Food Consumption Patterns and Household Welfare in Eswatini: An Empirical Analysis Using Household Survey Data

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Abstract: This paper analyzes the food consumption patterns of poor and non-poor rural households in Eswatini using the Quadratic Almost Ideal Demand System (QUAIDS) model to derive the estimates of price and expenditure elasticities for seven major food commodities. The derived elasticities are used in estimating the distributional welfare effects of a 43% price increase for maize using the compensating variation approach. The results of the study indicate that majority of the food items are demand inelastic with meat and dairy exhibiting elasticities greater than one, while maize is the least responsive to both price and expenditure. The results further show that high maize prices have a negative effect on poor households who generally spend more on maize to supplement their consumption requirements. Therefore, policy strategies that focus on expanding agricultural production and diversification of production activities especially at the household level can raise rural household income, lower the price of maize and ultimately improve food consumption for rural households. Moreover, this will insure net-buying households against market risks by lowering high reliance on the market and enable more consumption from own production. This study makes an important empirical contribution by providing useful insights on the estimates of demand elasticities for major food items consumed, taking into account that little attention has been devoted to empirical analysis of food consumption behavior in Eswatini.

Key words: Consumption patterns, food prices, maize, QUAIDS model, Eswatini.

1. Introduction

Eswatini is a middle-income country with 63% of the population living below the national poverty line and food insecurity is rising especially in the rural areas where nearly 80% of the population resides. Moreover, nearly 26% of children under five suffer from chronic malnutrition [1]. Most important is that food expenditure accounts for more than 50% of household budget, and even higher for the poor [2]. This highlights the fact that poverty reduction, hunger and food security are major policy issues in the country despite the middle-income country status that Eswatini holds. Access to adequate food supplies remains a serious issue for poor households, partially attributed to declining household incomes,

high unemployment rates, and the existing inefficient marketing and pricing policies that work against poor consumers [3]. All of these factors have important implications for food and nutrition security.

Being the major determinant of food security, access to food is influenced by market prices and available income. Changes in the structure of demand are the major determinant of observed variations in market prices as production is inflexible in the short run. In this case, a thorough knowledge on food consumption behavior is important in understanding household responses to price and income changes. This is paramount in guiding public policy debate, particularly dealing with food security issues. Apart from informing policymakers on how consumers or households make their food purchasing decisions, food demand studies are important in

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evaluating the impact of certain policies on food consumption and household welfare [4]. This is of importance taking into account that the domestic food policy in Eswatini has been linked to high and rising food prices, especially maize and maize meal prices and the fact that the country regularly imports approximately 40% of its major staple, maize. Moreover, consumption of other essential food items including rice and wheat is also met through imports, making the price of basic staples to be increasingly important for food security and household welfare in the country.

While a surge in empirical studies on food consumption behavior [5-9] has been observed over the years in other countries, little attention has been devoted to understanding food consumption patterns in Eswatini. Empirical evidence available on food demand in the case of Eswatini includes cross-country studies [10, 11], where Eswatini was part of the countries analyzed. These studies made use of the Florida-Preference Independence and Florida-Slutsky demand models as well as applied international comparison program data for the analysis. The use of such data does not allow incorporation of household characteristics in order to account for the heterogeneity in demand responses that exists among households with different socioeconomic characteristics, as this requires the use of household survey data. In particular, it has been demonstrated that low-income households are more price responsive than those with high incomes, owing to the fact that food is typically a larger share of expenditures for low-income households. Accounting for such differences is critical in the formulation of targeted food policies which would ideally target specific households to improve for instance their food access and nutritional status. Well-targeted food security interventions crucially depend on accurate information on household behavior.

In addition, a large number of studies on the implications of food price changes on household

welfare have since been conducted following the 2007/2008 price spike in global food prices of major staples. Yet, there is a lack of empirical studies on the same subject in the case of Eswatini. This is also despite the recent severe drought conditions experienced in the Southern African region, which have resulted in extreme food price increases domestically. In particular, the drought conditions resulted in a 43% price increase in maize meal [12] and in the same period, food inflation increased by 13.4%, mainly driven by an increase in the price of maize [13]. As a major food commodity, maize accounts for 64% of caloric intake [14] and is grown by more than 80% of rural households. Previous studies on the impact of food price increases on household welfare show that food price increases lower household purchasing power especially for the poor who typically spend more of their income on food, pushing a number of people deeper into poverty [15-20]. In particular, price increases of basic staples have negative implications on household welfare. However, this is dependent on the extent of price transmission, whether households are net buyers or net sellers and the budget share devoted to the basic staple. In the case of Eswatini, statistics indicate that net selling households account for only 16% of the rural population with nearly 80% of rural and urban poor being net purchasers of maize [21]. This may suggest that a higher share of the population is negatively affected by high maize prices. Further, a high degree of transmission of international prices to the domestic maize market has been established [22], signifying that severe price spikes experienced globally and in the major import market, South Africa, have a far-reaching impact on a higher percentage of the population who are net buyers.

The present study therefore, analyses food consumption patterns for poor and non-poor rural households in Eswatini using a Quadratic Almost Ideal Demand System (QUAIDS) model to obtain the estimates of price and expenditure elasticities for

seven major food commodities. The estimated elasticities are subsequently used to evaluate the distributional effects of maize price increases on household welfare. The compensating variation approach is applied to estimate the gains or losses resulting from maize price increases following the recent drought conditions. To that effect, this study makes an important empirical contribution by providing useful insights on the estimates of demand elasticities through the use of a QUAIDS model, which has not yet been employed in the case of Eswatini. The model is enhanced to account for zero consumption. Besides the use of a QUAIDS model, the study contributes by analyzing food consumption patterns between poor and non-poor rural households as well as evaluates the welfare effects through the use of the compensating variation approach. A study that provides differentiated estimates of food demand elasticities including household level effects of maize price changes will help in identifying suitable interventions that can improve household consumption behavior in Eswatini.

2. Materials and Methods

2.1 Food Consumption Behavior

In analyzing household food demand behavior, single linear demand equations and complete demand systems have been widely documented and used to derive price and income or expenditure elasticities. However, complete demand systems have gained importance in the quantitative estimation of food demand elasticities. In particular, the Almost Ideal Demand System (AIDS) model has received considerable attention in consumer demand studies because of a number of its desirable demand properties and the fact that it is relatively easy to estimate [23]. However, it makes the restrictive assumption that expenditure elasticities are constant at all levels of expenditure, thus not adequately describing the relationship between demand and total expenditure. As a result, the QUAIDS model was

developed to enable the use of non-linear Engel curves [24]. This study also employs the QUAIDS model.

The QUAIDS model is based on following indirect utility (V) function:

$$\ln V = \left(\left[\frac{\ln x - \ln a(p)}{b(p)} \right]^{-1} + \lambda(p) \right)^{-1} \quad (1)$$

where x is total expenditure, p is a vector of prices, $a(p)$ is a function that is homogenous of degree one in prices, and $b(p)$ and $\lambda(p)$ are functions that are homogeneous of degree zero in prices. The terms $a(p)$ and $b(p)$ are translog and Cobb-Douglas price aggregators, as specified in the AIDS model. They are defined as follows:

$$\ln a(p) = \alpha_0 + \sum_{i=1}^n \alpha_i \ln p_i + \frac{1}{2} \sum_{i=1}^n \sum_{j=1}^n \gamma_{ij} \ln p_i \ln p_j \quad (2)$$

$$b(p) = \prod_{i=1}^n p_i^{\beta_i} \quad (3)$$

$$\lambda(p) = \sum_{i=1}^n \lambda_i \ln p_i \quad (4)$$

where $i = 1, \dots, n$ represent commodities.

In the above equations, p_j and x represent the price of commodity j and total consumption expenditure, respectively.

The corresponding expenditure function in logarithm to Eq. (1) is given by:

$$\ln X = \ln a(p) + \frac{b(p)}{[\ln V]^{-1} - \lambda(p)} \quad (5)$$

Application of Roy's identity to the utility function in Eq. (1) or Shephard's lemma to Eq. (5), gives the share equations as follows:

$$w_{ih} = \alpha_i + \sum_{j=1}^n \gamma_{ij} \ln p_j + \beta_i \ln \left[\frac{x_h}{a(p)} \right] + \frac{\lambda_i}{b(p)} \left\{ \ln \left[\frac{x_h}{a(p)} \right] \right\}^2 + \varepsilon_i \quad (6)$$

where w_i is the budget share of commodity i in household h , x is the total food consumption, α_i , β_i , γ_{ij} , λ_i are coefficients to be estimated from the full demand system of equations, and $a(p)$ and $b(p)$ are price indices as defined above. When $\lambda = 0$, the QUAIDS model reduces to the AIDS model. This can be tested based on the statistical significance of λ or

other statistical tests such as the likelihood ratio (LR) test, Wald test, etc.

For the model to be consistent with demand theory, certain theoretical restrictions derived from economic theory have to be imposed on the QUAIDS parameters. These include adding-up, homogeneity and symmetry of the Slutsky matrix restrictions. Adding up implies that the sum of the budget shares equals one. The homogeneity restriction expresses the prediction that the demand functions are homogenous of degree zero in prices and income. For homogeneity to hold, the price index $a(p)$ must be homogenous of degree one in prices and expenditure and $b(p)$ homogenous of degree zero. Symmetry ensures that the Slutsky symmetry would hold true. The restrictions are imposed as follows:

Adding-up:

$$\sum_{i=1}^n \alpha_i = 1; \quad \sum_{i=1}^n \gamma_{ij} = 0; \\ \sum_{i=1}^n \beta_i = 0; \quad \sum_{i=1}^n \lambda_i = 0 \quad (7)$$

Homogeneity:

$$\sum_{j=1}^n \gamma_{ij} = 0 \quad (8)$$

Symmetry:

$$\gamma_{ij} = \gamma_{ji} \quad (9)$$

These conditions are satisfied by dropping one of the budget-share equations ($n - 1$) from the system and recovering the parameters of the omitted equation from the estimated equations by exploiting the adding-up and homogeneity restrictions.

It has been noted that one major problem in cross-sectional data is the problem of zero expenditure whereby, some goods are not consumed by households. This arises due to imperfect recall, permanent zero consumption, zero consumption during the survey period and optional zero consumption [9]. Zero expenditures result in biased demand estimates if included. To correct for zero expenditures, this study adopts the two-step approach [25], originally introduced by Ref. [26] and based on

Ref. [27]. It involves the estimation of a probit model on the probability of purchase after which the standard normal cumulative distribution function (cdf) and the probability density function (pdf) are estimated for the different food equations. Cdf and pdf are then used as additional explanatory variables in the second stage estimation to correct for zero expenditure.

This is modelled in the system of equations with limited dependent variables as follows:

$$w_{ih}^* = f(x_{ih}, u_i) + u_{ih}, d_{ih}^* = D_{ih}^* \theta_i + v_{ih} \\ d_{ih} = 1 \text{ if } d_{ih}^* > 0 \text{ \& } 0 \text{ if } d_{ih}^* \leq 0 \quad (10)$$

then,

$$w_{ih} = d_{ih} w_{ih}^* \quad (11)$$

where i and h are respectively index commodities and households, w_{ih} is the observed expenditure share of good i , d_{ih} is the indicator of whether household h consumed the i^{th} commodity and takes the value of one if household consumes a commodity; w_{ih}^* and d_{ih}^* are the corresponding latent variables; D_{ih} is vectors of explanatory variables; μ_i and θ_i are vectors of parameters and u_{ih} and v_{ih} , are random disturbances. Two main difficulties are identified with estimating the above equation [25]. First, representing w_i by a continuous distribution is likely to be inappropriate in the case where a considerable fraction of w_i are zero; second, the presence of cross-equation correlation of error terms imply that the likelihood function will involve multiple integrals thus making direct maximum likelihood estimation of Eq. (10) complex.

To solve the inconsistencies, a multivariate probit regression is estimated in the first step of the two-step procedure [25]. The multivariate probit estimates the probability that a household will consume a commodity under consideration and expresses the dichotomous choice problem as:

$$d_{ih} = \theta_0 + \sum_j \theta_{ij} \ln P_j + \theta_x \ln x_h + \sum_k \theta_{ik} Z_{kh} + \mu_i \quad (12)$$

where $d_{ih} = 1$ if the household consumes the i^{th}

commodity and 0 if the household does not consume the said commodity; Z_{kh} are household demographic variables. Eq. (12) is estimated for all the seven commodities.

Conditional on the decision to consume the good i , Ref. [25] define the second-stage regression as follows to estimate consistent parameters of QUAIDS:

$$w_{ih}^* = \Phi(z_{ih}\theta_i)f(x_{ih}, \mu_i) + \delta_i\phi(z'_{ih}\theta_i) + e_{ih} \quad (13)$$

where Φ and ϕ are the pdf and cdf obtained from the multivariate probit model by using Eq. (12) in the first step where the probability that a household will consume a certain commodity under consideration is estimated.

Finally, the estimated demand equations of QUAIDS modified to correct for zero consumption is as follows:

$$w_{ih} = \Phi(z'_{ih}\theta_i) \left[a_i + \sum_{j=1}^n \gamma_{ij} \ln p_j + \beta_i \ln \left[\frac{x_h}{a(p)} \right] + \frac{\lambda_i}{b(p)} \left\{ \ln \left[\frac{x_h}{a(p)} \right] \right\}^2 \right] + \delta_i \phi(z'_{ih}\theta_i) + \varepsilon_i \quad (14)$$

As indicated [24], the budget share in Eq. (14) is differentiated with respect to $\ln x$ and $\ln p$ to derive expenditure and price elasticities:

$$\mu_i = \frac{\partial w_{ih}^*}{\partial \ln x} = \Phi(z'_i \theta_i) \left[\beta_i + \frac{2\lambda_i}{b(p)} \left[\ln \left(\frac{x_h}{a(p)} \right) \right] \right] \quad (15)$$

and

$$\mu_{ij} = \frac{\partial w_{ih}^*}{\partial \ln p_j} \Phi(z'_{ih}\theta_i) \left[\gamma_{ij} - \mu_i \left[\alpha_j + \sum_{i=1}^n \gamma_{ij} \ln p_i \right] - \frac{2\lambda_i \beta_j}{b(p)} \left\{ \ln \left[\frac{x_h}{a(p)} \right] \right\}^2 \right] \quad (16)$$

The conditional expenditure elasticities are then derived as follows:

$$e_i = 1 + \frac{u_i}{w_{ih}^*} \quad (17)$$

These are greater than one when the level of expenditure is low and less than one when the total expenditure increases.

The uncompensated price elasticities are computed

as follows:

$$e_{ij}^u = \frac{\mu_{ij}}{w_{ih}^*} - \delta_{ij} \quad (18)$$

where δ_{ij} is the Kronecker delta equal to one when $i = j$, and zero otherwise.

The compensated price elasticities are computed from the Slutsky equation as:

$$e_{ij}^c = e_{ij}^u + w_j e_i \quad (19)$$

The demand system was estimated using the Non-linear Seemingly Unrelated Regression model in STATA as suggested [28, 29], with the theoretical restrictions imposed during estimation.

2.2 Evaluation of Welfare Effects

To evaluate the welfare effects, the study uses the compensating variation approach in order to estimate the income gains or losses accrued to households following a maize price spike. The compensating variation is a monetary welfare measure which measures the amount of money required to leave a household as well off as before a price change. The study takes into account that a price change influences both the consumption and production side since maize is a widely consumed as well as produced food commodity in Eswatini. This is typical for many rural households in developing countries like Eswatini. Moreover, the study considers that households might revise their consumption and production decisions following a price change.

The compensating variation can be expressed as follows:

$$CV = [e(p_1, u_0) - e(p_0, u_0)] - \pi(p_1, u_0) \quad (20)$$

where, $e(\cdot)$ is the expenditure function, p is the vector of prices, μ is the utility level and $\pi(\cdot)$ is the profit function. Subscripts 0 and 1 refer to before and after a price change.

Eq. (20) can be approximated using second-order Taylor expansion as follows:

$$\begin{aligned}
 CV = & \sum_{i=1}^n w_{ih}(\Delta p_{ci}) - pY_i/x_0(\Delta p_{pi}) \\
 & + \frac{1}{2} \sum_{i=1}^n \sum_{j=1}^n w_{ih} \varepsilon_{ij} \Delta p_{ci} \Delta p_{cj} \\
 & + \sum_{i=1}^m \sum_{j=1}^m \psi_{ij} \Delta p_{pi} \Delta p_{pj}
 \end{aligned} \tag{21}$$

where, w_i is the budget share of commodity i , pY_i/x_0 is the value of production as a proportion of household expenditure, ε_{ij} is the compensated price elasticity of demand for i with respect to j and ψ_{ij} is the price elasticity of supply for i with respect to j . The elasticities capture household's behavioral responses in terms of demand and supply.

By dividing Eq. (21) by the original income in order to express the welfare effects as a share of household income, the following expression is provided:

$$\begin{aligned}
 \frac{CV}{x_0} = & \sum_{i=1}^n (PR_i \Delta p_{pi} - CR_i \Delta p_{ci}) + \frac{1}{2} \sum_{i=1}^n \sum_{j=1}^n w_{ih} \varepsilon_{ij} \Delta p_{ci} \Delta p_{cj} \\
 & + \sum_{i=1}^m \sum_{j=1}^m \psi_{ij} \Delta p_{pi} \Delta p_{pj}
 \end{aligned} \tag{22}$$

CR and PR are simply the production and consumption ratios. Eq. (22) suggests that the degree of the impact on household welfare is determined by the consumption share, production share, the magnitude of the price change and the responsiveness of the household's demand and supply decisions. The first part of Eq. (22): $(PR_i \Delta p_{pi} - CR_i \Delta p_{ci})$ measures the short-run effects of food price changes.

For evaluation of the welfare implications to be made possible, the following assumptions have to be taken into consideration. Only own price responses for maize are considered, thus there are no cross-price effects or possible changes in wages. Also, the study assumes that the proportional change in the consumer price is similar to the producer price. The price elasticity of demand is estimated in this study while the supply elasticity is adapted from Ref. [30], this is 0.33. The study also assumes a larger supply response

of 0.65 instead of 0.33, keeping the demand elasticity constant.

To account for the distributional welfare effects, the welfare measure is disaggregated by poverty status (poor and non-poor) as well as by net buyers and net sellers considering that a household's market position plays an important role in assessing the welfare effects of food price changes. In recognition that the Eswatini government has limited measures in place to cushion domestic consumers against severe price increases, an alternative policy intervention that might lessen the pressure of high maize prices on households is evaluated. This is done by assuming that the government subsidizes the consumer price by 10%.

2.3 Data Description and Sources

The study uses cross-sectional household survey data that were collected in 2015 from five villages in the Manzini region of Eswatini. The dataset collected provides detailed information on household demographics, production, consumption (food and non-food), resource endowments and information on food prices for commodities consumed. Household food consumption expenditure was reported in terms of quantities from own production, purchased or food aid/transfers (from relatives, government, non-governmental organizations (NGOs), etc) used in final consumption. The data on food consumption were collected on a one-week recall basis. Shorter recall periods are sufficient for household consumption data, as the accuracy of the data is negatively correlated with the length of the recall period. For non-food consumption data, the reference period was either a month or a year.

Moreover, the quantities of goods produced and consumed at home, as well as transfers, were converted into an imputed value using farm gate and community level prices. This is vital in generating household expenditure aggregates. It is also important to consider that own production is accounted for by treating the imputed value as a

negative expenditure. Given that high and rising prices have negative effects on food access, own production lessens the adverse effects of the price increases in the context of food price shocks. Hence, own production should be accounted for. In cases where households could not provide their own prices, unit prices were imputed based on Ref. [31]. The food commodities consumed were aggregated into seven food groups: maize, other cereals (to a large extent wheat and rice), sugar, meat and products, milk and dairy products, fruits and vegetables, and pulses. Fats and oils are not part of the analysis as they constitute an insignificant proportion of household budget, at 1% and less. The construction of the food groups used in this study is partially influenced by previous food demand studies, conducted especially in sub-Saharan Africa (SSA), as economic theory does not provide any guidance on the grouping. A major advantage of the grouping is that it reduces the total number of parameters estimated in the model.

Households were disaggregated into poor and non-poor using a poverty line determined through the cost of basic needs approach [32, 33]. A poverty line based on the level of expenditures is an appropriate proxy for determining how poor a household is,

especially in a developing country setting. Generally, consumption is viewed as more reliable than income mainly because consumption is less prone to seasonal fluctuations and volatility than income, which reduces measurement errors associated with income.

The general approach in deriving the poverty line is to first determine and price a nutritionally adequate food bundle that is a reflection of the actual consumption choices of surveyed households. This food bundle is determined based on gender and age of individual household members, using a calorie-based scale [34], provided in Table 1. Determining the food bundle based on adult equivalent recognises that individual household members have different consumption requirements. Given the household consumption data collected, the poverty line is thus constructed using the bundle of food items that would provide the recommended minimum calorie threshold per adult per day. This is 2,300 kcal for Eswatini [35]. The food bundle therefore provides an estimate of food expenditure required to attain 2,300 kcal. The relevant quantities are then converted into calories using a food nutrition table that presents the calorie value of each food item (Table 2). The resulting food bundle is subsequently converted into monetary value using the average prices collected for each food item.

Table 1 Recommended daily caloric intake by age group.

Age category	Female		Male	
	Equivalence scale	kcal/d	Equivalence scale	kcal/d
0-1	0.33	820	0.33	820
1-2	0.46	1,150	0.46	1,150
2-3	0.54	1,350	0.54	1,350
3-5	0.62	1,550	0.62	1,550
5-7	0.7	1,750	0.74	1,850
7-10	0.72	1,800	0.84	2,100
10-12	0.78	1,950	0.88	2,200
12-14	0.84	2,100	0.96	2,400
14-16	0.86	2,150	1.06	2,650
16-18	0.86	2,150	1.14	2,850
18-30	0.8	2,100	1.04	3,000
30-60	0.82	2,150	1	2,900
Above 60	0.74	1,950	0.84	2,450

Source: FAO, WHO (1985) as published in Ref. [34].

Table 2 Calorie content of selected food items in Eswatini.

Food item	kcal/capita/d
Maize	800
Wheat	600
Rice	300
Sugar	480
Fat & oil	90
Fruits & vegetables	200
Sorghum	71
Pulses	54
Meat	250
Milk & dairy	132

Source: WFP/FAO (2011).

Table 3 Household poverty ratios.

Household	Frequency	Percentage	Poverty line
Poor	109	53	E463.47 pae/m
Non-poor	96	47	

pae/m = per adult equivalent per month.

The cost of the food bundle was scaled upward by an econometrically estimated factor representing non-food expenditures¹. The computed poverty line is therefore E463.47² per adult equivalent per month (Table 3), considered as a proxy of the total cost of essential food and non-food consumption needs for surveyed households. A household is considered poor if its resources are below the determined poverty line. This implies that the household's resources are not sufficient to obtain the minimum consumption basket. This poverty line is comparable to the national poverty line that was estimated by United Nations Development Programme of E461 per month, per adult equivalent [2]. Based on the poverty line in Table 3 and the Foster-Greer-Thorbecke poverty index [36] which was used to decompose households into poor and non-poor, 53% of sampled households were found to be below the poverty line, while 47% were above the poverty line. The estimated poverty rate is at 66% and is slightly higher than the national poverty rate of 63%, and below the prevailing poverty rate of 73% in the rural areas.

¹ Details can be provided upon request.

² Eswatini's currency, Emalangeni (SZL).

3. Results and Discussion

3.1 Descriptive Analysis

According to Table 4, cereals account for the largest share for both poor and non-poor households but maize is clearly the most important commodity consumed by Swazi households. In total, cereals account for 39% and 36% for poor and non-poor, while maize makes up 29% and 22% of food expenditures for poor and non-poor households, respectively. This suggests that households allocate a larger share of their budget on starchy staples, thus severe price increases of these commodities are extremely burdensome to both households. What is noticeable from Table 4 is the fact that sampled households devote a higher share of their income to food and the share is larger for poor households (75%), as one would expect. This is reinforced by food security assessment surveys conducted [37, 38] which indicated that the Manzini region in general, has a higher share of households spending 70% and above of their income on food. In this respect, surveyed households are vulnerable to severe food price increases which can increase their vulnerability to food insecurity. Spending a larger proportion of household

Table 4 Household expenditure shares and demographic characteristics.

Food group	Poor	Non-poor
Budget shares		
Maize	0.288	0.215
Other cereals	0.098	0.145
Sugar	0.138	0.109
Meat	0.128	0.171
Milk & dairy	0.102	0.12
Fruits & vegetables	0.135	0.162
Pulses	0.111	0.078
Share of food expenditure (%)	75	64
Household demographics		
Age (years)	55.93 (13.21)	52.53 (13.58)
Family size	5.42 (2.38)	4.38 (1.82)
Education (years)	5.96 (5.02)	9.53 (5.98)
Gender (%)		
Male	61	75
Female	39	25

Standard deviation in parentheses.

budget on food suggests that households have limited capacity to respond to combined effects from production shortfalls and high market prices.

3.2 Demand Elasticities

This section presents the empirical results of the QUAIDS model. As discussed earlier, seven food groups are included in the demand analysis and the grouping was made based on literature and own discretion. The parameter estimates provide a clear understanding of household food demand behavior in Eswatini, summarized through price and expenditure elasticities. The compensated and uncompensated price elasticities, including expenditure elasticities calculated from the QUAIDS model are presented in Tables 5 and 6. The estimated QUAIDS model is robust whereby most of the coefficients are significant at 1%, 5% or 10% significant levels³.

3.2.1 Expenditure Elasticities

The estimated expenditure elasticities for all food items presented in Table 5 are positive, indicating that these commodities are normal goods. This is

expected and implies that consumption of these food items will on average increase with rising income. The expenditure elasticities for poor households range from 0.856 (for maize) to 1.560 (for meat), while for non-poor households the expenditure elasticities range from 0.814 (for maize) to 1.243 (for meat). The results indicate that maize, other cereals, sugar, fruits and vegetables, as well as pulses are necessities for both households, with expenditure elasticities ranging between zero and one. This entails that on average, the expenditures on these food items will increase less than proportionate to an increase in household food expenditures. Similar results have been reported in Refs. [10, 11]. However, the expenditure elasticity for other cereals in poor households is greater than one, suggesting that other cereals are more responsive to expenditure changes for poor households. For maize and other cereals, a 10% increase in total food expenditures will result in 8.6% and nearly 11% for poor, compared to 8.1% and nearly 9% for non-poor households. This is in contrast to the results reported in Refs. [10, 11] that all cereals in Eswatini are expenditure inelastic. Grains or cereals are most often expenditure inelastic [8] in most of SSA yet, other cereals are expenditure

³ Due to space the coefficients of the QUAIDS model are not presented but available on request.

Table 5 Household expenditure elasticities.

Commodities	Poor	Non-poor
Maize	0.856 ^{***} (0.001)	0.814 ^{***} (0.000)
Other cereals	1.088 ^{***} (0.247)	0.888 ^{***} (0.000)
Sugar	0.951 ^{***} (0.001)	0.923 ^{***} (0.000)
Meat	1.560 ^{***} (0.174)	1.243 ^{***} (0.247)
Milk & dairy	1.150 ^{***} (0.000)	1.101 ^{***} (0.000)
Vegetables and fruits	0.934 ^{***} (0.000)	0.862 ^{***} (0.000)
Pulses	0.883 ^{***} (0.001)	0.926 ^{***} (0.000)

^{***} significant at 1% level of significance; standard errors in parenthesis.

elastic especially for poor households in this case. Although the expenditure elasticities for sugar as well as fruits and vegetables are less than one, they are close to unity, suggesting that average expenditures on these food items will increase nearly at the same rate as an increase in household expenditures. The low expenditure elasticity for maize implies that even if a shift in the consumption of maize to other cereals is observed as income increases, large-scale substitution is highly unlikely given that maize is a staple food and culturally dominates consumption of cereals in the country.

Meat and dairy have expenditure elasticities greater than one, signifying that the expenditure shares for meat and dairy will increase more than an increase in household food expenditures on average. For instance, a 10% increase in household expenditures will lead to a nearly 11.7% increase in the budget share for meat for poor households and 11% for non-poor households. Meat is a luxury across households despite the fact that non-poor households spend slightly more on meat. This is not surprising in a low-income country such as Eswatini where priority is mostly given to calorie-dense foods (mostly staples) that are cheaper compared to high-quality food items. This finding however does not conform to the findings in Refs. [10, 11], where meat and dairy were reported to be expenditure inelastic in Eswatini, which could be attributed to the model used as well as the sample size. On the other hand, this finding is in accordance to Ref. [5], which indicated that meat and milk are expenditure elastic

for most households. Moreover, the demand for vegetables and fruits is quite responsive especially for poor households. Fruits in particular are consumed less by low-income households. A bulk of fruits consumed in Eswatini is mostly imported from South Africa, making fruits to be somewhat expensive. Given these expenditure elasticities, it would therefore be argued that any future increase in total food expenditure would elicit a shift from consumption of basic staples to expansion of high-value foods for Swazi households. This will diversify household consumption such that the budget share of cereals declines while that of high-value foods increases. This is consistent with theory and other food demand studies that have been conducted. It also supports the view that raising income is instrumental in improving the food and nutritional status in developing countries.

Comparing poor and non-poor households, Table 5 further indicates that poor households are more responsive to changes in expenditure for most food items, shown by the larger expenditure elasticities relative to non-poor households. Expenditure elasticities have generally been shown to be predominantly higher for poor households and strongly declining with an increase in household expenditures, as reported in Refs. [5, 7]. This suggests that a small change in expenditure affects the demand for food more for poor households as they spend more on food. The implication is that the purchasing structure and the quality of food consumed by poor households are much more

affected, either in the context of an economic crisis or favourable economic and market conditions. Under such conditions, households may lower or increase consumption of high-quality and high-value food items such as meat and dairy, compared to non-poor households, whose consumption structure is less sensitive to changes in expenditure. In other words, a reduction in household expenditures for poor households would lead to a more than proportionate reduction in the consumption of luxury food items while an increase would have the opposite effect.

3.2.2 Price Elasticities

Table 6 presents the results for compensated and uncompensated own price elasticities for both poor and non-poor households. All the own price elasticities are negative and consistent with microeconomic theory of demand, signifying an inverse relation between own-price changes and quantities demanded. The delta method was used to estimate the standard errors and *p*-values for the elasticities. As indicated in Table 6, the uncompensated elasticities are larger in magnitude compared to the compensated elasticities. This implies that an increase or a decline in the price of

the food commodities would have real expenditure effects. This is also an indication that all consumed goods are normal.

A closer look at Table 6 shows that most commodities are price inelastic across households, with the exception of dairy and meat. But for poor households, other cereals are nearly unitary elastic, suggesting that a 1% increase in the price of other cereals leads to nearly a 1% decline in the consumption of other cereals. Maize appears to be the least responsive both in poor and non-poor households, compared to other food items. This is an indication that a price fall in maize will result in a less than proportionate increase in the quantity demanded. The same has been reported in Refs. [6, 7], since maize is a major staple in the majority of countries in Southern Africa. Food price elasticities for poor households range from -1.159 for meat to -0.696 for maize while these range from -1.005 for meat to -0.526 for maize for non-poor households. As seen in Table 6, a 1% increase in the price of maize and other cereals would lead to a decline of 0.84% and 0.99%, respectively, in the quantities consumed for poor households. In contrast, this would lead to a decline of 0.74% and 0.87%, respectively, in the quantities consumed for

Table 6 Compensated and uncompensated own-price elasticities.

Food items	Uncompensated		Compensated	
	Poor	Non-poor	Poor	Non-poor
Maize	-0.842*** (0.233)	-0.736*** (0.221)	-0.696*** (0.233)	-0.526 (0.211)
Other cereals	-0.994*** (0.232)	-0.867*** (0.222)	-0.823*** (0.215)	-0.723*** (0.213)
Sugar	-0.898*** (0.152)	-0.885*** (0.296)	-0.852*** (0.153)	-0.778*** (0.296)
Dairy	-1.005*** (0.103)	-0.937*** (0.189)	-0.809*** (0.105)	-0.805*** (0.184)
Meat	-1.213*** (0.142)	-1.108*** (0.179)	-1.060*** (0.134)	-0.906*** (0.174)
Pulses	-0.863*** (0.078)	-0.994*** (0.040)	-0.825*** (0.047)	-0.935*** (0.055)
Vegetables and fruits	-0.979*** (0.175)	-0.959*** (0.172)	-0.843*** (0.172)	-0.857*** (0.173)

() are standard errors; ***, **, * significant at 1%, 5% and 10% level of significance.

non-poor households. Other cereals (mainly wheat and rice) are imported from outside the SACU⁴ region and subjected to import levies, making these cereals costly. Households are therefore quite responsive to price changes of other cereals than to maize and maize meal price. The inelasticity of maize compared to other foods signifies its importance as a staple food for all households.

In contrast, meat and dairy are price elastic for both households but poor households are more responsive to a price change for these commodities. In this respect, a 1% increase in the price of these commodities would elicit a greater demand reduction for meat (-1.2) and a slightly above unitary reduction for dairy (-1.005) in poor households. Dairy is inelastic for non-poor households, but this is closer to one. This is expected as these commodities are somehow unaffordable especially for low-income households. Instead, poor households consume more of pulses which are a cheap source of protein relative to meat. Comparing this finding to Ref. [6], the author reported meat, especially beef, to be price elastic for the poorest while milk was reported to be price elastic across surveyed poor households. The same has been observed in Ref. [5]. On the other hand, the finding that meat and dairy are price elastic is contrary to Refs. [10, 11] where meat and dairy have been found to be price inelastic in the case of Eswatini. As already established, the differences could be from the type of data and modelling procedure used for the analysis. What can also be noted is the fact that all food items for poor households exhibit larger magnitudes in own price responses with the exception of pulses. Therefore, a slight change in the price of consumed commodities results in larger demand responses for these households. In cases where price increases are observed, there will be a reduction in consumption of expensive food items such as meat, dairy, fruits and

vegetables, which may affect the nutritional status of households. Of particular importance is the fact that most food items become less elastic when substitution effects are taken into consideration, indicated by the low compensated (Hicksian) price elasticities.

Cross-price elasticities are presented in Tables 7 and 8. These indicate the effect of a price change in one commodity on the demand for another. Positive cross-price elasticities imply that the commodities are substitutes, while negative cross-price elasticities indicate that the commodities are compliments. The estimates for the cross-price elasticities are fairly low in comparison to own price elasticities in most cases, and some are statistically significant. But the most striking feature is that, a number of these elasticities appear to be larger, implying a high degree of complementarity or substitution among food items, as seen from Tables 7 and 8. One possible explanation could be the use of a rather small sample data set which yields larger elasticities in general, compared to large-sample data. Except for other cereals, dairy and pulses, all other food items are considered complements to maize for both households. Importantly, the degree of responsiveness of demand for maize to the price of other cereals is low and statistically insignificant. The observed low and insignificant value of the cross-price elasticity of maize with other cereals suggests that substitution between these food items is quite limited. This finding reinforces the fact that maize is a staple food and substitution between maize and other staples may be observed in small quantities, especially in the context of a severe price increase. A degree of complementarity is also observed between maize and sugar, meat, fruits and vegetables. An increase in the price of maize reduces the demand for these food items. Further, all other food items are a substitute for meat, apart from other cereals and dairy. This suggests that an increase in the price of meat would result in an increase in consumption of all other food items, but a

⁴ Southern African Customs Union where Eswatini is a member together with Botswana, Lesotho, Namibia and South Africa.

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Table 7 Uncompensated cross price elasticities.

Prices		Maize	Other cereals	Sugar	Meat	Milk & dairy	Vegetables & fruits	Pulses
Budget share								
Poor	Maize	-0.842***	-0.181	-0.168	0.330***	0.279***	-0.219***	0.213***
	Other cereals	0.131	-0.994***	-0.479*	-0.423***	-0.169**	0.191***	-0.299***
	Sugar	-0.181***	0.448*	-0.898***	0.393**	0.133***	0.177	0.191***
	Meat	-0.294***	-0.305***	-0.291***	-1.213***	0.229***	-0.191***	-0.391***
	Milk & dairy	0.017	0.734**	0.290***	-0.166	-1.005***	-0.237***	0.251***
	Vegetables & fruits	-0.273***	-0.709***	0.184***	0.239***	-0.166**	-0.979***	0.203***
	Pulses	0.386***	-0.196	0.470**	0.201	-0.452	-0.380***	-0.863***
Non-poor	Maize	-0.736***	-0.165	0.101***	-0.217**	0.172	-0.135**	0.207**
	Other cereals	0.194***	-0.867***	-0.197***	-0.322***	0.088	0.666*	-0.217**
	Sugar	-0.190***	0.233***	-0.885***	0.314**	0.503*	0.261**	0.207***
	Meat	-0.174**	-0.179***	-0.642***	-1.108***	-0.226	-0.607	-0.306***
	Milk & dairy	-0.026	-0.193**	0.235***	-0.125***	-0.937***	-0.357**	0.252***
	Vegetables & fruits	-0.123***	-0.144**	0.031**	0.333***	0.532**	-0.959***	0.188***
	Pulses	0.486	0.345	0.277***	0.227*	-0.693**	0.215*	-0.994***

***, **, * significant at 1%, 5% and 10% level of significance.

Table 8 Compensated cross price elasticities.

Prices		Maize	Other cereals	Sugar	Meat	Milk & dairy	Vegetables & fruits	Pulses
Budget share								
Poor	Maize	-0.696***	0.202	-0.043	0.244***	0.222***	0.206***	0.161**
	Other cereals	0.063	-0.823***	0.424	0.365***	0.059***	0.170**	0.222***
	Sugar	-0.146**	0.644***	-0.852***	0.297**	0.055***	0.144	0.144**
	Meat	0.217***	-0.143**	-0.244***	-1.060***	0.190**	0.160***	-0.306***
	Milk & dairy	0.062	0.554*	0.217***	0.021	-0.809***	-0.157**	0.168***
	Vegetables & fruits	0.195***	0.483**	0.172**	0.023	0.131**	-0.843***	0.195**
	Pulses	0.375***	-0.035	0.437**	0.165	-0.395	0.314***	-0.825***
Non-poor	Maize	-0.526**	0.121	0.050***	0.189**	0.189	-0.044*	0.157*
	Other cereals	0.148	-0.723***	-0.157***	0.181*	0.089	0.597**	0.190**
	Sugar	0.127	0.147**	-0.778***	0.440***	0.513*	0.079	0.210***
	Meat	-0.159**	0.130***	-0.467**	-0.906***	-0.227	0.510*	-0.172**
	Milk & dairy	0.195***	-0.101*	0.217***	0.125	-0.931***	0.233**	0.209***
	Vegetables & fruits	0.084***	-0.119**	0.023**	0.165**	0.537**	-0.857***	0.183***
	Pulses	0.429***	0.164	0.199***	0.163	0.721**	0.195	-0.935***

***, **, * significant at 1%, 5% and 10% level of significance.

decrease in the consumption of dairy and other cereals for both households. This is expected since meat is the most expensive food item consumed by both households.

3.3 Distributional Welfare Effects of Food Price Changes

It is important to note that this study simulates the

impact of a 43% increase in the price of maize as a result of the 2015/2016 severe drought conditions experienced in Southern Africa, using the household survey data collected between August and December 2015. Specifically, the study uses the retail price increase between December 2015 and June 2016 to simulate the welfare effects. The first-order effects are approximated using the first part of Eq. (22) and the

second-order effects are approximated through the use of Eq. (22). Table 9 summarizes the results on the implied welfare effects at the household level for both poor and non-poor households as well as for net buyers and net sellers. This is important especially since the major objective of the study is to identify implications for policy. The welfare estimates are expressed as a percentage of household food expenditure obtained from the household survey data.

A close examination of Table 9 reveals that a 43% increase in the prices, erodes household welfare by nearly 10.7% for poor households and by only 5.2% for non-poor households in the short run. In this case, poor households would require a compensation of nearly E98, while this is E78 for non-poor households, for the cost-raising effect on their consumption basket. A plausible explanation to this is that poor households spend a larger share of their expenditures on maize consumption, as already established in Table 4, thus, are more affected by price increases. This finding is

also supported by a number of empirical studies on the welfare effects of staple food price changes including [15-17, 20]. Needless to say, net-buying households lose from severe price increases, while net selling households gain, as indicated in Table 9. Consideration of household behavior indicates a decline in the welfare loss by nearly 2% and 1.3%, for both poor and non-poor households. This suggests that accounting for household behavioral responses lessens the price pressure on these households. A similar effect is observed for net buying households. What is also noticeable is that, net selling households gain by 3%, which is equivalent to nearly E146 of their household expenditure. This is not surprising and is in accordance with previous findings [19, 20, 39] that higher maize or staple prices are more beneficial to households that are net sellers and have a negative impact on those that are net buyers of staples. The fact that both households loose from a price increase, even when household behavior is considered, highlights the fact that sampled households are mostly

Table 9 Welfare approximations—maize price increase.

Household type	First-order effects		Second-order effects		Second-order effects—larger supply response	
	Mean CV (%)	Change in x_0 ⁵ (E)	Mean CV (%)	Change in x_0 (E)	Mean CV (%)	Change in x_0 (E)
By poverty status						
Poor	-10.7	-97.67	-8.7	-79.42	-8.5	-77.59
non-poor	-5.2	-77.83	-3.9	-58.38	-3.6	-53.88
total	-8.3	-97.28	-6.6	-77.36	-6.4	-75.01
By market position						
Net buyers (93)	-9.7	-111.85	-8.1	-93.88	-8.0	-92.72
Net sellers (7)	8.2	109.00	11.0	145.87	12.5	165.76

() is the share in percentages of net-buying and net-selling households in the whole sample.

Table 10 Welfare approximations—collective cereal price increase.

Household type	First-order effects		Second-order effects	
	Mean CV (%)	Change in x_0 (E)	Mean CV (%)	Change in x_0 (E)
By poverty status				
Poor	-13.4	-122.50	-11.3	103.15
non-poor	-8.3	-124.09	-6.9	103.28
total	-11.2	-131.27	-9.3	109.00

⁵ Initial household food expenditure.

Table 11 Welfare approximations with a consumer subsidy.

Policy scenario	Poor	Non-poor	Total
Real price changes			
Mean CV	-9.8	-4.5	-7.4
Subsidy equivalent (E)	8.21	10.47	10.55

Source: author's computations from 2015 household survey data.

net buyers⁶, with maize contributing less to household expenditures.

Assuming a larger supply response results in a slight decline in household welfare loss. However, the change is very minimal in this case. This is as could be expected since surveyed households are mostly net buyers and that their production levels are somehow lower. Such a scenario would have positive effects if a majority of the households were net sellers as observed in Table 9. Net sellers' welfare gain increases by 1.5% which is equivalent to nearly E166 of their food expenditure. Therefore, it can be concluded that high maize prices coupled with a higher supply response have a potential to yield positive welfare effects among Swazi rural households in the long run. An increase in the supply response implies an increase in the value of maize production and its contribution to food expenditure. Overall, high maize prices are detrimental to a majority of the sampled households, with poor households being the most vulnerable to maize price increases and consequently bearing the highest losses in their food expenditures, especially in the short run.

3.3.1 Collective Increase in the Price of Staples

Assuming a collective price increase for cereals: 43% for maize and 13% (similar to the increase in the food inflation) for other cereals, this is more detrimental to household welfare relative to only a maize price increase. As presented in Table 10, the average losses are estimated at 13.4% for poor, while this is 8.3% for

non-poor households in the short run. This is an affirmation that price increases for cereals are extremely burdensome and detrimental to household welfare, especially for the poor.

3.3.2 Consumer Subsidy Scenario

For more insight on the welfare effects of maize price changes at the household level, the study also evaluated the effect of a 10% subsidy on the consumer price. This is presented only for immediate effects (first-order), considering that households would revise their consumption and production decisions in the medium and long term. The results presented in Table 11 reveal that a consumer subsidy leads to a decline in the welfare losses suffered by households. For instance, a consumer price subsidy lowers the welfare losses from 10.7% to 9.8% for poor and from 5.2% to 4.5% for non-poor households (Table 11). This suggests a slight decline in the loss of household expenditure in this case. As expected, a consumer subsidy would set a lower level market price for maize/maize meal, and thus protect domestic consumers from excessive food price spikes that may be introduced due to unfavourable weather and market conditions both domestically and in South Africa where maize is imported from.

4. Conclusions

This paper presented the demand system approach to analyzing the consumption patterns of rural households in Eswatini. Moreover, the paper evaluated the distributional economic effects of a maize price increase using the compensating variation approach. This is the first study to apply the QUAIDS model and the compensating variation approach in analyzing food demand and household level effects of

⁶ From the descriptive statistics, 95% of poor and 90% of non-poor households were found to be net buyers. As much as this finding is not unique for Eswatini as more than half of rural households in SSA have been reported to be net buyers of food [40, 41], these figures may be higher. This could be attributed to that the data were collected at the beginning of the severe drought period experienced in the country.

food price changes in Eswatini. Reliable estimates of price and income elasticities for food are essential parameters in food policy analysis. Insufficient information on food demand can result in inappropriate food security interventions. The study employed a QUAIDS model to estimate price and income elasticities using household expenditure survey data. The food groups used for the analysis include maize, other cereals, sugar, meat, milk and dairy, pulses as well as fruits and vegetables. Several issues were addressed including zero expenditure, to enable unbiased estimation of the demand elasticities.

Results of the analysis showed that majority of the food items are price and expenditure inelastic, with meat and dairy exhibiting price elasticities greater than one. This is an indication that an increase in household income will induce a substantial increase in household demand for milk and meat products. Maize was found to be the least price responsive compared to all other food commodities, signifying the importance of maize as a staple food for Swazi households. Moreover, there are notable variations in the expenditure and price elasticities of the poor compared to non-poor whereby, demand elasticities for poor households are larger than those for non-poor households. Overall, both households are responsive to price and expenditure changes suggesting that households would make adjustments to their consumption patterns as price and income change. Nevertheless, the consumption patterns between poor and non-poor slightly differ with poor households allocating somehow a larger share of their household budget on maize, while non-poor households consume more meat products as well as fruits and vegetables.

In terms of the welfare effects, poor and non-poor households incur welfare losses both in the short and in the long run; hence require a compensation for the loss in household expenditure. Clearly, the average welfare losses are more pronounced for poor rather than non-poor households, who spend a relatively smaller proportion of their food budget on maize. The

impact is larger for a collective price increase in maize and other cereals. In the event of sustained and large food price increases resulting from unfavourable weather and market conditions both regionally (SACU) and domestically, these households would suffer large losses in their welfare and would need to be assisted, particularly in the short run. This is in view of the fact that large price increases for a commodity that is predominantly consumed erode household purchasing power, thus their ability to access adequate food. On the other hand, a consumer subsidy would have a positive effect in lessening the impact of severe price shocks on households, although the effects are minimal in this case. Poor households are the major beneficiaries of such a policy intervention. The subsidy however, would have to be targeted as well as provided only in the period of price surges in order to benefit the most vulnerable households, as well as lower the fiscal burden of the subsidy on the Swazi government.

The results have important policy implications. Firstly, the fact that most expenditure elasticities are larger than the price elasticities suggests that policies that would raise household income would have a greater effect on improving the consumption patterns and consequently food access and nutrition. This will boost the consumption of high-quality foods including meat, dairy and fruits. Secondly, maize is price and expenditure inelastic and accounts for a larger share of household expenditures. Without a doubt, price-reducing maize policy strategies can lower the budget share for maize and promote consumption of other food items. However, lowering the price of maize would have negative implications on maize production in the long run taking into account that price-oriented interventions that lower food prices reduce the incomes of net food sellers and the incentive to increase production. Therefore, policy strategies should focus more on expanding agricultural production by encouraging more production, especially at the household level.

In particular, growth in maize production at the household level can benefit both maize producers and consumers by increasing household income, which in turn would positively contribute to household consumption requirements and ultimately improve the food security and nutritional status, particularly among poor households. This will also insure net buying households against market risks by reducing high reliance on the market. Further, policy strategies should focus more on promoting diversification into other crops to reduce the high reliance on maize as a major crop produced and consumed by households. This would dilute the likely effects of maize price fluctuations on households and the economy as a whole. In the short run, providing subsidized maize meal prices at the consumer level, while allowing prices to rise and benefit net selling households would lessen the negative effects of food price surges on the vulnerable segments of the population. Any price increase without an adequate compensation is harmful especially to the poor and vulnerable. Ultimately, these strategies can reduce poverty and hunger (Sustainable Development Goals 1 and 2) as well as improve food security, which are some of the most important challenges Eswatini is faced with.

The above analysis is mainly limited by the data used. Demand elasticities are estimated based on a small sample and may have somehow resulted in larger demand elasticities. Moreover, cross-price effects of price changes are not considered, yet prices rarely move in isolation. Most important is the fact that the data were collected in the beginning of a severe drought period, which may have overestimated especially the quantity of maize bought or underestimated the quantity consumed from own production. Future research should therefore estimate demand elasticities and household level effects of food price changes based on a large-sample survey data either taken from the recently released national expenditure and income household survey data or collected from different regions. This will also allow

the analysis of consumption patterns by location and other important socioeconomic characteristics as well as provide a holistic picture of food price changes on household welfare. Despite these limitations, this study makes an important empirical contribution to food demand analysis and distributional welfare implications of food price changes in the case of Eswatini. The results could be used as a building block for longer term welfare measures that consider substitution between production activities and wages when the price of maize changes.

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Appendix

Fig. 1 Food inflation and overall consumer price index (CPI) (Jan. 2015-April 2017).
Source: Central Bank of Eswatini.