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Diversification, climate risk and vulnerability to poverty in rural Malawi

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Executive summary

This brief summarises the results of a recent analysis of a nationally representative farm household survey in Malawi¹ linked with climate data to assess the impact of climate variability on farm household welfare, the patterns of diversification farmers adopt, and how different policy factors such as fertilizer subsidies, extension services and credit can affect diversification choices and ultimately welfare patterns. We look closely at three main factors that can affect both diversification choices and subsequent impacts on household welfare. First, “push” factors, such as high climate variability make farming a risky business, and can lead farmers to diversify in order to reduce that risk. However, this may lead to lower, though more stable, welfare levels. On the other hand, “pull” factors, such as greater education or wealth, enable households to take advantage of a wider range of opportunities not available to the less wealthy or poorly educated. These “pull” factors should increase welfare, but do not necessarily create greater stability. Finally, we look at the institutional context within which households are situated to evaluate how it impacts both diversification choices and resulting welfare outcomes.

Introduction

Malawi is ranked as one of the twelve countries in the world most vulnerable to the adverse effects of climate change (World Bank 2010), and subsistence farmers suffer from climate related stressors in a number of different ways. These include increased exposure to extreme climate events such as droughts, dry spells and floods. According to the Intergovernmental Panel on Climate Change (IPCC),

increased variability in climate patterns, including increased intensity and frequency of extreme events, is already occurring in many areas of the world, with particularly negative impacts on rainfed agriculture and the populations that depend upon it for food security. Malawi is especially at risk, with agriculture employing over 85 percent of the population, and a majority farming less than one hectare under rainfed

HIGHLIGHTS – KEY RESULTS

- Household welfare is lower in environments with greater climate risk.
- Access to extension, credit and access to fertilizer subsidies all increase household welfare.
- Availability of fertilizer subsidies, in addition to increasing expected consumption also lowers income variability, indicating that households that have access to fertilizer subsidies are less vulnerable to poverty.
- Availability of agricultural extension and credit increase mean consumption, but are also correlated with higher variability of consumption. The latter implies there is scope to restructure or augment these services to reduce vulnerability. Households with greater wealth have a greater level of diversification.
- Labour, cropland and income diversification is higher in environments with greater climate risk.
- Diversification is a positive response to opportunity, rather than a negative response to constraints imposed on the household.
- Labour diversification is greater with males but lower with females when the head of the household is a man.

¹ Socio-economic data from Malawi Third Integrated Household Survey (IHS3), 2010/11.

conditions. Understanding the impacts of climate variability on smallholder production and welfare, and developing strategies to support farmers' capacity to cope with the challenge is thus a key concern for the country's agricultural policy-makers.



Diversification, including expanding the number and types of crops grown, sources of agricultural income (e.g. livestock, fishing), or sources of household income (e.g. increasing off-farm labour income) is often considered a key strategy for dealing with climate risks. However, the effectiveness of diversification as a coping strategy is variable; in some cases it can lead to reduced incomes and increased vulnerability to poverty while other forms may increase incomes and reduce vulnerability. Understanding the drivers and impacts of diversification on household welfare under increasing exposure to climate risk is important for developing effective policy responses.

Climate variability in Malawi – recent trends

We analyse climate variability trends in Malawi using time series indicators of historical rainfall and temperature at the highest resolution and for longest time period available.

In the analysis of diversification and risk coping in Malawi, we develop indicators of long-term climate trends, as well as short-term shock related variables. For the former we focus on long-term mean rainfall, estimated at 850 mm per year, as well as the coefficient of variation of rainfall over the 1983–2010 period, which corresponds to 0.21.

With regard to short-term climate variables, we construct a measure of rainfall anomaly which represents the deviation of the rainfall for the year 2009–10 from its long-term average (1983–2010). The anomaly is computed as the difference between the total amount of rainfall in the 2009–10 rainy season and the long-term rainy season average rainfall, divided by the latter. Its mean value is -0.086.

In Figure 1a and 1b we show the distribution of mean rainfall and its variability across Malawi's Enumeration Areas (EAs). They indicate that the southern region has both lower mean rainfall and higher variability in rainfall.

Figure 1a. Mean rainfall 1983–2010 (mm/year)

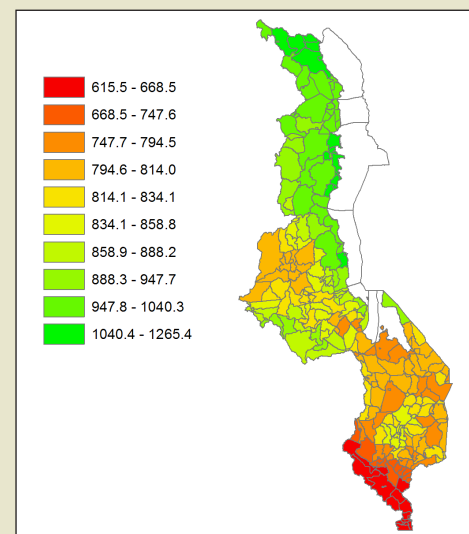
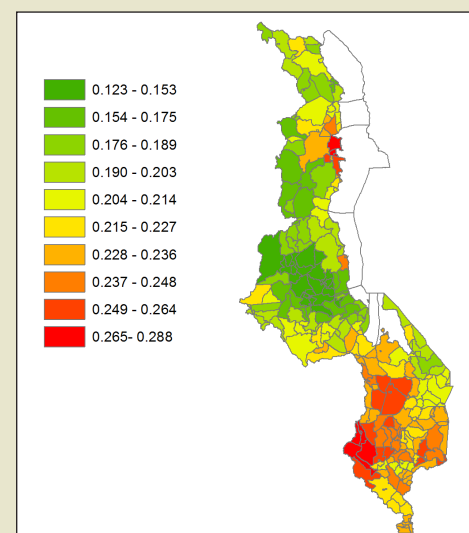


Figure 1b. Coefficient of variation of rainfall 1983–2010



Measuring diversification and welfare in the Malawi smallholder farm sector

Measures of diversification

In the Malawian context diversification can take place within the farming sector (diversifying into different crops, livestock, natural resource related activities or working on other farms) and/or in the non-farm sector (diversifying into non-farming activities such as wage employment, self-employment, transfers and rents). The Margalef index has been computed to measure household livelihood diversification for labour, cropland and income.

Labour diversification involves farmers allocating labour to non-farm activities, including both wage labour and self-employment in household enterprises. Labour diversification indices are calculated separately for men and women.

Cropland diversification involves farmers choosing a combination of crops depending on the amount and type of land under cultivation. For example, they may choose to grow different crops

on different parcels of land in order to minimize the effect of biotic or abiotic stresses, or to better exploit different agro-ecological features of their land.

Income diversification is measured by assessing the share of farm income derived from nine different possible sources, ranging from crops, fishing and livestock, to off-farm labour and transfers (including remittances and government payments such as cash transfers).

Figures 2a, 2b and 2c indicate the distribution of labour, cropland and income diversification patterns across Malawian EAs using the Margalef Index. Labour diversification does not show a clear pattern across Malawi, whereas cropland and income diversification are higher in the central-south, but income diversification is particularly low in the southernmost part of the country.

Figure 2a. Labour diversification

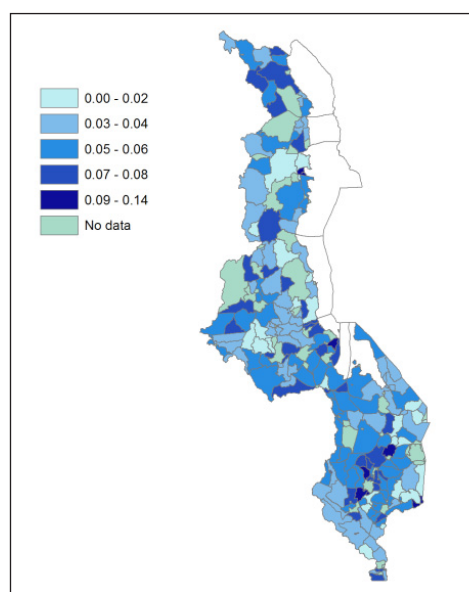


Figure 2b. Cropland diversification

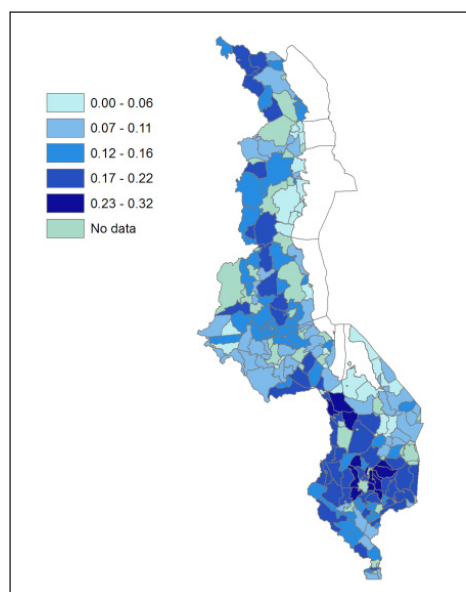
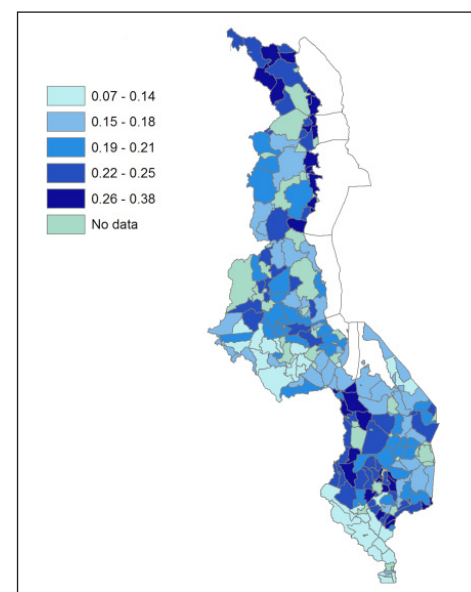


Figure 2c. Income diversification



Measures of welfare

To measure welfare we try to go beyond the traditional indicators of household income and consumption to gain a better understanding of the stability and structural nature of household income. We calculate the expected level of consumption and its variability in the current year. These two measures allow us to understand the degree to which

the household is vulnerable to falling into poverty in the future and to experiencing major shifts in consumption levels in the current period. They also give us a deeper assessment of the relationship between climate risk, diversification and welfare in both the short and long term.

Results

Effects of climate variability on consumption per capita and vulnerability to poverty

- Consumption per capita is lower in environments with greater long-term climate variability (i.e. coefficient of variation of rainfall), but vulnerability is also lower. It is important to note that lower, but more stable, consumption is consistent with households actively pursuing strategies to reduce risk, even if such strategies have a negative impact on mean consumption.
- Higher long-term mean rainfall is associated with higher per capita consumption.
- The greater the deviation from long-term average rainfall patterns experienced in the last season, the more consumption per capita is reduced and vulnerability to poverty increased. This supports the notion

that households cannot adequately cope with shocks in the current period.

- In general, those with greater household wealth have higher consumption levels and are less vulnerable to poverty, as expected.
- Access to institutions such as extension, credit and fertilizer subsidies all increase per capita consumption. Access to fertilizer subsidies also reduces vulnerability to poverty.

Determinants of diversification and the role of climate variability

- Labour, cropland and income diversification is higher in environments with greater long-term climate variability, indicating that unreliable rainfall is a “push” factor for these indices.
- Higher long-term mean rainfall

- is also associated with greater diversification of income, but not for labour or cropland diversification. This indicates that more favorable average rainfall conditions are a “pull” factor that enables households to secure income from a wider range of sources.
- Those with greater household wealth in terms of cropland, agricultural assets and education have greater levels of diversification, indicating that these are “pull” factors.
- Access to institutions such as extension, credit and fertilizer subsidies leads to greater labour and income diversification.
- Access to extension increases all types of diversification acting as a “pull” factor, whereas fertilizer subsidies increase only cropland and income diversification. On the other hand, credit availability leads to

- higher diversification in labour.
- Looking at differences across gender, when the head of household is male, we find higher male labour diversification, but lower female labour diversification.
- Household size strongly increases female labour diversification, indicating that women's labour supply off-farm is more constrained by availability of household labour.

Relationship between diversification and measures of household welfare

- The correlation between all three measures of diversification and consumption per capita is positive, indicating that, overall, diversification is a positive response to opportunity, rather than a negative response to constraints imposed on the household.
- Diversification due to “push” factors leads to lower, but more stable, welfare outcomes.
- Higher long-term climate variability increases diversification, but also leads to lower, though more stable, consumption.
- Diversification due to “pull” factors should increase welfare measures, and the finding of a positive impact of household capital and access to services on both diversification and consumption per capita are consistent with this hypothesis.
- Income diversification is also negatively correlated with long-term consumption variability, and thus clearly reduces levels of vulnerability to poverty.
- Labour and cropland diversification lead to higher current consumption with no impact on variability. Overall,

they still reduce vulnerability to poverty.

- Looking at differences across gender, the positive effect of diversification on expected consumption is significantly higher for male than female labour, suggesting that female labour diversification is less responsive than that of men.



Conclusion and recommendations

The evidence presented here suggests that income diversification is an effective means of coping with climate variability, since it is found to have the strongest positive impact on current consumption levels, as well as reducing vulnerability to falling into poverty in the future.

The results suggest that increasing access to extension services and fertilizer subsidies are likely to have the strongest positive effects on increasing income diversification.

While social safety net payments have limited or no impact on consumption per capita, current period shocks reduce diversification and consumption per capita and increase vulnerability to poverty in the future. This indicates that government social safety net programmes are not adequately addressing the consumption risks imposed by climate shocks. Thus, improved programme design is needed to address this issue.

Access to credit, which is relatively limited, does increase consumption per capita, but also decreases the stability of consumption – e.g. it

increases the variability of consumption and thus increases the risk of food insecurity. Access to credit also leads to greater labour diversity, but not to greater income diversity. Policies and programmes aimed at expanding the delivery of credit, as with extension, should explicitly incorporate the risks farmers face in order to expand income diversification opportunities without destabilizing incomes. Similarly, insurance and credit schemes need to take better account of household exposure to shocks and vulnerability.

Finally, looking at differences across gender, we found that women are less responsive to “pull” factors in diversifying labour than men, and thus we observe lower impacts on expected consumption per capita. There are two conclusions to be drawn from this: first gender differentiated analysis is important if we are to understand the full dynamics of diversification; and second we need to better understand the gender specific “push” and “pull” factors for diversification to design adequate policy responses.

ACKNOWLEDGEMENTS

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ABOUT EPIC

EPIC is a programme of the Food and Agriculture Organization of the United Nations (FAO). It supports countries in their transition to Climate-Smart Agriculture through sound socio-economic research and policy analysis on the interactions between agriculture, climate change and food security.

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