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Abstract: The predominance of rain-fed agricultural cultivation in Malawi, makes income and consumption to be highly seasonal for more than 80 percent of the population that largely derive their livelihoods from agriculture. Seasonality of livelihoods for the poor is bound to affect their consumption at particular times of the year, and therefore may be an important determinant of poverty. This study estimates a model of determinants of poverty in Malawi which take into account the seasonality by exploiting household data collected over several months in 2004/05. The study finds that seasonal dummies are significant in explaining poverty in Malawi, suggesting that seasonality should not be ignored in the estimates of poverty and poverty estimates that do not control for seasonality may be biased.

1. Introduction

Many agrarian economies are associated with seasonal patterns of income and consumption expenditure. Chambers (1982) notes that many poor people in developing countries live in tropical environments characterized by wet-dry seasonality with varying levels of incomes, food availability, incidence of disease and supply of and demand for labour. However, studies that model the determinants of poverty tend to ignore the issue of seasonality in the estimates of poverty although the household level data used in the analysis is collected over a long period of time, in some cases more than a year. There are some notable studies on determinants of poverty in some African countries that ignore seasonality (Grootaert, 1997; Geda et al., 1999; Gatt et al., 2000; Mukherjee and Benson, 2003; Okwi et al., 2007). Geda et al. (2005) while acknowledging that the data collection did not take into account seasonality, the do not control for seasonality in the estimation of the determinants of poverty in Kenya. There are, however, studies that recognize the role of seasonality in household welfare. For instance, Dercon and Krishnan (2000) use seasonal price indices and seasonal wages to capture seasonality and these proxies were highly

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significant with per capita consumption increasing in peak labour periods and decreasing in prices. Appleton (2002) using nationally representative survey in Uganda controls for the time of interview in regression models and find statistically significant in welfare and poverty functions. Similarly, Khandker (2009), controls for a season associated with food deprivation and find a negative and significant impact on welfare in Bangladesh.

Such seasonality in income and consumption expenditure are also expected in Malawi as an agrarian economy. The agricultural sector remains the important sector for livelihoods in rural Malawi. More than 80 percent of the population derive their livelihoods from agriculture. Agriculture also accounts for nearly 40 percent of gross domestic product, 80 percent of export earnings and is the main economic activity for 71 percent of the rural population. Agriculture in Malawi is largely rain-fed with less than 5 percent of the land under irrigation cultivation. According to NSO (2005), about 97 percent of households were engaged in rain-fed agricultural cultivation with only 36 percent engaging in dry-season (dimba) cultivation. Recent estimates of poverty reveal that about 52 percent of the population in Malawi lives below the poverty line. Poverty is largely a rural phenomenon; with 56 percent of the rural population compared with 25 percent of the urban population living below the poverty line (NSO, 2005).

Literature suggests that seasonality in consumption in agrarian economies is determined by seasonality in income opportunities and the absence of credit markets to facilitate consumption smoothing of the poor (Khandker, 2009). Nonetheless, the seasonality in consumption is determined by several factors. In Malawi, these factors include seasonal patterns in food stocks and incomes, reliance on seasonal labour markets, seasonal movements in food prices and seasonal patterns in asset prices. For instance, most rural households in Malawi tend to have adequate food stocks soon after harvest, and on average maize stocks from own production last five months after harvest. The food crisis for many households reaches the peak in the lean season, between January and March. The seasonality in availability of food stocks is also accompanied by the seasonality in maize prices, with maize prices rising sharply in lean periods, thereby adversely affecting the livelihoods of the poor during the lean season. Devereux (2009) notes during periods of food crises the poor cope by, *inter alia*, reducing portions of meals and consuming inferior and less expensive foods. These may result in reduced consumption expenditures and increase poverty and vulnerability.

Although, most of the income is seasonal in Malawi, previous studies on the determinants of poverty in Malawi, do not account for seasonality in their models (Mukherjee and Benson, 2003; GoM and World Bank, 2006). Ignoring seasonality in the estimates of poverty may lead to less efficient estimate of correlates of poverty and may lead to biased estimates of poverty. This study aims at investigating the importance of seasonality in the estimate of poverty in Malawi. The study exploits the 2004/05 integrated household survey that collected data over 13 months. The paper is organized as follows. The next section presents a review of economic reforms and resulting economic performance in Malawi. Section 3 presents the methodology and estimation techniques used in the study. The empirical evidence on the relationship between poverty and seasonality is presented in section 4. Section 5 presents concluding remarks and policy implications.

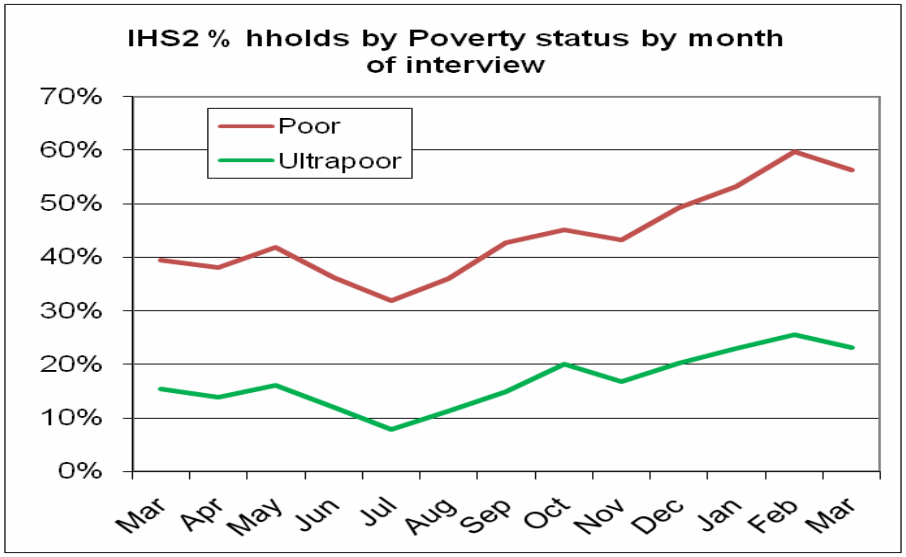
2. Seasonality and Poverty in Malawi

The seasonal nature of agricultural and agricultural-related incomes, which are dominant in the rural areas in Malawi, makes households vulnerable to seasonal variations in consumption and poverty. First, most smallholder farmers are subsistent farmers and produce maize mainly for their food requirements. However, studies show that about 57 percent of households in 2006 have inadequate food consumption. For instance, NSO (2005) find that 81 percent of the households who grew food crops in the 2004/05 agricultural season had run out of the staple food by December 2005. Most of these households that ran out of their own produced food rely on purchases from the markets to meet their food requirements. Food prices in Malawi are also highly seasonal and tend to be high during the lean season around January and February. Devereux (2009) present case study evidence that about 92 percent of households in Southern Malawi use food expenditure reducing strategies as coping mechanisms during food shortages.

Secondly, the poor are usually engaged in *ganyu* labour, partly as a coping strategy. Whiteside (2000) notes that *ganyu* is the most important coping strategy for most poor households in the crucial hungry period between food stores running out and the next harvest. *Ganyu* activities by households tend to intensify during the wet season, between November and February, thereby competing with own labour demand on own farm production (Devereux, 2009). Thirdly, the seasonality in consumption is also exacerbated by the lack of credit for consumption smoothing among rural households. Most households in Malawi do not have access to credit. Only 13 percent of households in 2004/05 received a loan (NSO, 2005). Zeller and Sharma (2000) observe that there are several ways in which access to or lack of financial services can influence income and food consumption (food security) of households. The first is through income generation in which access to credit provides additional capital to enhance the level of the household's existing human, physical and social capital so as to earn more income or by increasing the risk-bearing capacity of households by investing in more risky and more profitable income generating activities. Thus, access to financial services help the poor households diversify their sources of income and reduces their vulnerability to income shocks. Secondly, credit can directly be used to finance immediate consumption needs of the household. Households may stabilize their consumption in bad states of nature by adjusting their disposable income or liquidity through borrowing for consumption or borrowing for investment with the fungibility of credit the borrowed funds may be diverted to immediate consumption.

Data from the 2004/05 integrated household survey reveals seasonal patterns in the proportion of households that are poor. Figure 1 shows that households that were interviewed soon after harvest (during the peak marketing season in June and July) are less likely to be poor while those interviewed during the lean season (December – February) are likely to be poor. The pattern of ultra-poor is similar to that of the poor. This analysis shows that the date of interview matters, and poverty seem to be associated with seasonality in income sources. As noted during the period after harvest, the proportion of poor households tend to be low while during the lean season when most households experience food shortages the incidence of poverty tends to rise.

Figure 1 Poverty and Date of Interview, March 2004 – March 2005



The seasonal incidence of poverty is reinforced by the trends in household expenditures. Figure 2 illustrates the levels of household expenditures from March 2004 to March 2005 for aggregate annual expenditure, food expenditure and non-food expenditure. It is evident that median annual household expenditures for different categories show similar patterns, with higher median expenditures in the post-harvest period and lower expenditures during the lean agricultural season. Interestingly, the movement in total annual income is determined mainly by the movement in food consumption which is cyclical with own food availability.

Figure 2 Median Annual Household Expenditures, March 2004 – March 2005

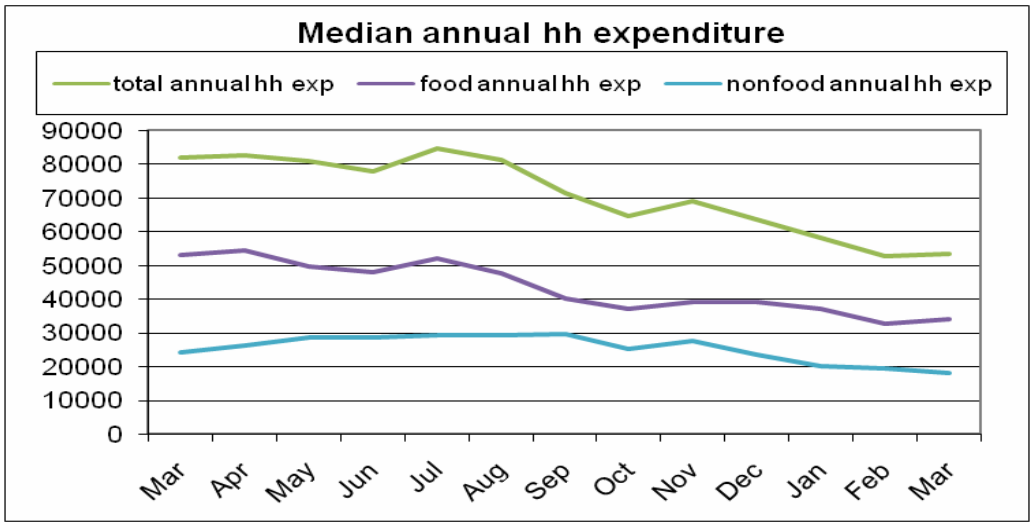
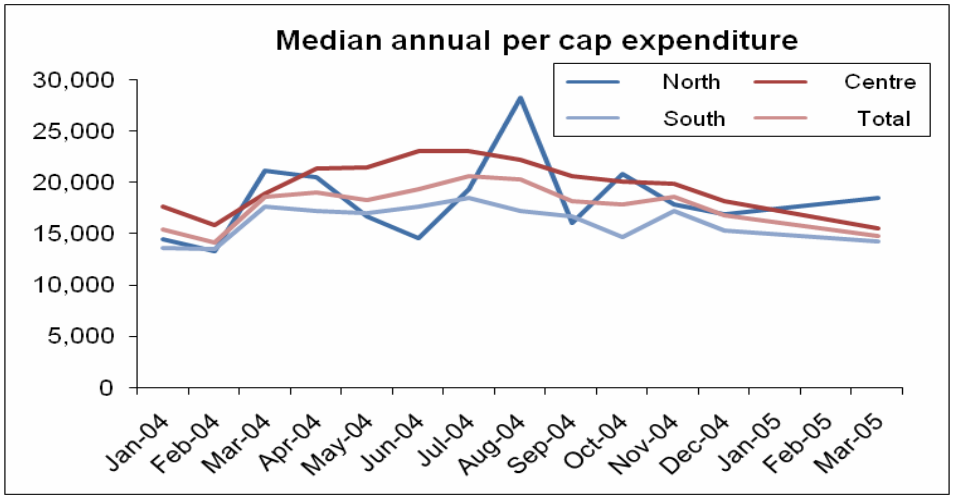


Figure 3 shows the median annual per capita expenditure by region in Malawi. Major swings in per capita expenditure are evident in the northern region. It appears households that were interviewed in July/August seem to have higher per capita expenditure in the northern region compared with other months. The central and southern regions do no display major swings although in all cases there median per

capita expenditures tend to be higher in the post harvest period than in the lean agricultural season.

Figure 3 Median Annual Per Capita Expenditure, January 2004 – March 2005

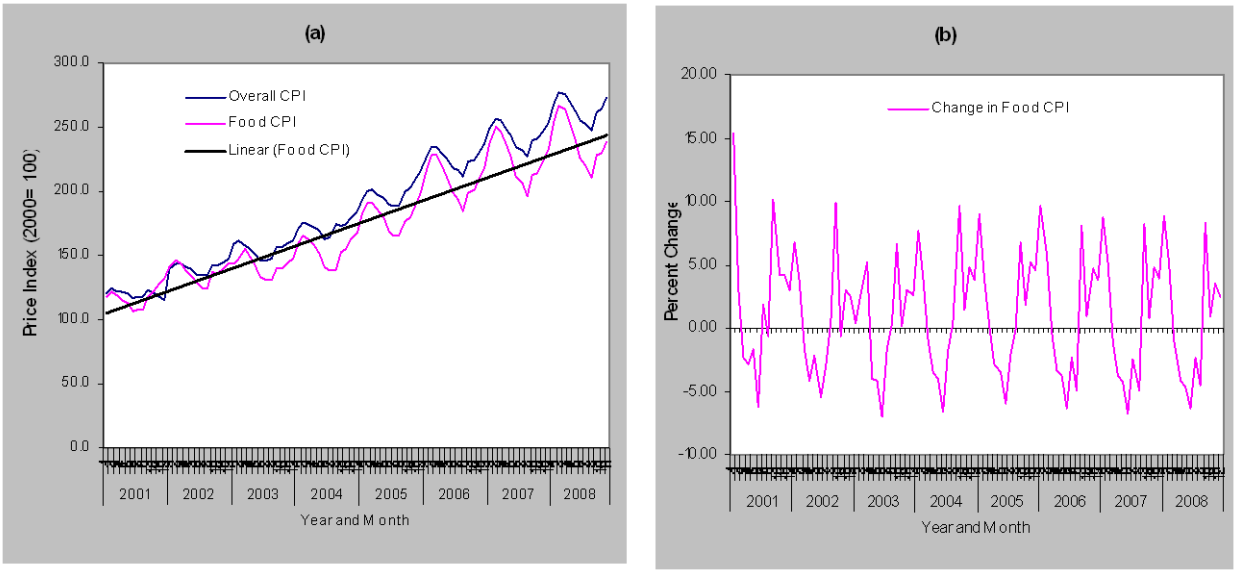


The poor and food insecure are also at risks due to seasonal variations in food prices. Figure 4 presents movements in the domestic food price index using the food consumer price index (CPI).[1] It is evident from Figure 4(a) that since 2001 the trend in food prices has been upwards. The upward trend is also characterized by swings in monthly prices. There are, however, seasonal patterns in the movement of prices. The downturns occur mainly in the post-harvest period between May and July while the upturns generally occur in the lean season of maize availability between December and March. Interesting to note as well is the fact that the swings in food prices have been spectacular since 2004 and are more pronounced more recently in 2007 and 2008.

Figure 4(b) shows that prices of foods also vary considerably month to month. The major price increases tend to occur around August/September the period when most of the households run out of stock of own food production and in February/March which is defined as the lean season just before maize harvest in Malawi. On the other, hand major price declines occur in April/May/June which is the period just after harvest by which time most households have maize from own production. The upper bound of price increase is nearly 10 percent mark while the lower bound decrease is 5 percent, implying that on average households face greater risks of increases in food prices.

[1] It is, however, important to note that maize is a dominant commodity in the computation of the food price index in Malawi, and the food price index is the main driver of the overall consumer index.

Figure 4 Food Price Trends in Malawi, 2001 - 2008



Source: Chirwa (2009)

The variations in poverty and average per capita expenditures, and the movements in prices underscore the need to take into account seasonality in poverty estimates especially where data is collected over a long period of time. The NSO uses a poverty model that ignores seasonality to estimate trends in poverty over time using Welfare Monitoring Surveys (WMS). As has been noted, 2004 was characterized by major swings in food prices in addition to usual food crises in the lean season, and households tend to adjust their consumptions depending on the season of income earning and shocks. For example, in 2006, the WMS collected data between June and October, but the poverty correlates using a non-seasonally adjusted model are used to predict the incidence of poverty. In this case, using a model that did not account for seasonality to estimate poverty may give biased and inconsistent estimates of poverty. Gujarati (2003) notes that if the excluded variable is correlated with the explanatory variables, then the parameter estimates will be biased and inconsistent. However, if they are not correlated the intercept term will remain biased and forecast based on the incorrect model are going to be unreliable. Hence, failure to include relevant variables can lead to biased and inconsistent estimators.

3. Model Specification and Data

Our approach is to use the same specification of the determinants of poverty model as specified by GoM and World Bank (2006) in the Poverty and Vulnerability Analysis (PVA) adapted from Mukherjee and Benson (1998), with the addition of various specification of seasonal dummies (see Appleton, 2002). Our welfare model is specified as follows:

$$\ln C_j = \beta_0 + \sum_{i=1}^{n} \beta_j X_{ij} + \sum_{k=1}^{m} \alpha_k S_k + \varepsilon_i \qquad (1)$$

where C_j is annual consumption expenditure per capita of household *j* in Malawi Kwacha (MK); X_{ij} is a set of exogenous household characteristics or other determinants, S_k is a set of seasonal dummies or indicator of seasonality and ε is a random error term. Our explanatory variables include demographic characteristics, education, employment and occupation, farm and non-farm activities, community characteristics (GoM and World Bank, 2006) and seasonality.

The demographic variables include age in years of household head, the sex of the household head, the age of the household head, whether the household head is a widow, the total size of the household and the number of children. The education variables are specified as categorical variables of maximum education level attained by the household head. Education categories include: primary education, secondary education, and tertiary education dummies with no education dummy variable as the reference category.

The employment and occupation category captures the effects of the distribution of different sorts of occupation at the household level. The variables used include whether the household head is engaged in formal wage employment, and/or whether the household runs a non-farm enterprise.

Agricultural activity variables account for whether the household farms had any rain-fed plots, the total per capita landholdings of rain-fed land held by the household, whether the household has a *dimba* plot, and whether the household grew tobacco cultivation (in the last cropping season).

We also include community characteristics and access to services at the community level such as the existence of a regular bus service to/from the community, the presence of a health clinic and bank in the community, differential access to markets by including a dummy if the household is in a *Boma* (District administrative centre) or Trading centre, and the presence of an ADMARC market and a daily market, and a dummy for the presence of a tarmac/asphalt road in the community. We also include dummies representing regions and agricultural development divisions.

We capture the effects of seasonality on poverty by constructing dummies in three ways. First, the data was collected over a period of 13 months (March 2004 to March 2005) and we include 12 monthly dummy variables to capture the role of seasonality in poverty. The month of March 2005 is taken as a base category. Secondly, we group the observations into four farming season: March-April 2004 (harvesting season) as base category; May-August 2004 (post-harvesting/ marketing season); Sep-Nov 2004 (pre-planting season) and Dec 2004-Mar05 (farming and lean season).[2] Thirdly, we expressed the month of interview as a categorical variable with 1 equal to March 2004 up to 13 equal to March 2005.

We use data from the second Integrated Household Survey done in 2004-2005 by the National Statistical Office (NSO). The survey collected information from a representative sample of 11,032 households (9,601 rural households and 1,431

[2] MVAC (2005), cited in Devereux (2009) categorizes the farming season into four periods: April-June, July-September, October-December, and January-March.

urban households). The sampling design is representative at both national and district level hence the survey provides reliable estimates for those areas.

4. Empirical Results

We investigate the effects of seasonality on poverty both by the statistical significance of seasonal dummies and testing the incremental contribution of seasonal dummies using the analysis of variance. We compare the R-squared obtained from models without seasonal dummies (R^2_{PVA}) and that obtained from models with seasonal dummies (R^2_{PVAS}). We use the F test for incremental contribution of additional variables to determine the significance of seasonal dummy variables in explaining poverty. The estimated poverty models without and with seasonal dummies are presented in Annex 1 to Annex 3. As can be seen from these tables, there are little changes in the values of the slope parameters with the inclusion of dummies and the coefficients remain statistically significant in all the models. However, the introduction of seasonality variables changes the value of the intercept. In the case of monthly seasonal dummy variables and farming seasons dummy variables there is positive shift in the value of the intercept term while the introduction of a continuous seasonal dummy variable lead to a downward shift of the regression line.

4.1 Poverty and Monthly Seasonal Dummies

Table 1 presents estimates of dummy variables from the determinants of poverty model by residence and regions. In all the models, inclusion of seasonal dummy variables increases the explained variations compared to the base model without seasonality. The hypothesis that all the coefficients of seasonal dummy variables are equal to zero is rejected at the 1 percent level in all the models. There is a consistent pattern that welfare declines as households approach the lean season. The decline in welfare due to seasonality is consistent with the findings in Appleton (2002) and Khandker (2009). First, from the national model, we find that the coefficients of the months of April 2004, August 2004 through to February 2005 are negative and statistically significant. Generally, there is absolute increase in the size of coefficients from August 2004 through to February 2005. Poverty tends to increase during the months of December, January and February. These are the lean months of food supply among poor households and consumption tends to be lower as households tend to pursue strategies that limit food consumption.

Turning to the model of rural households, we also find negative and statistically significant seasonal effects for the months of April, May, July through to February 2005. Similarly, absolute sizes of coefficients increase from July through to February, and households that were interviewed in the month of January are more likely to be poor. This picture is also depicted in the model of urban households (which exclude tobacco). All the seasonal dummies, except May 2004, June 2004 and October 2004, are statistically significant and the absolute value of coefficient increase as we approach the lean food availability season. Regional based regression models also depict the importance of the lean food availability season in determining the level of poverty. While the results of the central and southern regions are highly consistent

with the national results, for the northern region we also find that households that were interviewed in July were less likely to be poor. However, in all the three regions, the period from October 2004 through to February 2005, show increasing absolute effect of month of interview, with the month of January revealing the highest absolute value.

Table 1 Poverty and Monthly Seasonal Dummies

Seasonal Dummies	(1) National	Residence		Region		
		(2) Rural	(3) Urban (no tobacc0)	(4) North	(5) Centre	(6) South
March 2004	-0.02	-0.00	-0.16**	-0.02	0.02	-0.00
	(0.02)	(0.03)	(0.07)	(0.06)	(0.04)	(0.04)
April 2004	-0.05*	-0.06**	-0.18**	-0.11	0.11***	-0.12***
	(0.03)	(0.03)	(0.08)	(0.07)	(0.04)	(0.04)
May 2004	-0.03	-0.05**	-0.02	-0.25***	0.11***	-0.04
	(0.02)	(0.03)	(0.08)	(0.07)	(0.04)	(0.04)
June 2004	-0.00	0.01	-0.10	-0.14**	0.08*	0.05
	(0.03)	(0.03)	(0.10)	(0.07)	(0.04)	(0.04)
July 2004	0.01	0.05*	-0.30***	0.31***	0.04	-0.04
	(0.02)	(0.02)	(0.07)	(0.07)	(0.04)	(0.04)
August 2004	-0.13***	-0.12***	-0.33***	-0.31***	-0.03	-0.12***
	(0.02)	(0.02)	(0.07)	(0.07)	(0.04)	(0.04)
September 2004	-0.15***	-0.16***	-0.20**	-0.03	-0.07**	-0.20***
	(0.03)	(0.03)	(0.09)	(0.08)	(0.04)	(0.04)
October 2004	-0.12***	-0.16***	-0.08	-0.32***	-0.02	-0.06
	(0.03)	(0.03)	(0.08)	(0.07)	(0.04)	(0.04)
November 2004	-0.20***	-0.19***	-0.41***	-0.27***	-0.13***	-0.19***
	(0.03)	(0.03)	(0.08)	(0.07)	(0.04)	(0.04)
December 2004	-0.30***	-0.27***	-0.56***	-0.37***	-0.19***	-0.26***
	(0.03)	(0.03)	(0.09)	(0.07)	(0.04)	(0.05)
January 2005	-0.36***	-0.33***	-0.63***	-0.47***	-0.23***	-0.33***
	(0.02)	(0.02)	(0.08)	(0.06)	(0.04)	(0.04)
February 2005	-0.31***	-0.29***	-0.42***	-0.42***	-0.31***	-0.24***
	(0.02)	(0.02)	(0.07)	(0.10)	(0.04)	(0.03)
N	11032	9601	1431	1637	4219	5176
R^2_{PVAS}	0.50	0.47	0.55	0.50	0.53	0.49
R^2_{PVA}	0.47	0.43	0.51	0.41	0.50	0.47
F- test ($\alpha_i = 0$)	54.87***	60.02***	10.18***	23.72***	22.14***	16.73***
F(Prob.)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

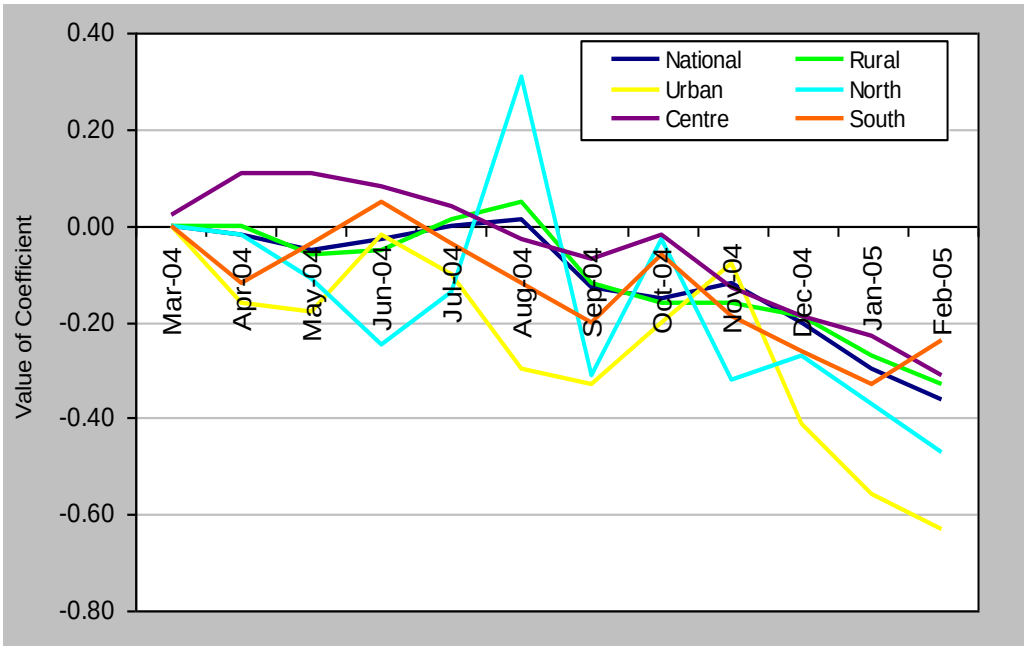
Note: The dependent variable is natural logarithm of per capita consumption. Robust standard errors are in parentheses. * Significant at 10%; ** significant at 5%; *** significant at 1%. Omitted dummy is date of interview = 1 if March 2005.

Source: Annex Table 1

Figure 5 presents the plot of coefficients of monthly seasonal dummies. There is a general trend which shows that per capita consumption falls from around October. However, there is a sharper decline in per capita consumption for urban area compared to rural areas, suggesting that urban household are more vulnerable partly to high variability in prices – hence tighten their belts more than rural households as they cope with food shortages. While the centre and the south are largely consistent

with the national trend, the northern region reveals a completely different pattern with per capita consumption increasing substantially in August. There are more seasonal variations in per capita consumption in the north compared to other regions. One reason for this is that generally the north receives rain late and they start harvesting around June/July and therefore tend to have plenty food around August.

Figure 5 Values of Monthly Seasonal Dummy Coefficients



4.2 Poverty and Farming Seasons

The agricultural season in Malawi is typically divided into three seasons. The first is the harvesting and marketing season that runs from May to August. During this time most of the households earn cash from their crop sales and they also have adequate food supplies, particularly maize, from own production. This period is also associated with low maize prices although food and cereal prices tend to rise sharply in August (FEWSNET, 2009). The second season is the pre-planting season, between September and November. The major agricultural activity is land preparation, although for some households this is also the time for winter crop harvests. The third season is the rainy season, between December and March. This is also known as the hunger season – as most households run out of their own production during this period. This season extends into April, in which the food security improves due to consumption of green maize (FEWSNET, 2008).

Table 2 presents a summary of the results on the effects of farming seasons on poverty in Malawi. The period from March 2004 – April 2004 is taken as a base category. In all the models, the F statistics shows that we reject the null hypothesis that the inclusion of seasonal dummies does not improve the explanatory power at the 1 percent level of significance. It is evident that farming seasons affects the level and depth of poverty. In all the estimations the coefficients of the September – November and December 2004 – March 2005 are negative and statistically significant at the 1 percent or 5 percent level.

Table 2 Poverty and Farming Season Dummies

Seasonal Dummies	(1) National	Residence		Region		
		(2) Rural	(3) Urban (no tobacc0)	(4) North	(5) Centre	(6) South
May-August 2004	-0.01	-0.01	-0.07	-0.01	0.08***	-0.04*
	(0.01)	(0.02)	(0.05)	(0.04)	(0.02)	(0.02)
Sep-Nov 2004	-0.13***	-0.15***	-0.14***	-0.19***	-0.05**	-0.14***
	(0.02)	(0.02)	(0.05)	(0.05)	(0.02)	(0.02)
Dec 2004-Mar 2005	-0.29***	-0.27***	-0.40***	-0.36***	-0.23***	-0.26***
	(0.01)	(0.02)	(0.05)	(0.04)	(0.02)	(0.02)
N	11032	9601	1431	1637	4219	5176
R^2_{PVAS}	0.50	0.46	0.54	0.45	0.53	0.49
R^2_{PVA}	0.47	0.43	0.51	0.41	0.50	0.47
F - test ($\alpha_i = 0$)	219.64***	176.89***	30.04***	38.55***	88.77***	67.05***
F(Prob.)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note: The dependent variable is natural logarithm of per capita consumption. Robust standard errors are in parentheses. * Significant at 10%; ** significant at 5%; *** significant at 1%. Omitted dummy is date of interview = 1 if March – April 2004.

Source: Annex Table 2

It is interesting to note that the evidence points to the fact that households interviewed during the hunger season are more likely to be poor compared to the base category and other seasons. The results from the national estimate of poverty in Model 1 shows that per capita annual expenditures fall by 25 percent during December 2004 and March 2005, but falls by only 12 percent during the pre-planting season. The largest margin in poverty between the base category and the hunger season occur in urban areas and in the northern region. In the urban areas, poverty increases by 33 percent while in the northern region poverty increases by 30 percent during the hunger period. For the central region, poverty falls by 8 percent during the harvesting and marketing season. The central region is the main producing area of tobacco which is the main cash crop and main foreign exchange earner in Malawi. The positive and statistically significant coefficient of the May-August 2004 dummy just manifests the seasonality of tobacco incomes. Nonetheless, even in the central region, poverty increases in the hunger season, per capita consumption falls by 23 percent.

4.3 Poverty and Continuous Seasonal Variable

Median annual household expenditures generally show a downward trend from March 2004 to March 2005 as presented in Figure 2 above. We estimated a model in which seasonality is represented by a continuous time variable and the results are presented in Table 3. The F statistics shows that in all the specifications the incremental contribution of the seasonal dummy variable to the explanatory power of the models is statistically significant at the 1 percent level. On average, the results show that per capita consumption increases by 6 percent due to seasonality.

Table 3 Poverty and Categorical Season Dummy

Seasonality variable	(1) National	Residence		Region		
		(2) Rural	(3) Urban (no tobacc0)	(4) North	(5) Centre	(6) South
Categorical variable for season cycle	0.06*** (0.00)	0.06*** (0.00)	0.08*** (0.01)	0.06*** (0.01)	0.07*** (0.00)	0.06*** (0.00)
N	11032	9601	1431	1637	4219	5176
R^2_{PVAS}	0.49	0.45	0.53	0.43	0.52	0.48
R^2_{PVA}	0.47	0.43	0.51	0.47	0.50	0.47
F - test ($\alpha_i = 0$)	219.64***	176.89***	30.07***	38.55***	88.77***	67.05***
F(Prob.)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note: The dependent variable is natural logarithm of per capita consumption. Robust standard errors are in parentheses. * Significant at 10%; ** significant at 5%; *** significant at 1%. Categorical variable defined as 1 = March 2004 through to 13 = March 2005.

Source: Annex Table 3.

5. Conclusions

This paper argues that in agrarian economies characterized by seasonal variations in incomes and food availability among households, modelling determinants of welfare or poverty without controlling for seasonality may lead to mis-specification errors. The results in this paper show that although the slope coefficients do not change, the incremental contribution of seasonality is statistically significant. Evidently, there are substantial changes in the intercept term with the inclusion of seasonality, suggesting that poverty projections based on a model that does not take into account seasonality may lead to biased and unreliable estimates of poverty. This is particularly the case in Malawi, where the annual welfare monitoring data is collected over a shorter period (1 month) than the data used for estimating the baseline model.

Food insecurity in Malawi increases substantially during the lean season, with the number of households that are food insecure increasing from 13.8 percent in April-June to 48.2 percent in January-March (Devereux, 2009). Such huge swings in food security make poverty estimates sensitive to the time of interview if household data is collected over longer periods. Based on a model that does not take into account for seasonality, poverty estimates in Malawi have shown a downward trend, from 52 percent in 2004/05 to 40 percent in 2007 based on welfare monitoring surveys that are conducted in the dry season. These estimates may therefore be biased although the direction of that bias cannot be established without access to welfare monitoring data. This is an area of further research that the study will examine.

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Annex Table 1 Determinants of Welfare with Monthly Seasonal Dummies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dep variable is log(pc exp)	**Baseline - All**		**Rural**		**Urban (no Tobacco)**		**North (with Tob.)**		**Centre (with Tob.)**		**South (with Tob.)**	
	PVA	PVA with Month D	PVA	PVA with Month D	PVA	PVA with Month D	PVA	PVA with Month D	PVA	PVA with Month D	PVA	PVA with Month D
Female household head	-0.14***	-0.15***	-0.14***	-0.15***	-0.07	-0.09*	-0.15***	-0.12***	-0.15***	-0.16***	-0.13***	-0.14***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)	(0.05)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
Age of hh head: 26-35 years	0.07***	0.07***	0.06***	0.06***	0.12***	0.11**	0.08**	0.09**	0.08***	0.07***	0.09***	0.08***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.05)	(0.04)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
Age of hh head: 36-45 years	0.09***	0.09***	0.08***	0.08***	0.14**	0.12**	0.06	0.08*	0.06**	0.05*	0.14***	0.13***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.06)	(0.06)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Age of hh head: 46-55 years	0.03	0.03	0.02	0.03	0.02	0.01	-0.01	0.04	0.01	0.00	0.05*	0.05*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.07)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Age of hh head: 56-65 years	-0.04*	-0.04*	-0.03*	-0.03*	0.01	0.02	-0.01	0.03	-0.08**	-0.09***	-0.01	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.07)	(0.06)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Age of hh head: 66+ years	-0.07***	-0.08***	-0.07***	-0.08***	-0.18*	-0.16*	-0.01	0.01	-0.13***	-0.15***	-0.07**	-0.08**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.09)	(0.09)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Widowed household head	0.06***	0.05***	0.06***	0.06***	-0.07	-0.04	0.11**	0.09*	0.04	0.04	0.04	0.04
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.06)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Household size	-0.28***	-0.28***	-0.29***	-0.29***	-0.32***	-0.31***	-0.22***	-0.23***	-0.32***	-0.31***	-0.27***	-0.27***
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)	(0.04)	(0.04)
Household size squared (/100)	1.37***	1.35***	1.33***	1.32***	2.02***	1.94***	1.00***	1.02***	1.68***	1.60***	1.29***	1.29***
	(0.21)	(0.21)	(0.22)	(0.21)	(0.24)	(0.24)	(0.20)	(0.21)	(0.11)	(0.10)	(0.36)	(0.35)
Number of children 0-4	-0.08***	-0.09***	-0.06***	-0.07***	-0.14***	-0.15***	-0.09***	-0.08***	-0.07***	-0.07***	-0.10***	-0.10***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
Number of children 5-10	-0.04***	-0.04***	-0.03***	-0.03***	-0.05*	-0.04	-0.02	-0.03	-0.03***	-0.03***	-0.05***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Number of children 11-14	-0.02**	-0.02**	-0.01	-0.01	-0.06*	-0.06**	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.03)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
Religion: Islam	0.03	0.02	0.00	0.00	0.24***	0.15*	0.10	0.11	0.05	0.05	-0.01	0.00
	(0.02)	(0.02)	(0.03)	(0.02)	(0.09)	(0.08)	(0.17)	(0.16)	(0.04)	(0.04)	(0.04)	(0.04)
Religion: Catholic	0.03	0.03	-0.00	0.01	0.21***	0.14*	-0.07	-0.06	0.05*	0.04	-0.00	0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.08)	(0.07)	(0.09)	(0.09)	(0.03)	(0.02)	(0.04)	(0.04)
Religion: CCAP	0.09***	0.09***	0.06**	0.06***	0.24***	0.18**	-0.07	-0.02	0.11***	0.10***	0.09**	0.11**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.08)	(0.08)	(0.08)	(0.08)	(0.03)	(0.03)	(0.04)	(0.04)
Religion: Other chrisitian	0.02	0.02	-0.00	0.00	0.16**	0.10	-0.10	-0.08	0.03	0.02	-0.01	0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.07)	(0.08)	(0.08)	(0.02)	(0.02)	(0.04)	(0.04)
Highest education: some primary	0.05**	0.05**	0.07***	0.06***	0.05	0.04	-0.07	-0.06	0.06*	0.04	0.06**	0.06**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.09)	(0.09)	(0.11)	(0.10)	(0.03)	(0.03)	(0.03)	(0.03)
Highest education: completed primary	0.13***	0.12***	0.16***	0.16***	0.13	0.10	-0.11	-0.07	0.17***	0.14***	0.17***	0.15***
	(0.03)	(0.02)	(0.03)	(0.03)	(0.09)	(0.09)	(0.11)	(0.10)	(0.04)	(0.03)	(0.03)	(0.03)
Highest education: post primary	0.40***	0.40***	0.37***	0.37***	0.67***	0.61***	0.10	0.17*	0.42***	0.40***	0.51***	0.50***
	(0.03)	(0.02)	(0.03)	(0.03)	(0.09)	(0.09)	(0.11)	(0.10)	(0.04)	(0.03)	(0.04)	(0.04)
HH has wage/salary income	0.12***	0.12***	0.11***	0.11***	0.10***	0.08**	0.18***	0.19***	0.14***	0.13***	0.12***	0.12***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Household has a non-farm enterprise	0.14***	0.13***	0.15***	0.13***	0.11***	0.07**	0.22***	0.24***	0.13***	0.11***	0.14***	0.13***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)

	Baseline - All		Rural		Urban (no Tobacco)		North (with Tob.)		Centre (with Tob.)		South (with Tob.)	
	PVA	PVA with Month D	PVA	PVA with Month D	PVA	PVA with Month D	PVA	PVA with Month D	PVA	PVA with Month D	PVA	PVA with Month D
HH grew tobacco last crop season	0.09***	0.10***	0.10***	0.10***			0.08**	0.04	0.08***	0.09***	0.03	0.04
	(0.02)	(0.01)	(0.02)	(0.01)			(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)
HH owns any dimba plot	0.07***	0.06***	0.08***	0.07***	-0.19***	-0.13***	0.05*	0.07**	0.06***	0.03**	0.08***	0.07***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)	(0.05)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
HH farms any rainfed plots (0/1)	-0.01	0.01	-0.03	0.01	0.06	0.05	-0.11**	-0.08*	-0.08**	-0.05*	-0.12***	-0.12***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.05)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)
Ln total hectares of rainfed plots	0.08***	0.08***	0.08***	0.08***	0.07***	0.09***	0.08***	0.09***	0.13***	0.13***	0.05***	0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Regular bus service in community	0.01	-0.00	0.01	-0.01	0.08**	0.11***	-0.02	0.02	-0.02	-0.05***	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.04)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Health clinic in community	0.07***	0.05***	0.06***	0.03***	-0.03	0.04	0.09***	-0.00	0.08***	0.07***	0.01	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.04)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
EA is a Boma or Trading center	0.15***	0.17***	0.19***	0.21***			0.24***	0.12*	0.09**	0.08*	0.06	0.09***
	(0.02)	(0.02)	(0.03)	(0.02)			(0.07)	(0.06)	(0.04)	(0.04)	(0.04)	(0.04)
Travel to nearest boma: >20-30mins	-0.00	0.02	-0.02	0.00			-0.03	-0.10**	0.15***	0.16***	-0.02	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)			(0.06)	(0.05)	(0.03)	(0.03)	(0.02)	(0.02)
Travel to nearest boma: >30-45mins	-0.10***	-0.08***	-0.11***	-0.10***			-0.13***	-0.09**	0.02	0.04*	-0.09***	-0.09***
	(0.02)	(0.02)	(0.02)	(0.02)			(0.05)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
Travel to nearest boma: >45-60mins	-0.04**	-0.04***	-0.04**	-0.05***			-0.27***	-0.22***	0.09***	0.10***	-0.01	-0.05*
	(0.02)	(0.02)	(0.02)	(0.02)			(0.05)	(0.05)	(0.02)	(0.02)	(0.03)	(0.03)
Travel to nearest boma: >60mins	-0.04**	-0.02	-0.03	-0.02			-0.14***	-0.05	0.07**	0.08***	-0.07***	-0.06**
	(0.02)	(0.02)	(0.02)	(0.02)			(0.05)	(0.05)	(0.03)	(0.03)	(0.02)	(0.02)
ADMARC market in the community	-0.04***	-0.04***	-0.04***	-0.03**	0.10	-0.05	-0.04	-0.04	-0.09***	-0.08***	-0.02	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.07)	(0.07)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
Bank in community	-0.02	-0.02	-0.02	-0.02	-0.10	-0.16**	0.33***	0.13	-0.04	0.02	-0.02	-0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.08)	(0.10)	(0.11)	(0.04)	(0.04)	(0.03)	(0.03)
Daily market in community	0.01	0.02*	-0.00	0.01	0.10**	0.04	0.03	0.05	0.13***	0.13***	0.07***	0.10***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)	(0.05)	(0.04)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Tarmac/asphalt road in community	0.13***	0.16***	0.03*	0.06***	0.44***	0.46***	-0.20***	-0.06	0.42***	0.43***	0.09***	0.11***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.05)	(0.05)	(0.03)	(0.03)	(0.02)	(0.02)
North region	-0.06**	-0.05*	-0.04	-0.03								
	(0.03)	(0.03)	(0.03)	(0.03)								
Central region	0.24***	0.24***	0.25***	0.26***								
	(0.02)	(0.02)	(0.02)	(0.02)								
ADD: Karonga	0.00	0.00	0.00	0.00	0.00	0.00	-0.18***	-0.17***	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.03)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)
ADD: Mzuzu	0.11***	0.11***	0.10***	0.09***	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.03)	(0.03)	(0.03)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

	Baseline - All		Rural		Urban (no Tob.)		North (with Tob.)		Centre (with Tob.)		South (with Tob.)	
	PVA	PVA with Month D	PVA	PVA with Month D	PVA	PVA with Month D	PVA	PVA with Month D	PVA	PVA with Month D	PVA	PVA with Month D
ADD: Kasungu	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18***	0.16***	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.03)	(0.03)	(0.00)	(0.00)
ADD: Salima	-0.10***	-0.09***	-0.08***	-0.07***	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ADD: Lilongwe	-0.03*	-0.04**	-0.04***	-0.06***	0.22***	0.19***	0.00	0.00	0.19***	0.16***	0.00	0.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.05)	(0.05)	(0.00)	(0.00)	(0.03)	(0.03)	(0.00)	(0.00)
ADD: Machinga	-0.06***	-0.06**	-0.06**	-0.05**	-0.04	-0.00	0.00	0.00	0.00	0.00	-0.02	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.06)	(0.06)	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.02)
ADD: Blantyre	-0.04*	-0.04*	-0.01	-0.01	-0.31***	-0.24***	0.00	0.00	0.00	0.00	0.01	0.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.06)	(0.06)	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.02)
Urban	0.31***	0.32***										
	(0.02)	(0.02)										
March04		-0.02		-0.00		-0.16**		-0.02		0.02		-0.00
		(0.02)		(0.03)		(0.07)		(0.06)		(0.04)		(0.04)
April04		-0.05*		-0.06**		-0.18**		-0.11		0.11***		-0.12***
		(0.03)		(0.03)		(0.08)		(0.07)		(0.04)		(0.04)
May04		-0.03		-0.05**		-0.02		-0.25***		0.11***		-0.04
		(0.02)		(0.03)		(0.08)		(0.07)		(0.04)		(0.04)
June04		-0.00		0.01		-0.10		-0.14**		0.08*		0.05
		(0.03)		(0.03)		(0.10)		(0.07)		(0.04)		(0.04)
July04		0.01		0.05*		-0.30***		0.31***		0.04		-0.04
		(0.02)		(0.02)		(0.07)		(0.07)		(0.04)		(0.04)
August04		-0.13***		-0.12***		-0.33***		-0.31***		-0.03		-0.12***
		(0.02)		(0.02)		(0.07)		(0.07)		(0.04)		(0.04)
September04		-0.15***		-0.16***		-0.20**		-0.03		-0.07**		-0.20***
		(0.03)		(0.03)		(0.09)		(0.08)		(0.04)		(0.04)
October04		-0.12***		-0.16***		-0.08		-0.32***		-0.02		-0.06
		(0.03)		(0.03)		(0.08)		(0.07)		(0.04)		(0.04)
November04		-0.20***		-0.19***		-0.41***		-0.27***		-0.13***		-0.19***
		(0.03)		(0.03)		(0.08)		(0.07)		(0.04)		(0.04)
December04		-0.30***		-0.27***		-0.56***		-0.37***		-0.19***		-0.26***
		(0.03)		(0.03)		(0.09)		(0.07)		(0.04)		(0.05)
January05		-0.36***		-0.33***		-0.63***		-0.47***		-0.23***		-0.33***
		(0.02)		(0.02)		(0.08)		(0.06)		(0.04)		(0.04)
February05		-0.31***		-0.29***		-0.42***		-0.42***		-0.31***		-0.24***
		(0.02)		(0.02)		(0.07)		(0.10)		(0.04)		(0.03)
Constant	10.47***	10.59***	10.52***	10.63***	10.43***	10.79***	10.92***	10.98***	10.57***	10.66***	10.56***	10.67***
	(0.05)	(0.05)	(0.06)	(0.06)	(0.13)	(0.14)	(0.15)	(0.15)	(0.06)	(0.06)	(0.08)	(0.08)
Observations	11032	11032	9601	9601	1431	1431	1637	1637	4219	4219	5176	5176
R-squared	0.47	0.50	0.43	0.47	0.51	0.55	0.41	0.50	0.50	0.53	0.47	0.49

Note: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Omitted seasonal variable is March 2004

Annex Table 2 Determinants of Welfare with Farming Season Dummies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Baseline - All		**Rural**		**Urban (no Tobacco)**		**North (with Tob.)**		**Centre (with Tob.)**		**South (with Tob.)**	
Dep variable is log(pc exp)	PVA	With crop season dummy	PVA	With crop season dummy	PVA	With crop season dummy	PVA	crop season dummy	PVA	With crop season dummy	PVA	With crop season dummy
Female household head	-0.14***	-0.15***	-0.14***	-0.15***	-0.07	-0.08	-0.15***	-0.15***	-0.15***	-0.16***	-0.13***	-0.14***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)	(0.05)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
Age of hh head: 26-35 years	0.07***	0.07***	0.06***	0.06***	0.12***	0.13***	0.08**	0.10**	0.08***	0.07***	0.09***	0.08***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.05)	(0.04)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
Age of hh head: 36-45 years	0.09***	0.09***	0.08***	0.08***	0.14**	0.13**	0.06	0.07	0.06**	0.05*	0.14***	0.13***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.06)	(0.06)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Age of hh head: 46-55 years	0.03	0.03	0.02	0.02	0.02	0.02	-0.01	0.02	0.01	0.00	0.05*	0.05*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.07)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Age of hh head: 56-65 years	-0.04*	-0.04*	-0.03*	-0.04*	0.01	0.02	-0.01	0.01	-0.08**	-0.09***	-0.01	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.07)	(0.06)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Age of hh head: 66+ years	-0.07***	-0.08***	-0.07***	-0.07***	-0.18*	-0.17*	-0.01	0.01	-0.13***	-0.14***	-0.07**	-0.08**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.09)	(0.09)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Widowed household head	0.06***	0.05***	0.06***	0.06***	-0.07	-0.05	0.11**	0.10**	0.04	0.04	0.04	0.04
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.07)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Household size	-0.28***	-0.28***	-0.29***	-0.29***	-0.32***	-0.32***	-0.22***	-0.24***	-0.32***	-0.31***	-0.27***	-0.27***
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)	(0.04)	(0.04)
Household size squared (/100)	1.37***	1.35***	1.33***	1.32***	2.02***	2.00***	1.00***	1.05***	1.68***	1.61***	1.29***	1.28***
	(0.21)	(0.21)	(0.22)	(0.21)	(0.24)	(0.24)	(0.20)	(0.21)	(0.11)	(0.10)	(0.36)	(0.35)
Number of children 0-4	-0.08***	-0.09***	-0.06***	-0.07***	-0.14***	-0.15***	-0.09***	-0.09***	-0.07***	-0.07***	-0.10***	-0.10***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
Number of children 5-10	-0.04***	-0.04***	-0.03***	-0.03***	-0.05*	-0.04*	-0.02	-0.02	-0.03***	-0.03**	-0.05***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Number of children 11-14	-0.02**	-0.02**	-0.01	-0.00	-0.06*	-0.06*	-0.02	-0.02	-0.02	-0.01	-0.02	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.03)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
Religion: Muslim	0.03	0.02	0.00	0.00	0.24***	0.15*	0.10	0.13	0.05	0.05	-0.01	0.00
	(0.02)	(0.02)	(0.03)	(0.02)	(0.09)	(0.08)	(0.17)	(0.16)	(0.04)	(0.04)	(0.04)	(0.04)
Religion: Catholic	0.03	0.03	-0.00	0.01	0.21***	0.13*	-0.07	-0.02	0.05*	0.04*	-0.00	0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.08)	(0.07)	(0.09)	(0.08)	(0.03)	(0.02)	(0.04)	(0.04)
Religion: CCAP	0.09***	0.09***	0.06**	0.06***	0.24***	0.18**	-0.07	-0.00	0.11***	0.10***	0.09**	0.11***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.08)	(0.08)	(0.08)	(0.08)	(0.03)	(0.03)	(0.04)	(0.04)
Religion: Other Christian	0.02	0.02	-0.00	0.00	0.16**	0.10	-0.10	-0.06	0.03	0.02	-0.01	0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.07)	(0.08)	(0.08)	(0.02)	(0.02)	(0.04)	(0.04)
Highest education: some primary	0.05**	0.05**	0.07***	0.06***	0.05	0.04	-0.07	-0.03	0.06*	0.04	0.06**	0.06**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.09)	(0.08)	(0.11)	(0.11)	(0.03)	(0.03)	(0.03)	(0.03)
Highest education: completed primary	0.13***	0.12***	0.16***	0.16***	0.13	0.11	-0.11	-0.05	0.17***	0.14***	0.17***	0.16***
	(0.03)	(0.02)	(0.03)	(0.03)	(0.09)	(0.09)	(0.11)	(0.11)	(0.04)	(0.03)	(0.03)	(0.03)
Highest education: post primary	0.40***	0.39***	0.37***	0.36***	0.67***	0.64***	0.10	0.18	0.42***	0.40***	0.51***	0.50***
	(0.03)	(0.02)	(0.03)	(0.03)	(0.09)	(0.09)	(0.11)	(0.11)	(0.04)	(0.03)	(0.04)	(0.04)
HH has wage/salary income	0.12***	0.11***	0.11***	0.10***	0.10***	0.09**	0.18***	0.16***	0.14***	0.13***	0.12***	0.11***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Household has a non-farm enterprise	0.14***	0.13***	0.15***	0.14***	0.11***	0.09**	0.22***	0.24***	0.13***	0.11***	0.14***	0.13***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)
HH grew tobacco in last cropping season	0.09***	0.10***	0.10***	0.11***			0.08**	0.06*	0.08***	0.10***	0.03	0.04
	(0.02)	(0.01)	(0.02)	(0.01)			(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Baseline - All		**Rural**		**Urban (no Tobacco)**		**North (with Tob.)**		**Centre (with Tob.)**		**South (with Tob.)**	
	PVA	PVA with crop season dummy	PVA Rural	PVA Rural with crop season dummy	PVA	with crop season dummy	PVA	crop season dummy	PVA	With crop season dummy	PVA	With crop season dummy
HH owns any dimba plot	0.07***	0.06***	0.08***	0.07***	-0.19***	-0.18***	0.05*	0.05**	0.06***	0.03**	0.08***	0.07***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)	(0.05)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Household farms any rainfed plots (0/1)	-0.01	0.00	-0.03	0.01	0.06	0.05	-0.11**	-0.08*	-0.08**	-0.06*	-0.12***	-0.12***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Ln total hectares of rainfed plots	0.08***	0.08***	0.08***	0.08***	0.07***	0.09***	0.08***	0.08***	0.13***	0.13***	0.05***	0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Regular bus service in community	0.01	-0.01	0.01	-0.02	0.08**	0.06	-0.02	-0.01	-0.02	-0.05***	-0.01	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.04)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Health clinic in community	0.07***	0.05***	0.06***	0.04***	-0.03	0.04	0.09***	0.04	0.08***	0.07***	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.04)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
EA is a Boma or Trading center	0.15***	0.17***	0.19***	0.21***			0.24***	0.19***	0.09**	0.06	0.06	0.10***
	(0.02)	(0.02)	(0.03)	(0.02)			(0.07)	(0.07)	(0.04)	(0.04)	(0.04)	(0.04)
Travel to nearest boma: >20-30mins	-0.00	0.01	-0.02	-0.01			-0.03	-0.07	0.15***	0.15***	-0.02	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)			(0.06)	(0.05)	(0.03)	(0.03)	(0.02)	(0.02)
Travel to nearest boma: >30-45mins	-0.10***	-0.08***	-0.11***	-0.10***			-0.13***	-0.14***	0.02	0.04*	-0.09***	-0.09***
	(0.02)	(0.01)	(0.02)	(0.02)			(0.05)	(0.05)	(0.02)	(0.02)	(0.02)	(0.02)
Travel to nearest boma: >45-60mins	-0.04**	-0.05***	-0.04**	-0.06***			-0.27***	-0.23***	0.09***	0.09***	-0.01	-0.05**
	(0.02)	(0.02)	(0.02)	(0.02)			(0.05)	(0.05)	(0.02)	(0.02)	(0.03)	(0.03)
Travel to nearest boma: >60mins	-0.04**	-0.03**	-0.03	-0.03*			-0.14***	-0.13***	0.07**	0.06**	-0.07***	-0.06***
	(0.02)	(0.02)	(0.02)	(0.02)			(0.05)	(0.05)	(0.03)	(0.03)	(0.02)	(0.02)
ADMARC market in the community	-0.04***	-0.04***	-0.04***	-0.03**	0.10	-0.03	-0.04	-0.05	-0.09***	-0.08***	-0.02	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.07)	(0.07)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
Bank in community	-0.02	-0.02	-0.02	-0.01	-0.10	-0.10	0.33***	0.18*	-0.04	0.01	-0.02	-0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.07)	(0.10)	(0.10)	(0.04)	(0.04)	(0.03)	(0.03)
Daily market in community	0.01	0.02*	-0.00	0.00	0.10**	0.07	0.03	0.02	0.13***	0.13***	0.07***	0.09***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)	(0.05)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
Tarmac/asphalt road in community	0.13***	0.16***	0.03*	0.06***	0.44***	0.45***	-0.20***	-0.14***	0.42***	0.43***	0.09***	0.11***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.05)	(0.05)	(0.03)	(0.03)	(0.02)	(0.02)
North region	-0.06**	-0.05*	-0.04	-0.03								
	(0.03)	(0.03)	(0.03)	(0.03)								
Central region	0.24***	0.24***	0.25***	0.25***								

	(0.02)	(0.02)	(0.02)	(0.02)								
ADD: Karonga	0.00	0.00	0.00	0.00	0.00	0.00	-0.18***	-0.19***	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.03)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)
ADD: Mzuzu	0.11***	0.11***	0.10***	0.10***	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.03)	(0.03)	(0.03)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ADD: Kasungu	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18***	0.16***	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.03)	(0.03)	(0.00)	(0.00)
ADD: Salima	-0.10***	-0.09***	-0.08***	-0.07***	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ADD: Lilongwe	-0.03*	-0.04**	-0.04***	-0.05***	0.22***	0.19***	0.00	0.00	0.19***	0.16***	0.00	0.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.05)	(0.05)	(0.00)	(0.00)	(0.03)	(0.03)	(0.00)	(0.00)
ADD: Machinga	-0.06***	-0.06**	-0.06**	-0.05**	-0.04	-0.02	0.00	0.00	0.00	0.00	-0.02	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.06)	(0.06)	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.02)
ADD: Blantyre	-0.04*	-0.04*	-0.01	-0.01	-0.31***	-0.26***	0.00	0.00	0.00	0.00	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.06)	(0.05)	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.02)
Urban	0.31***	0.32***										
	(0.02)	(0.02)										
Season: harvest/post harvest		-0.01		-0.01		-0.15**		-0.02		0.07**		-0.04
		(0.02)		(0.02)		(0.06)		(0.05)		(0.03)		(0.03)
Season: pre planting		-0.14***		-0.15***		-0.22***		-0.21***		-0.04		-0.14***
		(0.02)		(0.02)		(0.06)		(0.06)		(0.03)		(0.03)
Season hungry gap		-0.30***		-0.28***		-0.48***		-0.37***		-0.22***		-0.26***
		(0.02)		(0.02)		(0.06)		(0.06)		(0.03)		(0.03)
Constant	10.47***	10.60***	10.52***	10.64***	10.43***	10.79***	10.92***	11.00***	10.57***	10.67***	10.56***	10.68***
	(0.05)	(0.05)	(0.06)	(0.06)	(0.13)	(0.14)	(0.15)	(0.15)	(0.06)	(0.06)	(0.08)	(0.08)
Observations	11032	11032	9601	9601	1431	1431	1637	1637	4219	4219	5176	5176
R-squared	0.47	0.50	0.43	0.46	0.51	0.54	0.41	0.45	0.50	0.53	0.47	0.49

Note: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Omitted seasonal variable is March 2004

Annex Table 3 Determinants of Welfare with Continuous Seasonal Variable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dep variable is log(pc exp)	**Baseline - All**		**Rural**		**Urban (no Tobacco)**		**North (with Tob.)**		**Centre (with Tob.)**		**South (with Tob.)**	
	PVA	With cat season	PVA	With cat season	PVA	With cat season	PVA	With cat season	PVA	With cat season	PVA	With cat season
Female household head	-0.14***	-0.14***	-0.14***	-0.14***	-0.07	-0.07	-0.15***	-0.15***	-0.15***	-0.16***	-0.13***	-0.14***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)	(0.05)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
Age of hh head: 26-35 years	0.07***	0.07***	0.06***	0.06***	0.12***	0.12***	0.08**	0.09**	0.08***	0.07***	0.09***	0.09***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.05)	(0.05)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
Age of hh head: 36-45 years	0.09***	0.09***	0.08***	0.08***	0.14**	0.12**	0.06	0.07	0.06**	0.05*	0.14***	0.14***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.06)	(0.06)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Age of hh head: 46-55 years	0.03	0.03	0.02	0.02	0.02	0.01	-0.01	0.01	0.01	0.00	0.05*	0.05*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.07)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Age of hh head: 56-65 years	-0.04*	-0.04*	-0.03*	-0.03*	0.01	0.01	-0.01	0.00	-0.08**	-0.09***	-0.01	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.07)	(0.06)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Age of hh head: 66+ years	-0.07***	-0.08***	-0.07***	-0.07***	-0.18*	-0.19**	-0.01	0.00	-0.13***	-0.14***	-0.07**	-0.07**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.09)	(0.09)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Widowed household head	0.06***	0.05***	0.06***	0.06***	-0.07	-0.06	0.11**	0.10**	0.04	0.03	0.04	0.04
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.07)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Household size	-0.28***	-0.28***	-0.29***	-0.29***	-0.32***	-0.31***	-0.22***	-0.23***	-0.32***	-0.31***	-0.27***	-0.27***
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)	(0.04)	(0.04)
Household size squared (/100)	1.37***	1.35***	1.33***	1.32***	2.02***	1.97***	1.00***	1.05***	1.68***	1.63***	1.29***	1.28***
	(0.21)	(0.21)	(0.22)	(0.22)	(0.24)	(0.23)	(0.20)	(0.20)	(0.11)	(0.10)	(0.36)	(0.35)
Number of children 0-4	-0.08***	-0.09***	-0.06***	-0.07***	-0.14***	-0.15***	-0.09***	-0.09***	-0.07***	-0.07***	-0.10***	-0.10***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
Number of children 5-10	-0.04***	-0.04***	-0.03***	-0.03***	-0.05*	-0.05*	-0.02	-0.02	-0.03***	-0.03***	-0.05***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Number of children 11-14	-0.02**	-0.02**	-0.01	-0.01	-0.06*	-0.07**	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)	(0.02)	(0.02)
Religion: Muslom	0.03	0.02	0.00	0.00	0.24***	0.18**	0.10	0.15	0.05	0.07*	-0.01	-0.01
	(0.02)	(0.02)	(0.03)	(0.02)	(0.09)	(0.08)	(0.17)	(0.16)	(0.04)	(0.04)	(0.04)	(0.04)
Religion: Catholic	0.03	0.03	-0.00	0.01	0.21***	0.14*	-0.07	-0.03	0.05*	0.04*	-0.00	0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.08)	(0.07)	(0.09)	(0.08)	(0.03)	(0.03)	(0.04)	(0.04)
Religion: CCAP	0.09***	0.09***	0.06**	0.06***	0.24***	0.19**	-0.07	-0.01	0.11***	0.10***	0.09**	0.10**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.08)	(0.08)	(0.08)	(0.08)	(0.03)	(0.03)	(0.04)	(0.04)
Religion: Other Christian	0.02	0.02	-0.00	0.00	0.16**	0.10	-0.10	-0.07	0.03	0.03	-0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.07)	(0.08)	(0.08)	(0.02)	(0.02)	(0.04)	(0.04)
Highest education: some primary	0.05**	0.05**	0.07***	0.07***	0.05	0.03	-0.07	-0.05	0.06*	0.05*	0.06**	0.06**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.09)	(0.09)	(0.11)	(0.11)	(0.03)	(0.03)	(0.03)	(0.03)
Highest education: completed primary	0.13***	0.12***	0.16***	0.16***	0.13	0.10	-0.11	-0.08	0.17***	0.16***	0.17***	0.15***
	(0.03)	(0.02)	(0.03)	(0.03)	(0.09)	(0.09)	(0.11)	(0.11)	(0.04)	(0.03)	(0.03)	(0.03)
Highest education: post primary	0.40***	0.40***	0.37***	0.37***	0.67***	0.63***	0.10	0.14	0.42***	0.42***	0.51***	0.50***
	(0.03)	(0.02)	(0.03)	(0.03)	(0.09)	(0.09)	(0.11)	(0.11)	(0.04)	(0.04)	(0.04)	(0.04)
HH has wage/salary income	0.12***	0.12***	0.11***	0.11***	0.10***	0.10***	0.18***	0.17***	0.14***	0.14***	0.12***	0.12***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.04)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Household has a non-farm enterprise	0.14***	0.13***	0.15***	0.14***	0.11***	0.10***	0.22***	0.22***	0.13***	0.11***	0.14***	0.13***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.04)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)
HH grew tobacco in last cropping season	0.09***	0.09***	0.10***	0.10***			0.08**	0.07**	0.08***	0.08***	0.03	0.04
	(0.02)	(0.01)	(0.02)	(0.01)			(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)

	Baseline - All		Rural		Urban (no Tobacco)		North (with Tob.)		Centre (with Tob.)		South (with Tob.)	
	PVA	With cat season	PVA	With cat season	PVA	With cat season	PVA	With cat season	PVA	With cat season	PVA	With cat season
HH owns any dimba plot	0.07***	0.07***	0.08***	0.08***	-0.19***	-0.18***	0.05*	0.05*	0.06***	0.05***	0.08***	0.08***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)	(0.05)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Household farms any rainfed plots (0/1)	-0.01	-0.01	-0.03	-0.02	0.06	0.06	-0.11**	-0.10**	-0.08**	-0.06**	-0.12***	-0.12***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Ln total hectares of rainfed plots	0.08***	0.08***	0.08***	0.08***	0.07***	0.08***	0.08***	0.08***	0.13***	0.13***	0.05***	0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Regular bus service in community	0.01	-0.00	0.01	-0.01	0.08**	0.06	-0.02	0.01	-0.02	-0.05***	-0.01	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.04)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Health clinic in community	0.07***	0.05***	0.06***	0.04***	-0.03	0.00	0.09***	0.06**	0.08***	0.05***	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.04)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
EA is a Boma or Trading center	0.15***	0.15***	0.19***	0.19***			0.24***	0.20***	0.09**	0.05	0.06	0.08**
	(0.02)	(0.02)	(0.03)	(0.02)			(0.07)	(0.07)	(0.04)	(0.04)	(0.04)	(0.04)
Travel to nearest boma: >20-30mins	-0.00	-0.01	-0.02	-0.02			-0.03	-0.03	0.15***	0.13***	-0.02	-0.04
	(0.02)	(0.02)	(0.02)	(0.02)			(0.06)	(0.06)	(0.03)	(0.03)	(0.02)	(0.02)
Travel to nearest boma: >30-45mins	-0.10***	-0.09***	-0.11***	-0.11***			-0.13***	-0.11**	0.02	0.03	-0.09***	-0.10***
	(0.02)	(0.02)	(0.02)	(0.02)			(0.05)	(0.05)	(0.02)	(0.02)	(0.02)	(0.02)
Travel to nearest boma: >45-60mins	-0.04**	-0.04**	-0.04**	-0.04**			-0.27***	-0.24***	0.09***	0.09***	-0.01	-0.03
	(0.02)	(0.02)	(0.02)	(0.02)			(0.05)	(0.05)	(0.02)	(0.02)	(0.03)	(0.03)
Travel to nearest boma: >60mins	-0.04**	-0.05***	-0.03	-0.04**			-0.14***	-0.13**	0.07**	0.05*	-0.07***	-0.07***
	(0.02)	(0.02)	(0.02)	(0.02)			(0.05)	(0.05)	(0.03)	(0.03)	(0.02)	(0.02)
ADMARC market in the community	-0.04***	-0.03**	-0.04***	-0.02*	0.10	0.12*	-0.04	-0.06	-0.09***	-0.07***	-0.02	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.07)	(0.07)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
Bank in community	-0.02	-0.04	-0.02	-0.02	-0.10	-0.17**	0.33***	0.32***	-0.04	-0.02	-0.02	-0.05
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.08)	(0.10)	(0.10)	(0.04)	(0.04)	(0.03)	(0.03)
Daily market in community	0.01	0.03**	-0.00	0.01	0.10**	0.11**	0.03	0.00	0.13***	0.14***	0.07***	0.10***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)	(0.05)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
Tarmac/asphalt road in community	0.13***	0.15***	0.03*	0.05***	0.44***	0.45***	-0.20***	-0.18***	0.42***	0.42***	0.09***	0.12***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.05)	(0.05)	(0.03)	(0.03)	(0.02)	(0.02)
North region	-0.06**	-0.05*	-0.04	-0.03								
	(0.03)	(0.03)	(0.03)	(0.03)								
Central region	0.24***	0.24***	0.25***	0.25***								
	(0.02)	(0.02)	(0.02)	(0.02)								
ADD: Karonga	0.00	0.00	0.00	0.00	0.00	0.00	-0.18***	-0.17***	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.03)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)
ADD: Mzuzu	0.11***	0.11***	0.10***	0.10***	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.03)	(0.03)	(0.03)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ADD: Kasungu	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18***	0.17***	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.03)	(0.03)	(0.00)	(0.00)
ADD: Salima	-0.10***	-0.10***	-0.08***	-0.07***	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ADD: Lilongwe	-0.03*	-0.03*	-0.04***	-0.05***	0.22***	0.20***	0.00	0.00	0.19***	0.17***	0.00	0.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.05)	(0.05)	(0.00)	(0.00)	(0.03)	(0.03)	(0.00)	(0.00)

ADD: Machinga	-0.06***	-0.06***	-0.06**	-0.06**	-0.04	-0.04	0.00	0.00	0.00	0.00	-0.02	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.06)	(0.06)	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.02)
ADD: Blantyre	-0.04*	-0.04**	-0.01	-0.01	-0.31***	-0.30***	0.00	0.00	0.00	0.00	0.01	0.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.06)	(0.05)	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.02)
Urban	0.31***	0.31***										
	(0.02)	(0.02)										
categorical variable for season cycle		0.06***		0.06***		0.08***		0.06***		0.07***		0.06***
		(0.00)		(0.00)		(0.01)		(0.01)		(0.00)		(0.00)
Constant	10.47***	10.25***	10.52***	10.31***	10.43***	10.23***	10.92***	10.63***	10.57***	10.37***	10.56***	10.34***
	(0.05)	(0.05)	(0.06)	(0.06)	(0.13)	(0.13)	(0.15)	(0.15)	(0.06)	(0.06)	(0.08)	(0.08)
Observations	11032	11032	9601	9601	1431	1431	1637	1637	4219	4219	5176	5176
R-squared	0.47	0.49	0.43	0.45	0.51	0.53	0.41	0.43	0.50	0.52	0.47	0.48

Note: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.