Property Rights and Household Income Diversification in Rural Malawi

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1. Introduction

Little is known about the gendered determinants of household income diversification patterns. Although empirical studies in the household bargaining literature suggest households do not necessarily operate under the context of a unitary household model, most studies on diversification patterns center mainly on inter-household differences with limited attention to individuals with the household. This paper aims to partially fill that gap by investigating gendered patterns of property rights and intra-household income diversification in rural Malawi.

In order to reduce fluctuations in income and enhance their standard of living, rural and urban households in many developing countries often diversify their income sources by engaging in more than one income generating activity. Studies find that income diversification is positively associated with household welfare in Africa (Block and Webb 2001; Lanjouw et al. 2001). Many rural African households who earn income from farming also engage in non-farm activities, and according to the literature non-farm income opportunities are important for higher income realizations (Barrett et al. 2004). As such, policymakers in government and development agencies promote diversification as part of their poverty reduction and welfare-enhancing strategies.

Holding productive assets is an important determinant of income diversification (Ellis 2000). If one has access to their own land, for instance, it can be used for crops and if the property is owned it can be used as collateral for credit to purchase other productive assets that could generate income. In rural India for example, Chadha (1992) found that individuals who owned land generated much higher rural nonfarm earnings from self-

employment than did those without land. Of course, the concept of land ownership is different in Malawi than India. Land in Malawi is classified into customary, public and private land with customary land comprising almost 80 percent of the total land area. Under customary tenure individuals only have use-rights and are not able to sell the land or use it as collateral. Instead, land rights are preserved by keeping the land in use. Even so, rural households with access to land in Malawi will possess a different set of income generating options than those without access to land. Lack of access to particular assets limits a household's options for diversification all else being equal.

Individual income diversification is also shaped by social institutions including gender relations. Since men and women operate differently within the economy and have specialized division of labor in the household, the ways in which men and women diversify their income generating activities also differ. For instance, women's land holdings tend to be used for subsistence production while men's tend to be used for cash crops. Given these differences, women's property holdings may contribute in different ways than men's to household diversification.

This paper extends the analysis in Swaminathan et al (2005) which sought to investigate whether differences in asset holdings between men and women impact household income diversification strategies in rural Malawi. Swaminathan et al (2005) found that women's property ownership in male-headed households contributes to specialization while men's property ownership contributes to greater diversification. Moreover, in female-headed households, their property ownership does not affect diversification. The present paper seeks to further disentangle these results. As explained below, we use a panel data

approach to control for seasonality and experiment with different specifications of key variables, including land value. Second, we test additional hypotheses about the effect of *inequality* in male and female individual land holdings on household income diversification. Specifically, assuming that individual access of an asset translates into control over how the asset is used, we hypothesize that the more equal the head and the spouse's shares of the household's property, the greater the household diversification.

The paper is organized as follows. The next section reviews literature on income diversification strategies with an emphasis on Sub-Saharan Africa and, in particular, Malawi. The third section presents the country background and discussions of diversification patterns and of property rights in Malawi. Section four describes the methodology of measuring diversification the empirical models. Section five presents the data and sampling framework. Sections six and seven present a discussion of the empirical work. Some conclusions and policy implications are discussed in the final section.

2. Review of the Literature

There are several reasons why households choose to diversify and these can be classified as "push" and "pull" factors (Barrett *et al.* 2001). Diversification due to "pull" factors is a response by households to exploit economic opportunities that are created by local economic and population growth, proximity to urban markets and improvements in infrastructure. In contrast, "push" factors are those that force households to diversify as a coping strategy. Diversification by poor households in developing countries is usually a response to "push" factors.

Income diversification is useful for *ex ante* risk management or *ex post* coping of shocks (Rosenzweig and Binswanger 1993, Reardon *et al.* 1998). By creating a portfolio of weakly covariate activities that are diversified across sectors or across space (migration), households seek to minimize variation to their total income. Barrett *et al.* (2001) note that if risk aversion is decreasing in income and wealth, then poorer households will exhibit greater demand for diversification for the purposes of *ex ante* risk management. However, in addition to risk management, there are several other reasons for diversification by households[1]. These include varying returns to productive assets over time or across different aggregation units (individuals or households); market failures due to missing markets or an inability to access markets due to lack of infrastructure; as an *ex post* coping strategy to income shocks, particularly for poorer households as they lack the resources for self-insurance; and to realize economies of scope in production. The differing income diversification patterns that are observed are thus a function of the constraints and incentives faced by households and individuals as well as their differing preferences (Barrett *et al.* 2004). Liquidity constraints, property rights in land, housing and other productive assets are key determinants of diversification.

Many studies find that diversification is positively associated with household welfare in rural Africa (Block and Webb 2001, Lanjouw *et al.* 2001). This is especially true when one considers the short-term effect of off-farm activity (Reardon *et al.* 1998). There is some concern regarding effects of diversification on a household's food security status in the long run due to a conflict between farm work and food production. However, empirical work has not supported this point of view (von Braun and Pandya-Lorch 1991). A greater concern is the regressive distributional effects of off-farm

[1] See Barrett *et al.* 2001 for a detailed review.

employment. If there are significant entry barriers to activities with high returns, then only the rich will be able to enter that market, while the poorer households will be caught in a low investment-low return cycle (Dercon and Krishnan 1996, Rosenzweig and Binswanger 1993).

3. Country Profile

Malawi is one of the world's poorest countries. With a per capita income of $160 in 2004, Malawi ranks among the poorest five countries in Sub-Saharan Africa (World Bank 2004). In 2004, the life expectancy at birth was only 38 years for the entire population. The infant mortality rate was 112 per thousand live births and child malnutrition for children under 5 was 25 percent (World Bank 2004). The 2000 Malawi Demographic and Health Survey (MDHS) results do not show a significant change in the nutritional status of children since 1992. About 49 percent of all children under the age of 5 are stunted, while 25 percent are underweight (World Bank 2003).

The agricultural sector is the backbone of Malawi's economy. It accounts for 36.5 percent of the GDP (World Bank 2004), employs more than 80 percent of the working population and contributes 90 percent of total export earnings (World Bank undated). The agricultural sector in Malawi is dualistic with an estate sector producing 90 percent of the country's main exports and a smallholder sector, comprised of commercial as well as subsistence farmers (Lele 1990, as noted in Green and Baden 1994). Crop production for smallholders is a risky undertaking in Malawi due to the rainfed nature of their agriculture. About 50 percent of the smallholder households are food insecure, with 60 percent of the rural population earning incomes below the poverty line (Diagne and Zeller 2001).

Food security is one of the most pressing concerns in Malawi. There are no safety nets to protect the vulnerable in event of an agricultural failure. Off-farm work is therefore an important source of income supplement for poor households in rural areas. Casual labor, small crafts and beer brewing are the major sources of income, although casual labor (*ganyu*) consisting mainly of agricultural wage labor has the highest contribution (Peters 1993, World Bank 1996). *Ganyu* is one form of distress labor that finance-constrained households undertake to meet their consumption needs and purchase inputs. However, it is an unreliable source of employment especially during poor agricultural seasons when the need for cash income is the highest. *Ganyu* also creates labor shortages on the farms of the households that undertake it, with serious consequences for their food security (Alwang and Siegel 1999). Gladwin *et al.* (2001) note the problem of food security is linked to low household income and poverty, not inadequate food production alone. Instead of focusing on increasing food production alone, Gladwin's study suggests ways to improve returns to women's resources and make their livelihoods sustainable by diversifying into cash cropping, income-generating activities and wage labor.

Property Rights in Malawi

Land in Malawi is classified into customary, public and private land with customary land comprising almost 80 percent of the total land area. Customary land tenure arrangements may vary depending on the tribe or ethnic group, but some of the common features of customary tenure are: (1) households and individuals have usufruct rights without the right to sell the land; (2) land is allocated to the household or individual by the village chief and is considered as being under their (household's or individual's) ownership; and (3) use rights to the land may be inherited (Kishindo 1991, as noted in

Green and Baden 1994). The patrilineal systems found mainly in Northern Malawi usually involve the payment of lobola after which the wife moves to the husband's village. The man is assumed to own everything in the marital home and the woman has no right to own property (Strickland 2004).

In the matrilineal predominant systems prevalent in Southern Malawi, and in parts of Central Malawi, land rights are held by women. The inheritance passes from the maternal side to the male child and women receive land from their mothers on marriage. Husbands can receive land from the village chief or from their in-laws, but in the event of divorce or wives' death, they retain right only to the land given to them by the chief (Dickerman and Bloch 1991, Kishindo 1991, as noted in Green and Baden 1994). Davison (1992) notes that in matrilineal systems, due to both better and independent access to land, women enjoy a greater degree of economic security that is uncommon to women in patrilineal systems. However, in recent times, matrilineal systems of inheritance have been on the decline with a shift from uxorilocal to virilocal residence (Green and Baden 1994). Furthermore, since there is also a decrease in the availability of unallocated customary land, land reallocation tends to reduce women's customary rights to land (World Bank 1996).

4. Data and Methods

4.1 Data Characteristics

The data set from Malawi, 'Financial Markets and Household Food Security, 1995', used in this research is available from the International Food Policy Research Institute (IFPRI), based in Washington D.C. The data are from a household rural finance survey of 404 households in 45 villages in Malawi spread over five districts: Dowa,

Mangochi, Nkhotakota, Rumphi and Dedza. Fifty percent of the sample is comprised of households who are members of several credit programs, with the remaining sample comprised of non-participating households.[2] The non-participants are further equally divided between those who never received credit from an organization and defaulters and, hence, are no longer eligible for loans. The non-participants are drawn from the same villages as the participants.

Households were interviewed in a three-round household survey with a recall period of up to two years for some data. The first round was conducted in February – April 1995, the second round in July – August 1995, and the last round in November – December 1995. The survey was conducted at three levels: the household level, community level and credit group level. The household-level survey, comprised of seven modules, was administered in all three rounds. The seven modules are (i) demographics, (ii) crop and livestock incomes, (iii) asset ownership and transactions, (iv) food and non-food expenditure, (v) credit and savings, (vi) non-farm income and time allocation, and (vii) anthropometric measures. The analysis presented here is restricted to Round 1 of the data set.

One of the unique features of this data set is that it has detailed information at the individual level on land/housing ownership and mode of acquisition, which makes it relevant for the current analysis.

4.2 Income Diversification

Off-farm share of total household income is commonly used in the literature to measure income diversification in rural households (Block and Webb 2001, Lanjouw *et*

[2] The four programs considered in the study are the Malawi Rural Finance Company (MRFC), Malawi Mudzi Fund (MMF), Malawi Union of Savings and Credit Cooperatives (MUSCCO), and the Promotion of Micro-Enterprises for Rural Women (PMERW).

al. 2001). Ersado (2003) argues there are some problems associated with this measure of diversification. The main critique is that it fails to differentiate between households that may also exhibit diversification within the nonfarm income component of their total income. The same weight is given to households who earn all their nonfarm income from one source versus those who earn it from multiple sources. Following Ersado (2003), this paper uses two measures of income diversification: the number of income sources and the inverse of the Herfindahl index of concentration[3]. The first measure is easy to calculate at the household level and is relatively free of measurement errors that may occur when calculating income levels. Thus, it also provides a robustness check of the more complex Herfindahl index:

$$S_k = \frac{Y_k}{Y} \qquad [1]$$

$$D = \frac{1}{\sum_k S_k^2}$$

where S_k is proportion of income generated from income source *k*, Y is total income and Y_k is income earned from *k*. This index captures both the number of sources and the relative importance of each source of income. Households with the most diversified portfolio will have the largest D, while less diversified households will have a smaller value of D. The value of D will approach 1 as households rely mainly on one source of income. The maximum value D can take will be equal to the number of income sources

[3] This is also referred as the inverse Simpson measure (see Dunn 1997).

for the household. This occurs when various activities contribute an equal share to total income (Ersado 2003).[4]

In the empirical analysis, we distinguish between seven sources of income activities: food and vegetable production, local maize, hybrid maize, cash crops (comprised of tobacco, tea, cotton and other crops), off-farm self employment, wage or contract work, and income from livestock. In many parts of rural Africa, remittances are an important source of income diversification for the household. In this sample, however, both the number of households receiving remittances and the amount received were very low. Moreover, very few households received remittances on a regular basis. Hence, remittances were not included as an income source, but receipt of remittances is included as a dummy variable in the empirical analysis described below.

4.3 Sampling Framework: Choice-Based Sampling

Due to low participation in credit programs in Malawi, IFPRI followed a stratified sample selection procedure. The stratification was along the program membership status variable with random selection within each stratum. Since the stratifying variable is endogenous, this is a choice-based sampling procedure. In a situation like Malawi, choice-based sampling is more cost efficient than random sampling, and with the use of appropriate estimators, yields estimates with better statistical properties (Diagne and Zeller 2001). However, the corresponding bias in the estimation process caused by the choice-based sampling procedure needs to be corrected. The estimation procedure, therefore, follows a two-step approach based on the methodology in Diagne and Zeller (2001) to correct for the bias in estimation. The probability choices of the household with regard to membership status, corrected for choice-based sampling, are estimated in

[4] See Barrett et al. (2001) for a discussion of the advantages of the Herfindahl index.

the first step. The outcome equations are then estimated in the second step, using the corrected probability choices from the first step as weights.

4.3.1 First-Step Estimation: Multinomial Logit Model

In the first step, a three-alternative multinomial logit model is used for estimation of the corrected probability choices of the household. The three alternatives are specified as: (i) never participated in a credit program (j = 0), (ii) current member of any credit program (j = 1), and (iii) joined a credit program and then dropped out of the program, i.e., past member (j = 2).[5] Due to the restriction of mutual exclusivity, each household can belong to only one of the three alternatives. The probability choices for household *i* are specified as:

$$Probability(y_i = j) = \frac{e^{\beta_j' x_i}}{\sum_{k=0}^{2} e^{\beta_k' x_i}}, \qquad [2]$$

where *j = 0, 1 ,2.* For the purpose of identification, we impose the normalization $\beta_0 = 0$, and rewrite the probabilities as:

$$Probability(y_i = 0) = \frac{1}{1 + \sum_{k=1}^{2} e^{\beta_k' x_i}}, \qquad [3]$$

$$Probability(y_i = j) = \frac{e^{\beta_j' x_i}}{1 + \sum_{k=1}^{2} e^{\beta_k' x_i}}$$

where *j = 1, 2.*

[5] Diagne and Zeller (2001) estimate a four-alternative nested multinomial logit model with two levels: choice is between participation vs. non-participation at the first level and at the second level (reached only if participation is chosen at the first level), the choice is between being a (i) member of MRFC, (ii) member of a second program, or (iii) past member.

The model is estimated as full information maximum likelihood (FIML) using the Manski and Lerman (1977) weighted-exogenous-sample maximum likelihood (WESML) estimator to correct for choice-based sampling (Greene 2000). The WESML estimator requires that the true population proportions be known. If p_0, p_1, and p_2 are the sample proportions and ω_0, ω_1, and ω_2 are the true population proportions corresponding to the three alternatives, then the estimator is obtained by maximizing the weighted log-likelihood

$$\log L = \sum_{i=1}^{n} w_i \log F(q_i \beta' x_i) \qquad [4]$$

where

$$w_i = y_{io}(\omega_0 / p_0) + y_{i1}(\omega_1 / p_1) + y_{i2}(\omega_2 / p_2) \qquad [5]$$

The results of the multinomial logit model are presented in the Appendix, *Table A*.

4.3.2 Second-Step Estimation: General Least Squares

In the second stage, we estimate the following equations by general least squares (GLS):

$$\begin{aligned} &\text{a) } \textit{Number of income sources}_i = \beta_1 X_i + \beta_2 \textit{property}_{ij} + \beta_3 Z_i + \beta_4 A + \varepsilon_i \\ &\text{b) } \textit{Diversification Index}_i = \beta_1 X_i + \beta_2 \textit{property}_{ij} + \beta_3 Z_i + \beta_4 A + \nu_i \end{aligned} \qquad [6]$$

where $i = 1 \ldots N$ households, j = head, spouse, X_i is a vector of individual characteristics, $\textit{property}_{ij}$ is the value of exogenously acquired property owned by the head and spouse, and Z_i and A are a vector of household and community characteristics, respectively. Since land ownership could be endogenous to income diversification, i.e., households that have diversified could have purchased more land, only land that was inherited or acquired through the chief or acquired as a gift is included in the land

ownership variable. The dependent variables are the number of income sources and the inverse of the Herfindahl index of diversification. Both models are estimated separately for male-headed and female-headed households.[6]

[*Third model to be added*]

5. Descriptive Statistics

The analysis in this paper is based on a sample size of 398 households, 32 percent of which are female-headed. Households participate in at most six different income-generating activities (Table 2).[7] Disaggregating the income sources by headship status shows that more than 60 percent of female-headed households rely on only two sources of income and less than five percent participate in more than four activities. Male-headed households, by contrast, participate in a greater number of income generating activities. The number of household income sources is a function of household labor supply; female headed households tend to be labor constrained as they lack the presence of an adult spouse, which explains why they participate in relatively fewer activities. However, the diversification index is only 1.62 and 1.69, which suggests that on average, there is no significant difference between male and female-headed households, respectively. The index takes into account both the number of activities as well as the income share from each activity; the relatively low diversification index suggests that income shares are not well distributed across the various activities.

This is borne out from Table 3 which shows that only two activities, production of local maize and off-farm self employment, contribute to almost 50 percent of total household income across the entire sample. Looking at the average income share,

[6] For female-headed households, the equations include only the value of property owned by the head.
[7] We defined 7 income-generating activities, but no household participates in all 7 activities.

female-headed households show a higher dependency on own food production (food crops, vegetables and local maize) and correspondingly, a lower dependency on off farm self-employment as compared to male-headed households. Even though 37 percent of female heads participate in off-farm activities, its contribution to total household income is less than 20 percent.

There could be several explanations for this. First, female-headed households are generally poorer than male-headed households and this is true in Malawi as well (Swaminathan 2003, Diagne and Zeller 2001). Reardon (1997) found a strong and positive association between the share of nonfarm income and total household income in Africa. The nonfarm sector in Africa is unique because it has '*distributionally regressive effects on income'* according to Barrett *et al.* (2001, pg 324). It has also been found that female-operated enterprises usually involve low investment, have low returns and are operated for only part of the year (Tellegen 1997, Simler 1994). Entry into high-return activities requires liquidity, capital investments and a minimum level of skills. It is also interesting to note that less than five percent of female-headed households participate in cash crop production which is related to a sexual division of labor that generally assigns cash crop production to men and subsistence crop production to women (Darity 1995, Udry 1996). Livestock income is surprisingly very low for both types of households.

Figure 1 further explores these patterns of diversification by disaggregating them along the income distribution; quartile 1 represents the poorest households while quartile 4 represents the richest. Certain patterns of diversification are striking. Irrespective of headship status, the wealthiest households place a high reliance on off-farm self employment activities. This substantiates the argument that off-farm self employment and total household income are positively correlated. Interestingly enough, there do not

seem to be gender-related entry barriers for the richest households. The poorest male-headed households show the highest reliance on income from wage/contract labor. Wage labor (*ganyu*) yield low returns, is considered as distress labor, and is usually undertaken only by the poorest households (Gladwin *et al.* 2001). With the exception of the wealthiest households, food crop production (food, vegetables and maize) remains important for all other households but especially for female-headed households.

Turning now to the distribution of land and house ownership across the households, we see that 26 percent of women (spouses) in male-headed households own some land.[8] This could possibly be due to the matrilineal system of inheritance prevalent in the Southern part of the country, which accounts for the location of 25 percent of the current sample. Another explanation is the potential confusion between 'access' and 'ownership'. Women in sub-Saharan have access to land, which they can use for agriculture, but this does not confer the rights to engage in transactions involving that property.[9] Ngwira (2003) found that even in patrilineal systems, about 68 percent of widows in Malawi said they owned land. The author suggests that women perceive themselves as owning land and do not distinguish between access rights and ownership rights. However, for women in male-headed households, the average land area is only 0.8 acres (versus 2.8 acres for men) at an average value of 722 Mk (versus 1,897 Mk for men).[10] The average land area is almost three acres for female heads; this could be due to women inheriting land after the death of their spouse. In patrilineal societies, women retain entitlements to their husbands land if they have children, do not remarry and remain in the matrimonial home (Ngwira 2003).

[8] This is land that was acquired through inheritance, the chief or received as a gift.
[9] Unfortunately, the questionnaire does not differentiate between access and ownership, which could potentially account for the rather high percent of women in male and female-headed households owning some land.
[10] One Malawi Kwacha (Mk) = 15 US dollar at the time of the survey.

House ownership, on the other hand, is extremely low. There could be several explanations for this. First, housing in some instances is a temporary structure and not necessarily perceived as a valuable asset. Second, it is land that is usually inherited and individuals construct their own house; hence, it is not captured in this study's definition of exogenously acquired. It is also possible that the house is not considered as separate from the land and is accounted for in the value of land owned.

6. Results

The summary statistics of the variables used in the OLS models are presented in Tables 5a and 5b. The models are estimated separately by headship status for both the measures of diversification; the dependent variables are the number of income sources and the inverse of the Herfindahl index of diversification. The key variables of interest for this paper are the value of exogenous land owned by (women) spouses in male-headed households and the value of land owned by female heads. Accordingly, the discussion of results will focus mainly on these variables.

Number of income sources: for the male-headed households, the value of property owned by the head and spouse is strongly significant although the coefficient estimates are very small (Table 6a).[11] This implies that men owning property contributes to an increase in the number of income generating activities, while women owning property contributes to greater specialization within the household. The result of women's property ownership is somewhat puzzling, as greater property ownership was expected to contribute to greater diversification. It is possible that women's property ownership affects their individual diversification patterns, which we are unable to tease out in the current model. We do not know what percent of women participate in wage labor; it is

[11] Since very few households own housing, the value of the house was added to the value of land owned to form a single variable.

likely that with higher property ownership, they will move away from low remunerative activities and specialize in a smaller number of high return activities like self-employment. It could also reflect women's time constraints as they are also responsible for other non-market production like domestic work and child care.[12]

The model also controls for other individual, household and community level variables. As expected, access to credit is positive and significant implying that easing liquidity constraints help households to diversify. Amount of land owned by the household also increases the number of income generating sources that the household participates in. This is to be expected because almost all the activities defined as income generating are tied to agriculture; cash and subsistence cropping, livestock and off farm self-employment. Agriculture-related activities like beer brewing and produce selling dominate the off-farm self employment sector in Malawi, and hence, is also tied to the availability of land. Households with a history of more than just subsistence production (as indicated by the household growing tobacco in previous years) participate in a greater number of income generating activities. Good market access is also contributing to diversification (Barrett *et al.* 2004). Since a number of income generating activities are closely linked to agriculture, rainfall has a positive impact on diversification.

For female-headed households, individual property ownership does not affect household diversification. It is possible that the effect of their property ownership is being picked up by household land area; female heads own 2.9 acres of land (exogenous) while total household land area is 3.2. Correspondingly, the value of the land owned by the female head (1,840 Mk) and the household is also positively correlated (2,066 Mk). Livestock ownership has a negative effect.

[12] Information on time use is available in the data set and will be its effects will be explored in future work.

Access to credit and total land area owned, similar to male-headed households, are significant and positive. In fact, land area owned by the household has a higher coefficient estimate, reflecting perhaps that as heads they can now access agricultural inputs, which would help diversification in the agricultural sector. Households in the north and central part of the country participate in a greater number of income generating activities as compared to households in the south. This is consistent with a USAID (1999) report that finds that off-farm activity has a greater contribution to total income in the south than in the north or central regions of Malawi. The southern region is more densely populated, which is likely to put pressure on the limited agricultural land available and force people to seek employment opportunities outside the farm sector to supplement their household income.

Index of diversification: the OLS models of the index of diversification, for male-headed households, show similar patterns as the number of income sources model. The overall model fit (as indicated by the adjusted R square and the F statistic) is not as strong the as the previous models and there are fewer significant variables. This is likely because the dependent variable has more noise as it constructed using income from various activities. The number of income sources is a relatively cleaner measure of diversification than the Herfindahl index, but at the same time is also less nuanced. The property ownership variables, although estimated less precisely, show the same effect on the index of diversification as the number of sources of income generating activities.

The results for the diversification index models for female-headed households are similar in that fewer variables are significant. However, the explanatory power of this

model with an adjusted R square of 0.321 is almost equivalent to the number of income sources model with an adjusted R square of 0.325.[13]

[*Additional results to be added*]

7 Conclusion

To be completed

[13] Some variables not only lose their significance, but also reverse their sign, indicating a change in direction of their effect on the dependent variable. This potentially raises concerns about the stability of the model, which will be addressed in future work.

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Table 1: Demographic characteristics of sample households in rural Malawi, DRD/IFPRI survey

Characteristics	Household type		
	Male-headed		Female-headed
	Men	Women	
Age	40.2	33.5	44.6
Total household size	4.4		4.6
Number of children between:			
0 to 5 years of age	0.71		0.85
6 to 10 years of age	0.68		0.91
11 to 17 years of age	0.81		1.16
Number of adult males (aged greater than 17 and less than 64)	1.14		0.33
Number of adult females (aged greater than 17 and less than 64)	1.08		1.342
Dependent population (aged less than 15 and greater than 64)	1.98		2.68
Total land area owned by household (acres)	4.3		3.3
Value of land owned by household (Mk)	3,506		2,066
Value of livestock owned by household (Mk)	1,945		2,439
Value of other assets owned by household (Mk)	2,776		1,004
Number of observations	291		107

Source: Based on own calculations from DRD/IFPRI Rural Finance Survey.
15 Malawi Kwacha (Mk) = 1 US $ at the time of survey.

Table 2: Distribution of households by number of income sources

Diversification	Male-headed	Female-headed
Income Sources (No.)		
1	14.95	7.09
2	32.23	56.62
3	29.35	15.76
4	14.87	16.79
5	5.23	3.59
6	3.38	0.16
Diversification Index	1.62	1.69
Number of Observations	291	107

Source: Based on own calculations from DRD/IFPRI Rural Finance Survey
Tested for the difference in means for the diversification index.

Table 3: Patterns of income diversification

Income shares	All		Male-headed		Female-headed	
	AIS	Use	AIS	Use	AIS	Use
Cash crops	.027	10.8	.031	13.7	.018	4.7
Local maize	.226	49.5	.205	47.9	.271*	52.9
Hybrid maize	.131	51.8	.125	52.3	.143	50.8
Food crops and vegetables	.187	55.3	.148	51.5	.267***	63.0
Off-farm self-employment	.267	43.9	.300	47.1	.199**	37.4
Wage/contract	.161	45.5	.190	47.7	.102***	40.9
Livestock	.010	10.2	.002	13.2	.000	4.0
Number of Observations	398		291		107	

AIS = Average income share
Use = Percent of households earning income from that source
Tested for the difference in means between male-headed and female-headed households.
*, **, *** represent significance at 10%, 5%, and 1%, respectively

Figure 1. Income shares by source and income quartile

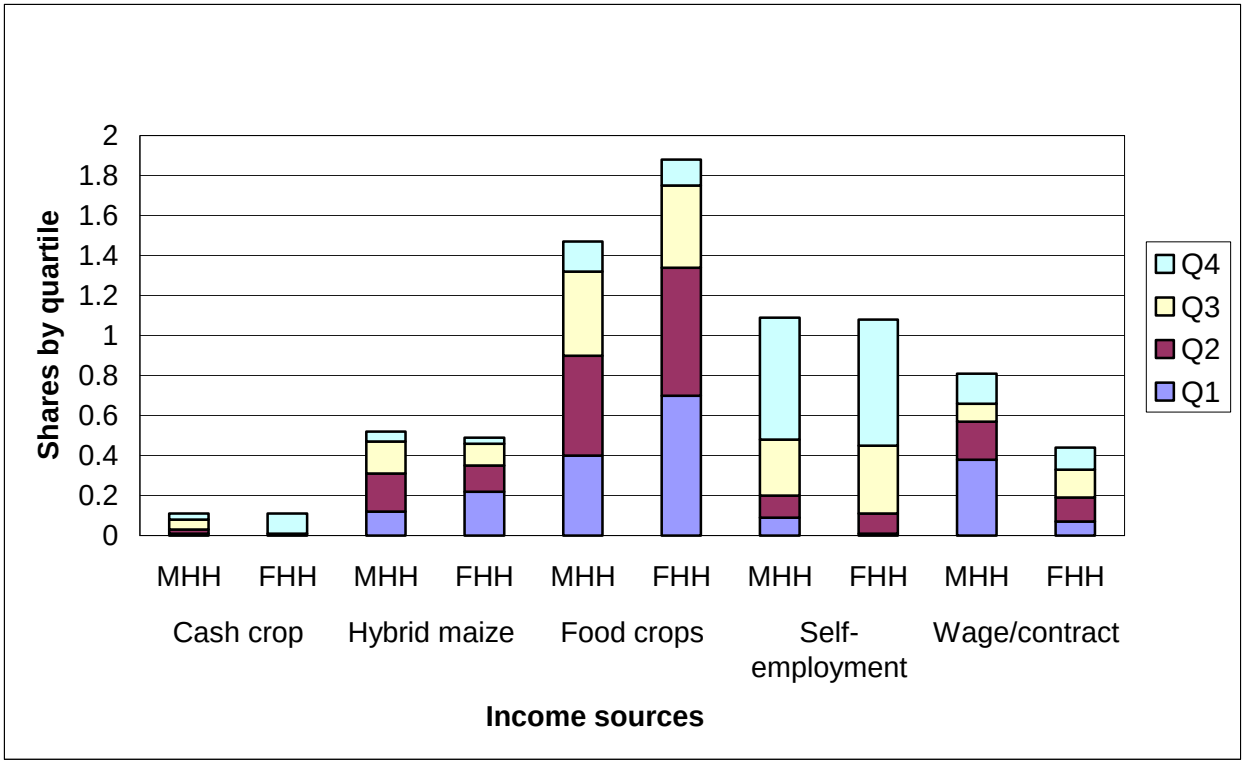

Table 4: Percent of households owning land and house[a]

	Land ownership	House ownership
MHH	75.32	3.34
FHH	94.50	7.37
Spouse in MHH	26.01	0.72

a: Land acquired through inheritance, through the chief or as a gift.
MHH = Male-headed Households; FHH = Female-headed Households

Table 5a: Means and standard deviations of variables used in the ordinary least squares regression for male-headed households

Variable Definitions	Mean	Standard deviation
Dependent Variables		
Number of income sources	2.73	1.19
Diversification index	1.62	0.60
Individual-level variables		
Age of male head	40.27	14.56
Age of spouse	33.50	12.58
Head attended primary school dummy variable	0.73	0.43
Spouse attended primary school dummy variable	0.51	0.48
Household-level variables		
Number of male adults	1.14	0.42
Number of female adults	1.08	0.52
Dependent population (household members aged less than 15 and over 64)	1.99	1.62
Remittances received dummy variable	0.59	0.48
Access to credit	0.71	0.44
Value of livestock owned by household (Mk)	1945	7214.17
Value of other asset owned by household (does not include land and livestock) (Mk)	2776	4392.15
Total land area owned by household (acres)	4.33	3.05
Household grew tobacco before 1994	0.05	0.20
Land ownership variables		
Value of exogenous land and house owned by spouse (Mk)	724	3792.73
Value of exogenous land and house owned by head (Mk)	1930	3641.49
Community-level variables		
Distance to bus stage	5.32	4.05
Village has a market place dummy variable	0.44	0.48
92/93 duration of effective rainfall season	158.84	7.75
93/94 duration of effective rainfall season	157.43	17.23
Location (region) dummy variables		
North	0.06	0.23
Central	0.59	0.47
South	0.35	0.46

All statistics are weighted using household sampling weights.
All asset values are in Malawi Kwacha (Mk): 15 Mk = 1 US $ at the time of survey.

Table 5b: Means and standard deviations of variables used in the ordinary least squares regression, female-headed households

Variable Definitions	Mean	Standard deviation
Dependent Variables		
Number of income sources	2.54	1.08
Diversification index	1.69	0.65
Individual-level variables		
Age of head	44.56	16.98
Head attended primary school dummy variable	0.62	0.54
Household-level variables		
Number of male adults	0.33	0.60
Number of female adults	1.34	0.58
Dependent population (household members aged less than 15 and over 64)	2.68	2.11
Remittances received dummy variable	0.69	0.51
Access to credit	0.61	0.54
Value of livestock owned by household (Mk)	2439	14504.39
Value of other asset owned by household (does not include land and livestock) (Mk)	1005	1767.67
Total land area owned by household (acres)	3.32	3.18
Household grew tobacco before 1994	0.02	0.15
Land ownership variables		
Value of exogenous land and house owned by head (Mk)	1871	3007.92
Community-level variables		
Distance to bus stage	6.34	5.38
Village has a market place dummy variable	0.41	0.54
92/93 duration of effective rainfall season	160.22	7.88
93/94 duration of effective rainfall season	158.98	18.89
Location (region) dummy variables		
North	0.03	0.20
Central	0.67	0.52
South	0.30	0.51

All statistics are weighted using household sampling weights.
All asset values are in Malawi Kwacha (Mk): 15 Mk = 1 US $ at the time of survey.

Table 6a: Effect of individual property ownership on number of income sources in male-headed households: ordinary least squares

Variables	Coefficient	t-statistic
Dependent variable: number of income sources		
Constant	-2.373	-1.244
Individual-level variables		
Age of head	0.037	1.180
Age of head squared	-0.0005	-1.593
Age of spouse	0.002	0.210
Primary education of head	0.098	0.621
Primary education of spouse	-0.002	-0.171
Household-level variables		
Number of adult females in household	0.073	0.659
Number of adult males in household	0.011	0.115
Dependent population (household members aged less than 15 and over 64)	0.029	0.783
Remittances received dummy variable	-0.124	-.952
Household has access to credit dummy variable	0.349	1.991**
Value of livestock owned by household (Mk)	0.000008	-0.983
Value of other asset owned by household (does not include land and livestock) (Mk)	0.000006	0.764
Total land area owned by household (acres)	0.078	3.878***
Household grew tobacco before 1994	0.384	1.883*
Land ownership variables		
Value of exogenous land and house owned by spouse	-0.00005	-3.248***
Value of exogenous land and house owned by head	0.00004	2.538**
Community-level variables		
Distance to bus stage	0.019	1.081
Village has a market place dummy variable	0.474	1.701*
92/93 duration of effective rainfall season	0.008	0.684
93/94 duration of effective rainfall season	0.012	2.045**
Location (region) dummy variables[a]		
North	0.290	0.994
Central	0.478	2.352**
Adjusted R-squared	0.265	
F Test	5.75	
Number of observations	291	

Asset values are in Malawi Kwacha (MK): 15 MK = 1 US $ at the time of survey
a: South is the omitted region
*, **, *** represent significance at 10%, 5%, and 1%, respectively

Table 6b: Effect of individual property ownership on number of income sources in female-headed households: ordinary least squares

Independent variables	Coefficient	t-statistic
Dependent variable: number of income sources		
Constant	-1.260	-0.385
Individual-level variables		
Age of head of household	-0.074	-2.043**
Age of head of household squared	0.0007	1.866*
Primary education of head	0.177	0.714
Household-level variables		
Number of adult females in household	-0.219	-1.561
Number of adult males in household	0.127	0.927
Dependent population (household members aged less than 15 and over 64)	0.147	2.529**
Remittances received dummy variable	0.170	0.812
Household has access to credit dummy variable	0.572	2.703***
Value of livestock owned by household (Mk)	-0.00005	-3.823***
Value of other asset owned by household (does not include land and livestock) (Mk)	-0.00005	-1.3633
Total land area owned by household (acres)	0.179	5.030***
Household grew tobacco before 1994	1.044	1.883*
Land ownership variables		
Value of exogenous land and house owned by head	-.00002	-0.578
Community-level variables		
Distance to bus stage	-0.012	-0.275
Village has a market place dummy variable	1.346	2.261**
92/93 duration of effective rainfall season	0.004	02.37
93/94 duration of effective rainfall season	0.017	1.198
Location (region) dummy variables[a]		
North	0.863	1.978**
Central	0.801	1.868*
Adjusted R-squared	0.325	
F Test	3.69	

Number of observations	107

Asset values are in Malawi Kwacha (MK): 15 MK = 1 US $ at the time of survey
a: South is the omitted region
*, **, *** represent significance at 10%, 5%, and 1%, respectively

Table 7a: Effect of individual property ownership on the diversification index in male-headed households: ordinary least squares

Independent variables	Coefficient	t-statistic
Dependent variable: index of diversification		
Constant	1.412	1.232
Individual-level variables		
Age of head of household	0.002	0.110
Age of head of household squared	-0.00002	-0.124
Age of spouse	0.0007	0.106
Primary education of head	0.102	1.074
Primary education of spouse	-0.0003	-0.045
Household-level variables		
Number of adult females in household	-0.028	-0.424
Number of adult males in household	-0.065	-1.116
Dependent population (household members aged less than 15 and over 64)	-0.009	-0.399
Remittances received dummy variable	-0.042	-0.535
Household has access to credit dummy variable	0.066	0.628
Value of livestock owned by household (Mk)	-0.000005	-1.008
Value of other asset owned by household (does not include land and livestock) (Mk)	-0.00001	-2.111**
Total land area owned by household (acres)	0.016	1.358
Household grew tobacco before 1994	-0.121	-0.985
Land ownership variables		
Value of exogenous land and house owned by spouse	-0.00002	-2.477**
Value of exogenous land and house owned by head	0.00002	1.681*
Community-level variables		
Distance to bus stage	0.004	0.422
Village has a market place dummy variable	-0.179	-1.069
92/93 duration of effective rainfall season	0.0009	0.130
93/94 duration of effective rainfall season	-0.0003	-0.083
Location (region) dummy variables[a]		
North	0.212	1.206
Central	0.236	1.931*
Adjusted R-squared	0.121	
F Test	2.82	
Number of observations	291	

Asset values are in Malawi Kwacha (MK): 15 MK = 1 US $ at the time of survey
a: South is the omitted region
*, **, *** represent significance at 10%, 5%, and 1%, respectively

Table 7b: Effect of individual property ownership on the diversification index in female-headed households: ordinary least squares

Independent variables	Coefficient	t-statistic
Dependent variable: index of diversification		
Constant	1.026	0.518
Individual-level variables		
Age of head of household	-0.058	-2.658***
Age of head of household squared	0.0006	2.524**
Primary education of head	0.254	1.690*
Household-level variables		
Number of adult females in household	-0.088	-1.033
Number of adult males in household	0.124	1.494
Dependent population (household members aged less than 15 and over 64)	0.049	1.395
Remittances received dummy variable	-0.137	-1.082
Household has access to credit dummy variable	0.144	1.128
Value of livestock owned by household (Mk)	-0.00002	-2.441**
Value of other asset owned by household (does not include land and livestock) (Mk)	-0.00003	-1.255
Total land area owned by household (acres)	0.055	2.533**
Household grew tobacco before 1994	1.208	3.601***
Land ownership variables		
Value of exogenous land and house owned by head	-0.000008	-0.516
Community-level variables		
Distance to bus stage	-0.006	-0.237
Village has a market place dummy variable	0.085	0.235
92/93 duration of effective rainfall season	0.004	0.409
93/94 duration of effective rainfall season	0.003	0.400
Location (region) dummy variables[a]		
North	0.266	1.010
Central	0.418	1.611
Adjusted R-squared	0.321	
F Test	3.64	
Number of observations	107	

Asset values are in Malawi Kwacha (MK): 15 MK = 1 US $ at the time of survey
a: South is the omitted region
*, **, *** represent significance at 10%, 5%, and 1%, respectively

Appendix

Table A: Results of the multinomial logit model for predicting probability choices for the household, corrected for choice-based sampling (weighted-exogenous-sample maximum likelihood estimates)

Independent variables	Marginal effects for membership status of the household		
	Never	**Current**	**Past**
Constant	3.300***	-2.526***	-0.774***
	(10.146)	-(8.172)	-(4.630)
Age of household head	-0.050***	0.044***	0.0050
	-(5.156)	(4.479)	(1.028)
(Age of household head)^2	0.001***	-0.0004***	-0.0001
	(4.962)	-(4.201)	-(1.133)
Male-headed household (dummy variable)	-0.037	-0.018	0.055*
	-(0.812)	-(0.407)	(1.823)
Head attended primary school (dummy variable)	-0.010	0.036	-0.025
	-(0.207)	(0.731)	-(0.971)
Total adult population in the household (15 to 64 years of age)	-0.085***	0.070***	0.014
	-(4.352)	(3.927)	(1.332)
Dependency ratio (household members aged less than 15 and over 64 divided by total household size)	-0.552***	0.418***	0.134**
	-(5.641)	(4.291)	(2.444)
Share of agricultural land of total land owned	-0.264**	0.280***	-0.017
	-(2.285)	(2.608)	-(0.236)
Log (total value of assets owned by household)	-0.160***	0.140***	0.020
	-(6.318)	(5.919)	(1.451)
Share of value of livestock of total value of assets owned	0.678***	-0.767***	0.089
	(4.277)	-(5.254)	(1.175)
Share of value of land of total value of assets owned	-0.060	-0.095	0.155***
	-(0.602)	-(1.027)	(2.988)
Number of observations		403	

t statistics are presented in parentheses. *, **, *** represent significance at 10%, 5% and 1%, respectively.

Table A: Results of the multinomial logit model for predicting probability choices for the household, corrected for choice-based sampling (weighted-exogenous-sample maximum likelihood estimates) continued

Independent variables	Marginal effects for membership status of the household		
	Never	**Current**	**Past**
Location (district) dummy variables[a]			
Dedza	0.121*	-0.088	0.209***
	-(1.823)	-(1.394)	(5.195)
Dowa	-0.057	-0.108	0.166***
	-(0.767)	-(1.549)	(3.742)
Nkhotakota	-0.188**	0.036	0.153***
	-(2.537)	(0.523)	(3.447)
Rumphi	0.029	-0.125*	0.096**
	(0.406)	-(1.923)	(2.014)
Log likelihood function		-652.947	
Restricted log likelihood		-796.262	
Likelihood ratio statistic (χ^2)		286.631	
P value		0.0000	
Likelihood ratio index (McFadden's pseudo R^2)		0.18	
Number of observations		403	

a: Mangochi is omitted district; t statistics are presented in parentheses.

*, **, *** represent significance at 10%, 5% and 1%, respectively.