dependants	−0.464 (0.509)	0.624 (0.732)	−0.052 (0.633)	0.213 (0.616)
Adults male	−0.017 (0.096)	0.092 (0.178)	−0.026 (0.161)	0.141 (0.163)
Adult female	−0.224** (0.091)	0.077 (0.187)	0.198 (0.180)	0.291* (0.162)
Years of schooling	−0.021 (0.039)	0.132* (0.071)	0.171*** (0.066)	0.240*** (0.063)
Farm size	0.126 (0.118)	−0.097 (0.243)	0.073 (0.228)	0.339* (0.194)
Output per worker (log)	−0.325*** (0.114)	0.468** (0.226)	0.205 (0.213)	0.296 (0.197)
Land constraint	0.549** (0.265)	0.153 (0.300)	0.840*** (0.292)	0.478** (0.236)
Social capital	−0.895** (0.362)	0.505 (0.424)	0.408 (0.411)	0.654* (0.361)

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Table A20. (Continued)

	Kenya	Malawi		
	stayinn vs. *stayout* (6)	*stepinn* vs. *stayout* (7)	*stepout* vs. *stayout* (8)	*stayinn* vs. *stayout* (9)
Received transfers	0.095 (0.363)	−0.083 (0.542)	−0.133 (0.463)	0.592 (0.419)
Lagged asset wealth	1.109 (0.780)	2.396 (1.483)	1.414 (1.294)	2.051 (1.262)
Livestock wealth	0.021 (0.106)	0.086 (0.072)	0.047 (0.070)	−0.003 (0.067)
Lagged ag. credit	−0.919*** (0.258)	−0.045 (0.431)	−0.520 (0.321)	−0.314 (0.232)
Commercialization	1.474*** (0.432)	2.408*** (0.619)	−0.814 (0.582)	1.867*** (0.495)
Poor region	−0.293 (0.407)	1.875*** (0.436)	0.744* (0.424)	2.190*** (0.397)
Intercept	3.965*** (1.162)	−1.621 (1.207)	−1.704 (1.149)	−0.687 (1.022)
Observations		−642.2		
Log-likelihood		0.165		
McFadden's R^2		−642.2		
	Tanzania	Zambia		
	stayinn vs. *stayout* (15)	*stepinn* vs. *stayout* (16)	*stepout* vs. *stayout* (17)	*stayinn* vs. *stayout* (18)
Female-headed	−0.233 (0.298)	0.106 (0.374)	0.128 (0.311)	0.064 (0.332)
Age of head	−0.029*** (0.009)	−0.013 (0.011)	−0.014 (0.010)	−0.033*** (0.010)
Sh. of dependants	0.499 (0.457)	1.220* (0.655)	0.140 (0.611)	0.509 (0.610)
Adults male	0.201* (0.115)	0.059 (0.079)	−0.003 (0.069)	−0.028 (0.071)
Adult female	0.302** (0.124)	−0.043 (0.074)	0.065 (0.075)	0.175*** (0.067)
Years of schooling	0.083* (0.045)	−0.096* (0.049)	−0.031 (0.042)	−0.038 (0.043)
Farm size	0.248** (0.099)	0.298*** (0.108)	−0.013 (0.109)	0.322*** (0.092)
Output per worker (log)	0.329** (0.164)	0.003 (0.187)	0.206 (0.163)	0.460*** (0.162)
Land constraint	0.413** (0.193)	0.535* (0.309)	−0.166 (0.258)	−0.209 (0.262)
Social network capital	0.695** (0.302)	0.612* (0.312)	0.435 (0.268)	0.534* (0.276)
Received transfers	0.403 (0.479)	0.897* (0.494)	0.743 (0.492)	2.168*** (0.446)
Lagged asset wealth	0.874 (0.727)	−0.316 (0.778)	0.571 (0.623)	0.308 (0.627)
Livestock wealth	−0.064 (0.053)	0.027 (0.035)	0.034 (0.032)	0.030 (0.037)
Lagged ag. credit	0.515 (0.316)	−1.166*** (0.374)	−0.640* (0.372)	−1.508*** (0.358)
Commercialization	−0.442 (0.407)	−0.610 (0.520)	−0.565 (0.478)	−2.088*** (0.476)
Poor region	1.289*** (0.258)	−1.840*** (0.486)	−1.203*** (0.449)	−2.324*** (0.446)
Intercept	−1.208 (0.938)	0.944 (1.059)	0.819 (1.005)	0.813 (0.977)

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Table A20. (Continued)

	Kenya	Malawi		
	stayinn vs. *stayout* (6)	*stepinn* vs. *stayout* (7)	*stepout* vs. *stayout* (8)	*stayinn* vs. *stayout* (9)
Observations		670		
Log-likelihood value		−696.1		
McFadden's R^2		0.193		

Table A21. Predicted probabilities (per cent)

Variables	Poor region *stepinn* vs. *stayout* (1)	 *stayinn* vs. *stayout* (2)	Rich region *stepinn* vs. *stayout* (3)	 *stayinn* vs. *stayout* (4)
Female-headed household	−9.2	−10.7	not sig.	not sig.
Age	−0.2	−0.6	−0.4	−0.6
Dependants	9.8	15.8	not sig.	not sig.
No. of male adults	1.5	3.0	not sig.	2.7
No. of female adults	not sig.	not sig.	not sig.	not sig.
Education	not sig.	not sig.	not sig.	1.5
Farm size	not sig.	4.4	not sig.	3.0
Output per worker (log)	3.2	7.2	2.5	6.3
Land constraint	not sig.	not sig.	6.2	5.2
Social network capital	6.2	12.8	not sig.	not sig.
Transfer	not sig.	9.3	not sig.	26.8
Lagged asset wealth	not sig.	not sig.	−25.5	not sig.
Livestock wealth	1.6	not sig.	not sig.	not sig.
Lagged agricultural credit	not sig.	−16.5	not sig.	−11.9
Crop commercialization	11.2	not sig.	14.3	not sig.
Electricity	not sig.	not sig.	not sig.	not sig.
Irrigation	not sig.	not sig.	12.5	not sig.
All-weather road	10.9	18.9	not sig.	not sig.
Distance to markets	−0.4	−0.3	not sig.	−0.3

Note: Estimates are based on the multinomial probit regressions in Table 5 of the main article. Not sig. means that we cannot reject the null hypothesis that the association equals zero at conventional levels (i.e. at the 10 per cent level at most)

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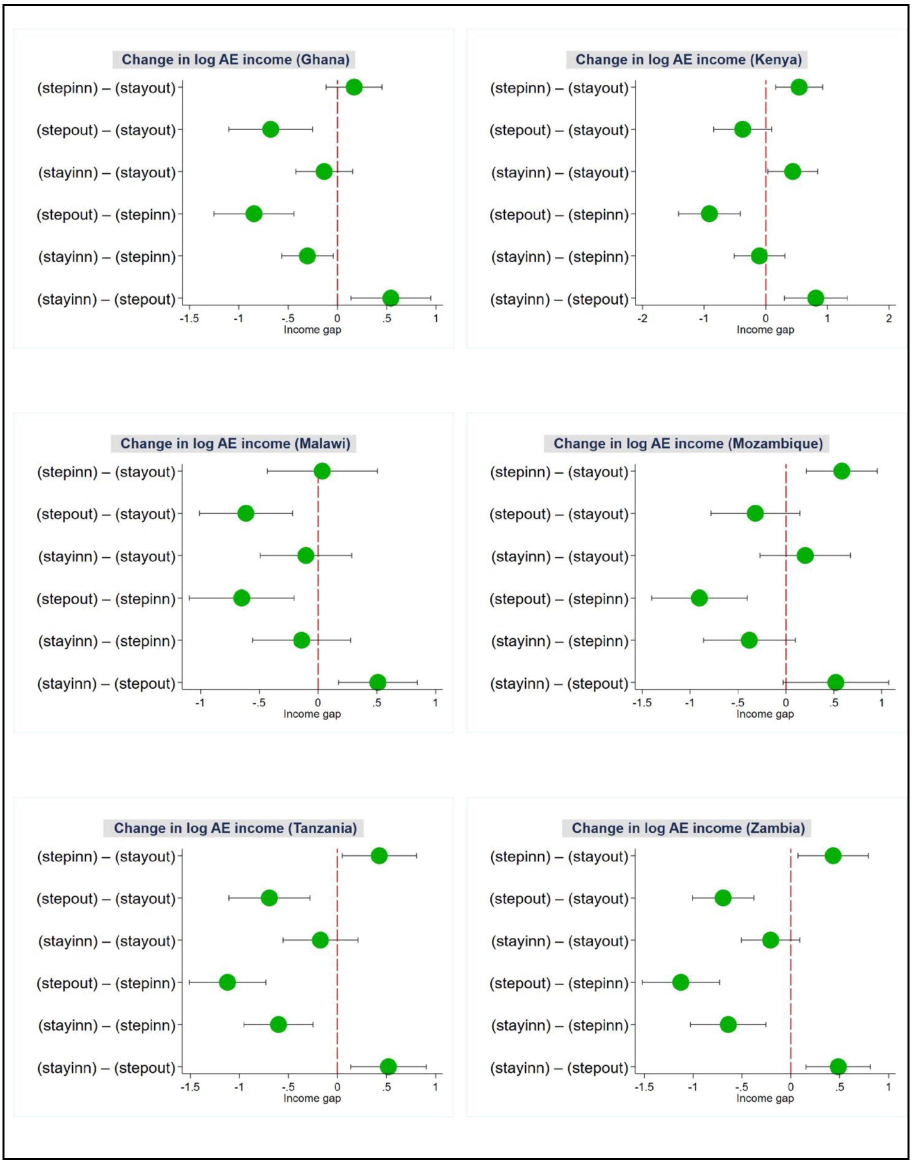

Note: The line caps represent the 95 per cent confidence intervals.

Figure A1. Average income growth gaps, by economic livelihood mobility position. Note: The line caps represent the 95 per cent confidence intervals. AE, adult equivalent [Colour figure can be viewed at wileyonlinelibrary.com]

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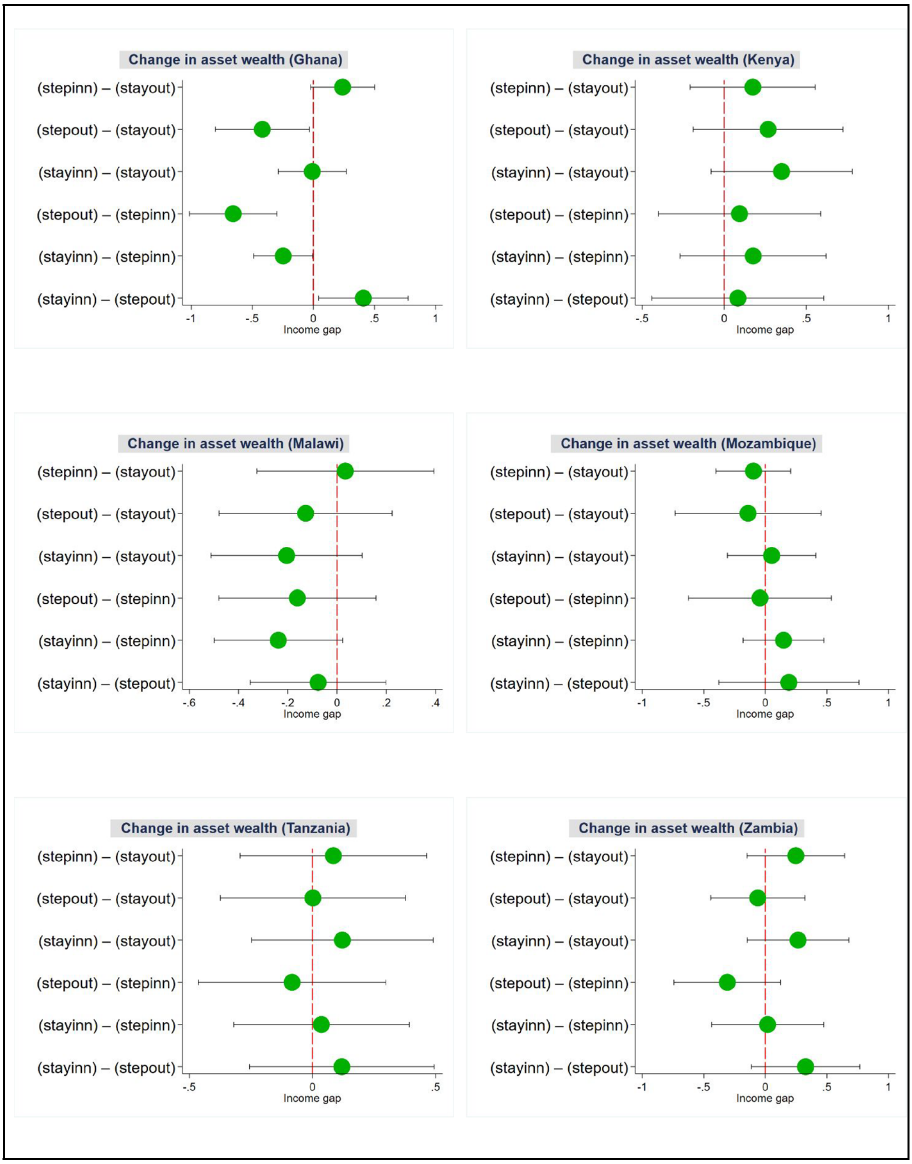

Note: The line caps represent the 95 per cent confidence intervals.

Figure A2. Average asset growth gaps, by economic livelihood mobility position. Note: The line caps represent the 95 per cent confidence intervals. AE, adult equivalent [Colour figure can be viewed at wileyonlinelibrary.com]

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