Public Policy and Administration Research
ISSN 2224-5731(Paper) ISSN 2225-0972(Online)
Vol.5, No.11, 2015

Government Food Pricing Preferences and its Determinants in Malawi

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Abstract
Political preference function (PPF) approach was used to estimate the political weights of maize producers and consumers. The weights indicate the political power to influence policy or willingness of policy makers to redistribute income towards either of the two groups. The results show that consumers have a higher political weight than producers indicating that policy makers favor consumers in considering food pricing policy. For comparison purposes a relative political weight was calculated as a ratio of producer to consumer weight. The determinants of this relative weight were analyzed using an ARIMA model to develop a framework that can be used to predict future direction of policy maker preferences. From the model it was observed that the relative influence of producer to consumers responds to changes in the ratio of agriculture to non-agricultural sector per capita income and the real maize price.
Keywords: political preference function, maize, producer influence, political power

1. Introduction

Government is the most powerful player in the agricultural policy networks in Malawi (Aberman, et al., 2012). Government intervention in the maize sector is partly influenced by the incumbent's desire to transfer government resources to his/her supporters (Phiri & Edriss, 2013). As such, using the efficiency criteria alone cannot sufficiently explain government intervention in agriculture, rather the decisions are endogenous and are likely manipulated by interest groups. Apart from vested interest it is reasonable to expect government also responds to changes in the macro economy. Macroeconomic changes create unfavorable effects in the agricultural sector arousing political concerns (Kwon, 1989). This provides a concept that macroeconomic changes create political influence on formation of agricultural policies. It is therefore important to know how they can impact on the willingness of government to redistribute incomes amongst various interest groups. As Johnson and Birner (2013) noted, for policy researchers to become more relevant in the policy process, it will require them to become more familiar with the local realities involving the political and socio economic state of affairs in Malawi. In this study,a political macro economy model, which focuses on the relationship between economic variables and political aspects of maize policy, was developed. The aim is to provide information on why and how the formation of maize pricing policy evolves in relation to economic changes. If political willingness to change policies adjust to changes in the economy, then this will provide a framework for determining desired policy reforms (Kwon, 1989).

2. Methodology

2.1 Approach to measuring political power

The political preference function (PPF) approach was used to estimate the influence of consumers, producers. The PPF approach is based on the assumptions that a group's voting behavior is related to its economic well-being and that policy-makers are primarily concerned with attaining and/or maintaining power. It acknowledges the influence of political agents and groups in the policy process by the assumption that an abstract policy maker maximizes a weighted objective function subject to economic constraints (Swinnen and van der Zee, 1993). There are three general approaches to obtaining weights of a PPF; the direct approach by interviewing policy makers, the indirect revealed preference approach, and the arbitrary approach.

The direct alternative involves interviewing central decision makers. Target respondents are individuals and groups who seem likely to significantly influence the final outcome of the policy bargaining process, and the objectives and preference functions of these individuals and groups. There are at least two major problems confronting the interview approach. First, there is some doubt about whether political decision makers are prepared or even able to articulate their preferences in detail. In part, successful bargaining places a premium on not revealing one's true preferences. Furthermore, preferences may be imperfect and change in response to new information obtained during the bargaining process. Second, the interview procedure is costly and it may be difficult to obtain access to central decision makers.

The indirect alternative that uses policy preference functions to infer weights from decisions that have been made in the recent past. These procedures treat as givens the mathematical form and arguments of the preference function and a known econometric model describing the economic sector of interest, and they assume the policy maker is rational and consistent preference function maximization. In the arbitrary approach a researcher chooses weights according to his/her own belief.

In this study, the indirect approach was adopted and assumed that policy makers adopt the following PPF.

$$Max.\ \ PPF = PS\ (a_i) * \omega_p + CS\ (a_i) * \omega_c + B\ (a_i) * \omega_g \quad (1)$$

Where PS, CS and B denote producer surplus, consumer surplus, and Government budget respectively for each commodity examined. The term $\mathbf{w_p}$, and $\mathbf{w_c}$ are the political weights of respective producer groups and the aggregate consumer, respectively. Substituting formulas for PS, CS and B in the (1) yields

$$Max\ PPF = w_p \int_{pw}^{pp} S(P)\,dP - w_c \int_{pw}^{cp} D(P)\,dP + w_g \{CP * D(CP) - PP * S(PP)\} \quad (2)$$

Where PP and CP are consumer and producer price for maize and are policy variables that must be decided each year. Then the optimal pricing policy can be obtained by differentiating the PPF with respect to the prices.

$$\frac{\partial PPF}{\partial PP} = S(PP)(w_p - w_g) - S(PP) * w_g(PP - PW) = 0 \quad (3)$$

$$\frac{\partial PPF}{\partial CP} = D(CP)(w_g - w_c) + D(CP) * w_g(CP - PW) = 0 \quad (4)$$

In addition, additional normalization equations such the $w_p + w_c + w_g = 3$ were used and set the $w_g = 1$ because our interest is to compare the influence of consumers and producers. Once the functional forms for the political weights have been establisehd, the formulas for describing endogenous domestic maize prices for producers and consumers were derived. Arranging the above first order conditions (3) and (4),equations for endogenous price determination were derived, and subsequently formulas for optimal price wedges from which political weights can be calculated.

$$\gamma = \frac{PP - PW}{PP} = \{(w_p - w_g)/w_g\} * (1/\epsilon) \quad (5)$$

$$\infty = \frac{CP - PW}{PP} = \{(w_c - w_g)/w_g\} * (1/\cap) \quad (6)$$

Prior knowledge of price elasticity of demand ($\cap$) and supply (ϵ) and the setting of government weight to equal one ($w_g = 1$) makes the political weight of producers and consumers the only unknown parameters in equation (5) and (6) respectively. The weights can then be easily estimated using data from the period under consideration. Elasticities used in this study were obtained from previous empirical work. Kumwenda (1991) estimated the supply response of maize using the Nerlove partial adjustment framework and reported a price elasticity of supply (ϵ) of 0.1. Ecker and Qaim (2008) used the Quadratic Almost Ideal Demand System to estimate the income and price elasticities of food demand and nutrient consumption in Malawi. A price elasticity of demand ($\cap$) of -0.487 reported in this study. After calculation of the weights,t the hypothesis that $w_c = w_p = 1$ was tested and that the $w_c \neq w_p$.

An Autoregressive Integrated Moving Average (ARIMA) model is then fitted to the data to determine factors that affect the relative influence of the interest groups. An ARIMA model is then fitted to the data to determine factors that affect the relative influence of the interest groups. The ARIMA model developed by Box and Jenkins (1976) has become popular due to its advantages of power and flexibility

$$X_t - \sum_{i=1}^{p} \emptyset_i X_{t-i} = a_t - \sum_{j=1}^{q} \vartheta_j a_{t-j}$$

Where Ø and ϑ are model parameters; p and q are the orders of the Auto Regressive (AR) and Moving Average (MA) processes respectively. If the B operator such as $X_{t-1} = BXt$ is introduced, the general form of an ARMA model can be written as:

$$\emptyset(B).X_t = \theta(B).a_t \quad (8)$$

Estimation of this model requires some conditions to be verified: the series must be stationary and ACF and PACF must be time independent. Variance non stationarity can be removed if the series is transformed with the logarithmic function. Mean non-stationarity can be removed using the operator $\nabla = 1 - B$ applied d times in order to make the series stationary. Such transformations lead to an ARIMA model:

$$\nabla^d \emptyset(B).X_t = \vartheta(B).a_t \quad (9)$$

The above model is a univariate ARIMA model because it contains only one variable, depending on its past values. Starting from a univariate ARIMA model, some explanatory (or independent) variables can be inserted. In this case, the dependent variable X_t depends on lagged values of the independent variables. The lag length may sometimes be known a priori, but usually it is unknown and in some cases it is assumed to be infinite. Generally, for one dependent variable and one explanatory variable the model has the form:

$$X_t = \alpha + \beta_0 y_t + \beta_1 y_{t-1} + \cdots + \beta_p y_{t-p} + \varepsilon_t \quad (10)$$

where p is the lag length. Such model is called finite distributed lag model, because the lagged effect of a change in the independent variable is distributed into a finite number of time periods. To compute p, these sequential hypotheses can be set up:

$$H_0^i : P = M - i \rightarrow \beta_{M-i+1} = 0 \quad (11)$$

where M is an upper bound. The null hypotheses are tested sequentially beginning from the first one. The testing sequence ends when one of the null hypotheses of the sequence is rejected for the first time. To assess the *i*-th null hypothesis the test can be written as:

$$\lambda_i = \frac{SSE_{M-i} - SSE_{M-i+1}}{\hat{\sigma}^2_{M-i+1}} \quad (12)$$

where SSE(.) is the sum of the square errors for a tested lag length. λ_i is F distributed with 1 and (N-M+i-3) degrees of freedom if $H_0^1, H_0^2, \ldots, H_0^i$ are true; N being the sample size of the dependent variable. The lag length being computed, the explanatory variable can be inserted in the univariate model to derive the so-called multivariate Autoregressive Integrated Moving Average model with exogenous variables (ARIMAX). In the general case of more than one explanatory variable, the model is written as:

$$\nabla^d \Phi(B) . X_t = \vartheta(B)_t . a_t + \sum_{j=1}^{k} \sum_{i=0}^{p_j} \beta_{t-j}^{(j)} y_{t-i}^{(j)} \quad (13)$$

Where: $y_{t-i}^{(j)}$ is the j[th] independent variable at time (t-i) and $\beta_{t-j}^{(j)}$ is the corresponding parameter.The dependent variable is ratio of consumer weight to the producer weight expressed mathematically as

$$W = w_p / w_c \quad (14)$$

Where W is the ratio, W_c is the consumer weight and W_p is the producer weight. The weight ratio (W) can be interpreted as the relative influence or power of the consumers to producers (Ochmeke & Yao, 1990). The null hypothesis was tested that relative influence of the interest groups is affected by changes in real prices of maize, self-sufficiency ratio and income ratio.

The real price (RP) is the average consumer price of maize deflated by the food price index. It was envisaged a positive relationship between RP and the dependent variable because governments are concerned guaranteeing less expensive food for the politically volatile urban populations in Africa (Maxwell, 1999).

Food or maize sufficiency has been a central objective for the Malawi government since pre independence (Kumwenda & Phiri, 2010). Self-sufficiency (SSR) as a ratio of domestic production to domestic consumption was measured and postulated a negative relationship with W. If the SSR declines, government is expected to implement policies that favor producers to boost production.

Majority of Malawians (>80%) are employed in the agribusiness sector (NSO, 2009). Declining incomes in the agricultural sector mean a reduction in welfare of the population. An income per capita ratio (IR) of agriculture to other sectors was calculated. A negative relationship with W is hypothesized as we expect the government to intervene when the income disparities worsen.

2.2 Data Properties

Data used in the study were collected from secondary sources. These included National Statistical Office (NSO), Ministry of Agriculture, Irrigation and Water Development (MoAIWD) and FAOSTAT. Table 2.1 presents a summary of the variables used in the estimation of political weights and the relative influence model. The SSR shows that on average domestic production in Malawi meets the maize consumption needs. However, in drought years' production usually falls critically below demand. For instance, the lowest SSR was in 1992 when a major drought reduced maize production by half such that production could only cover 48% of the domestic production. The income ratio points to a large discrepancy between per capita incomes in the agriculture and other sectors. The ratio ranged from 7% to 19% in the years between 1970 and 2010. Agricultural sector in Malawi is characterized by limited value addition. Unprocessed products fetch low prices and keep Agriculture GDP low. On the contrary, the other sectors of the economy produce high value products.

The conspicuously large difference (US$56/ton) between consumer and producer prices can be attributed to two reasons. First, in the earlier year 1970 – 1987 when pricing was government controlled. The producer prices were set very low to cover the operational costs of ADMARC while at the same time providing low cost food to the urban consumers (Phiri, 1993). Secondly, producers usually sell at harvest time (May – July) when the supply is high and the price is low whilst consumers buy all year round including the lean months (December – April) when supply is low and prices are very high.

Table 2.1: Descriptive statistics

Variable	n	Mean	Std. Dev	Min	Max
Sufficiency Ratio (SSR)	41	112.13	23.79	48.07	142.81
Income Ratio (IR)	41	0.13	0.03	0.07	0.19
Producer Price (US$/ton)	41	82.84	44.56	31.81	232.56
Consumer Price (US$/ton)	41	138.38	69.85	48.23	387.32

Source: Own calculation

3. Results and Discussion

3.1 Political Preference Function

The classical food policy dilemma of producers demanding high farm gate prices while consumer seeking affordable food prices comes into play (Nyoro, et al., 2009). With the two groups involved in bargaining battle to achieve policies that favor their respective group, actions taken by government can be viewed as a direct result of the lobbying game. The bargaining or lobbying game is regarded as a zero sum game in the sense that consumers and producers compete for a relatively larger share of benefits from a given economic pie (Kwon, 1989). The power or influence of interest groups, consumer and producers, to affect policy outcome in their favor was measure using from political weights. The computation of political weights was done by maximizing the PPF. The estimated political weights are shown in Figure 3.1.

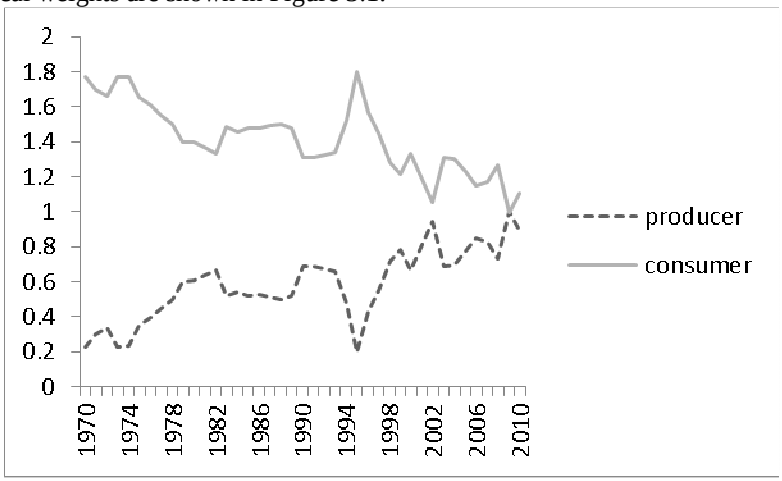

Figure 0.1 Producer and consumer weights 1970-2010
Source: Own calculation

Generally, political weights of consumers have been higher than those of producers. The average weights were 1.42 and 0.58 for consumers and producers respectively. A null hypothesis that $w_c = w_p$ i.e. mean difference is zero was tested. Results in Table 3.1 show that the two means are significantly different $p<0.01$. The individual means weights were also significantly different from the base value of 1. As a result, the null hypothesis was rejected that politics doesn't influence maize policy. The rejection of the null hypothesis implies that politics exert an influence on the maize price policy outcome.

Table 3.1: Mean differences between consumer and producer weight

Null hypothesis	N	Mean	Std error	T statistics	p-value
$\overline{w_c} = 1$	41	1.42	0.03	-13.22	0.0000
$\overline{w_p} = 1$	41	0.58	0.03	-13.22	0.0000
$\overline{w_c} = \overline{w_p}$	41	-0.83	0.04	-18.69	0.0000

$\overline{w_c}$ and $\overline{w_p}$ are means for the consumer and producer weights respectively

3.1 Relative political influence of groups

Since there are only two groups in the study playing in a zero sum game, an increase in producer weight mean a decline in consumer weight by a similar magnitude and vice versa. We calculated relative influence/political power/political weight (W) of the two interest groups was measured by the ratio of the producer to consumer weight (w_p/wc). It is presented as a proportion of the power exerted by consumers relative political power of producers.

The relative political power was lowest in 1970s. Eicher (1982) observed that in the late 1970s, the combination of unprecedented rates of rural/urban migration and agricultural stagnation in sub Saharan Africa gave rise to serious concerns over maintaining the supply of food to politically volatile urban populations. Consequently, the Malawi government adopted more favorable policies towards maize producers. Since maize production was encouraged to feed the growing urban population consumers maintained higher levels of influence despite the gain from the producers.

The rise in producer power was slow in the 1980's. Following the adoption of Structural Adjustment Programs (SAPs) in 1981, agricultural strategy in Malawi was dictated by the Structural Adjustment Loan (SAL) conditions. With advice from the World Bank, Malawi government fixed the price of maize from 1984 to 1987 to create disincentives for maize production. Maize producers had little influence on policy outcome during this period. However, the declining production which was caused by unfavorable maize input and output pricing policy forced government to unilaterally abandon the loan conditions and announce increases in prices in 1987 (Phiri, 1993). This coincided with the liberalization of the markets and price decontrols.

In the early 1990s, a number of key events took place. First, both government and World Bank realized that there was need to increase agricultural production if economic growth was to be achieved (Kumwenda and Phiri, 2010). Secondly, Malawi changed from one party autocratic rule to multiparty democracy and this led to the election of a new president and government in 1994. Farmers who form the majority of the electorate gained political power as candidate seek to amass political support. Consequently, the observed relative power declined between 1990–2010. . However, the fluctuations observed during this period suggest that economic variables also affect the relative influence of the two interest groups. For instance, in 1996 the relative influence declined to 0.11 while in 2002 and 2009 rose to over 0.80.

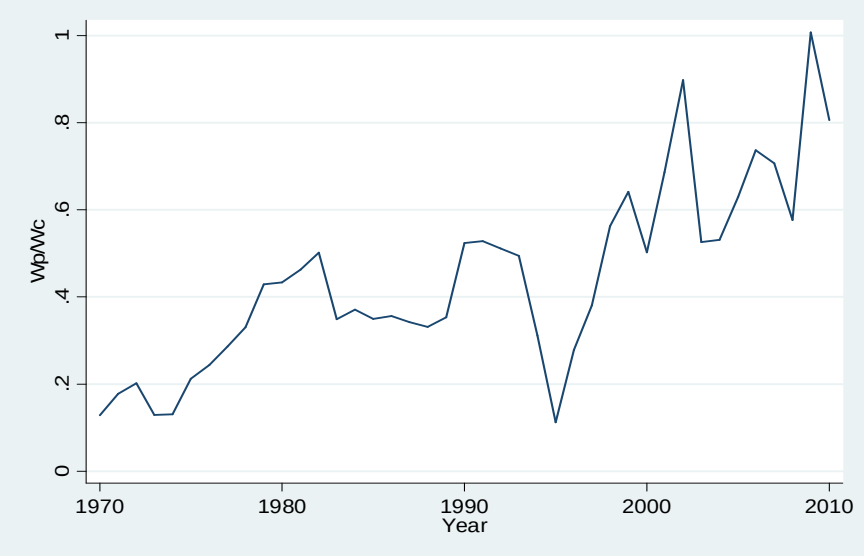

Figure 0.2 Relative political power of producers to consumers
Source: Own calculations

3.3 Effect of economic variables on relative political weight

Macroeconomic changes or performance determines the need for policy reform. This study considered political weights to represent the political filter through which macroeconomic forces are able to link to policy changes (Kwon, 1989). This implies that the weights are endogenous and depend on the prevailing economic and political factors. An ARIMA model was fitted to the data to analyze the effect of changes in economic variables on the relative influence of consumers on price policy outcome. In theory a wide range of variables exist that affect the political power of interest group. However, few variables were selected to ensure that the model is parsimonious. Relative influence was regressed on its past values Lag_1_W, Lag_2_W, Self Sufficiency Ratio (SSR), Income ratio (IR), and Real Producer Prices (RP). In order to avoid misleading results, time series variables must be stationary. Augmented Dickey Fuller (ADF) test was used for the presence of unit root. The results of the ADF test in Table 3.2 show that all variables were integrated of order 1. That is differencing the series once led to the rejection of the null hypothesis of unit root at 1% level of significance.

Table 3.2: ADF test results

Variable	Test Statistics	Critical Value	P-value
W	-2.016	-2.964	0.2794
SSR	-2.095	-2.964	0.2467
IR	-1.905	-2.978	0.3299
RP	0.819	-2.964	0.9919
D_W	-4.393	-2.966	0.0003
D_SSR	-5.454	-2.966	0.0000
D_IR	-4.472	-2.980	0.0002
D_RP	-4.542	-2.619	0.0002

Table 3.3 shows that the relative influence is affected by the real price and income ratio of rural to urban consumers. The negative coefficient on real prices entails that increases in real consumer price results in a gain in consumer political influence. This implies that government moves in to protect consumers when the real price of maize has increased. As it was expected, the coefficient on income was negative. The declining income ratio means that the gap between rural and urban incomes is widening. Under such circumstances, government is more willing to implement policies that will boost incomes in the agricultural sector. Self Sufficiency Ratio is the proportion of domestic production to consumption. This was found to be negatively related to W implying that as the Malawi is becoming less self sufficient in maize. However, the effect of the SSR was statistically insignificant at 5% (P>0.05). Most likely because government often times uses the input policy as opposed to price policy to increase production of maize.

Table 3.3: Political weight ratio model results

Variable	Coefficient	Std error	P-value
D_RP	-0.0897751	0.0258035	0.001***
D_SSR	0.0004289	0.0004535	0.344
D_IR	-0.0065968	0.0038607	0.088*
Lag_1_W	-0.2418678	0.3680714	0.311
Lag_2_W	-0.2966639	0.2504711	0.236
Sigma	0.0286232	0.0042636	0.000

Wald chi2 (5) = 16.16 prob> chi2 = 0.0064

3.Conclusion

The objective of the study was to determine the political power or influence that interest groups have on maize policies in Malawi. Using weights derived from a Political Preference Function, two hypotheses were tested. First whether agricultural policy is endogenously determined through political powers of various interest groups. Secondly, the effect of economic variables on the relative power of the interest group was tested. The analysis focused on the political power of consumers and producers on the maize prices in Malawi. The results from this study revealed that price policies are endogenously determined and that consumer and producers have different levels of power. In general, consumers have more power than producers but over the years the difference has narrowed. Evidence from the ARIMA model shows that the political power varies with changes in maize prices and income.

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