Impact of increases in food prices on consumer welfare in Lesotho

Ervin Prifti*
Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00153 Roma, Italy. E-mail: Ervin.prifti@fao.org

Silvio Daidone
Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00153 Roma, Italy. E-mail: Silvio.daidone@fao.org

Borja Miguelez
Food and Agriculture Organization of the United Nations, United Nations House, UN Road, Maseru, Lesotho. E-mail: Borja.miguelez@fao.org

* Corresponding author

Abstract

During 2015 and 2016, Lesotho experienced a large increase in the price of cereals, the main staple food in the country. This has led to an erosion of purchasing power and to a decrease in the consumption of staple foods. For the study, we used a demand system to simulate the effects of an increase in the price of staple foods. We based our analysis on data collected for the evaluation of the Child Grants Programme, which offers unconditional cash transfers to poor households with orphans and vulnerable children. We estimated the necessary increase in total income that is needed to counter the impacts of the current price hike and to maintain households' utility unchanged. In particular, every percentage increase in the price of cereals would need to be matched by a 0.4% increase in income. As for the possible policy measures, we suggest the country's social protection system as the source for the extra income.

Key words: AIDS; food prices; simulation; cash transfers

1. Introduction

The main staple food in Lesotho is maize, which is accessed through production and through market purchases. Less than half of the domestic demand for staple foods is satisfied by the country's own production, while the rest is imported from South Africa. Lesotho is currently facing one of the worst droughts to hit the region in 35 years, largely due to El Niño (World Food Program [WFP] 2015). Most small-scale farmers relying exclusively on rain for irrigation will be out of business due to a failure in food production. The combination of the drought and the high reliance on rain-fed agriculture in Lesotho implies that many households will rely on purchases of food for most of 2016 and into 2017. Therefore, changes in food prices are critical for Lesotho, as these prices have significant implications for household food security, particularly among poor and vulnerable households. According to the Food and Agriculture Organization (2015), 24 million people in sub-Saharan Africa fell below the poverty line during the 2008 global financial crisis, which lead to conspicuous increases in food prices.

The overall consumer price index (CPI), which refers to the general retail price level, was on the rise throughout 2016, and so was food CPI. In May 2016, food prices marked a 15% yearly increase, while in September prices increased at a slightly slower, but still worryingly high, rate of 10%. This

implies that the prices of foods are increasing at a higher rate compared to the overall basket that is being monitored (Lesotho Bureau of Statistics 2016). The Lesotho Disaster Management Authority ([DMA] 2015), which monitors trends in staple food prices, reported in its December 2015 market update that maize meal prices had kept increasing throughout the year and at that time were above both the previous year's average and the previous five years' average. Price increases ranged from 20% in the Qacha's Nek district to 32% in Butha Buthe from December 2014 to December 2015 (DMA, 2015). As a result, Lesotho faces a major food security crisis due to the impact of the El Niño-induced drought. The Government of Lesotho declared a state of drought emergency in December 2015 and appealed for assistance from the international humanitarian community in February 2016. The WFP declared Lesotho as a Level 3 emergency in June 2016. The main factor contributing to local price increases in Lesotho and South Africa has been the tightening of maize supplies because of the production failure caused by the El Niño-induced drought. This continued rise in food prices will most likely reduce consumer purchasing power and will certainly lead to a deterioration in the food security situation in Lesotho.

The main goal of this paper is to provide evidence in order to inform possible policy measures to counteract the increase in maize prices. To do so we used the compensating variation (CV) method to quantify by how much a household's total income should increase in order to keep utility unchanged compared to the pre-crisis period. Instrumental to the main goal of the paper, we estimated the own- and cross-price demand elasticities that are a necessary input to the CV method. We did so by estimating a quadratic Almost Ideal Demand System (AIDS) of nine commodity groups (cereals, tubers, meat, milk, eggs, fats and oils, fruits and vegetables, legumes, miscellaneous). Therefore we also were able to quantify by how much food consumption might decline in the country as a consequence of the price increases. Finally, we also estimated the welfare impact of the price increases by using several poverty indicators. We used data from the survey for the impact evaluation of the Child Grant Programme (CGP) – the largest unconditional cash transfer programme in the Lesotho. Once we had estimated by how much total income should increase to protect households from the price increases, we proposed that total income be integrated through public transfers from Lesotho's social protection system. In particular, we suggest an increase in the transfer size of the CGP as one possible response to the food security crisis, since the programme targets the poorest of the poor – that group of the population that is bound to suffer most the consequences of the current price increases.

Rural households are both producers and consumers and, under normal circumstances, producers are expected to reap some benefits from food price increases and partially compensate for the rise in the cost of foods they must purchase. Yet, in Lesotho, most farmers barely produce enough for themselves. This indicates that net food-buying households, which generally make up most of the population in Lesotho, will be adversely affected by any crisis in staple prices. Therefore, in this study we look only at the demand response to a given increase in the price of different commodities and ignore the supply side.

Other studies have looked at the welfare impact of rising food prices. Leyaro (2009) and Tafere *et al*. (2010) find a negative impact on consumer welfare in Tanzania and Ethiopia respectively. Kane *et al*. (2015) studied the impact of food price volatility in Cameroon and confirmed a reduction in household welfare. Caracciolo *et al*. (2014) show that a 50% increase in the price of maize may lead to a reduction in consumption of 17% and to an increase in poverty of two percentage points.

The rest of the paper is organised as follows. Section 2 describes the data and offers an overview of the methodology. Section 3 discusses the results, while Section 4 concludes and offers some policy implications.

2. Data and methods

The Lesotho CGP is an unconditional social cash transfer targeted at poor and vulnerable households. Its primary objective is to enhance the living standards of households with orphans and vulnerable children by reducing malnutrition, improving health status and increasing school enrolment. Since its introduction as a pilot programme covering only 1 250 households in 2009, the Lesotho CGP has come a long way and has developed a much wider coverage of around 25 000 households as of 2014. Originally set at a flat rate of 360 LSL (ca. 36 USD or 78.6 international dollars) quarterly per household, the transfer value has been indexed to the number of children since April 2013 and varies between 360 LSL and 750 LSL quarterly. According to its original design, the CGP transfer would have provided the equivalent of about 20% of the monthly consumption of an eligible household. The programme evaluation study involved 508 villages spread over 80 electoral divisions (EDs). The survey for the impact evaluation collected information from 747 eligible households in treatment EDs and 739 households in control EDs, for a total sample size at baseline of 1 486 units. To complete the longitudinal design, the follow-up survey took place in the same period of the year, from June to August 2013, exactly 24 months after baseline. More details about the programme and its evaluation can be found in Pellerano *et al*. (2014).

A brief overview of households' characteristics included in the study is shown in Table 1, in which the baseline and follow-up data have been pooled. The two treatment arms are quite similar on most demographic characteristics, such as household size, composition, main features of the household head, geographic distribution and labour constraints. The only noticeable difference concerns the share of cultivated area under irrigation, which is 6.7% for CGP beneficiaries and 1.8% for the households in the control group. The presence of irrigation infrastructure might make a difference during a drought-induced food crisis. However, the share of those with access to irrigation is still too low (6.7%) to possibly drive our results in a substantial way. Moreover, we controlled for such observed characteristics of the household in all our regressions in the subsequent analysis. Overall, households comprised 5.7 members on average, with around 2.5 adults of working age and a dependency ratio slightly below 3. The sample was split equally between male- and female-headed households, with the head being on average 52 years old. The protection of orphaned and vulnerable children (OVC) is one of the objectives of the programme, thus it is not surprising to have a large number of orphans in the sample – 1.4 per household on average. The sample households were generally asset-poor, as evidenced by the amount of operated land, on average less than one hectare, and by the number of livestock they own: 0.6 tropical livestock units (TLUs), which equals around six goats/sheep or 1.1 cattle.

Table 1: Household characteristics of sample

	Controls	Treated	All
Operated land, ha	0.7	0.9	0.8
Area irrigated (%)	1.8	6.7	4.4
TLUs owned	0.6	0.7	0.6
Female-headed (%)	52.8	49.2	50.9
Household (HH) size	5.5	5.9	5.7
Dependency ratio	2.9	2.8	2.9
Age head HH	52.0	52.0	52.0
Education head HH (years)	4.2	4.0	4.1
Highest education HH (years)	7.7	7.6	7.6
Single-headed (%)	58.8	55.4	57.0
Sex ratio	1.2	1.2	1.2
Member 0-5 years	0.8	0.9	0.8
Member 6-12 years	1.1	1.2	1.2
Member 13-17 years	0.8	0.8	0.8
Males 18-59 years	1.1	1.2	1.2
Females 18-59 years	1.2	1.3	1.3
Males > 60 years	0.1	0.2	0.2
Females > 60 years	0.3	0.3	0.3
No. orphans	1.4	1.4	1.4
Widow-headed (%)	49.6	45.5	47.5
Elderly head (%)	38.3	37.7	38.0
Leribe (%)	21.5	22.7	22.1
Berea (%)	29.8	26.5	28.1
Mafeteng (%)	24.4	26.5	25.5
Qacha's Nek (%)	4.9	4.2	4.6
Labour unconstrained (%)	68.2	68.2	68.2
Moderately labour constrained (%)	20.5	21.9	21.2
Severely labour constrained (%)	11.3	9.9	10.6
HH sold crop in market (%)	5.8	6.6	6.2
Adult equivalents HH members	2.9	3.0	3.0

We now explain briefly the methodology of the study. In microeconomic theory, the impact of price changes on consumer welfare is generally analysed by the compensating variation method. The compensating variation (CV) represents the amount of money required to compensate the household after a price change occurs and such that the household keeps the same level of utility as before the change in price. Conceptually, the CV is defined as

$$CV = e(p_1, u_0) - e(p_0, u_0), \quad (1)$$

where e(.) is the expenditure function, p_0 and p_1 refer to prices before and after the increase, and u is the utility.

In order to have an operational version of the above definition of the compensating variation per each household h, we applied Shephard's lemma and took a second-order Taylor series expansion approximation (Friedman & Levinsohn 2001):

$$\Delta \ln(CV_h) \approx \sum_{i=1}^{n} w_{ih}\, \Delta \ln(p_{ih}) + 0.5 \sum_{i=1}^{n} \sum_{i=1}^{n} w_{ih} ued_{ij}\, \Delta \ln(p_{ih})\, \Delta \ln(p_{jh}), \quad (2)$$

where w_{ih} is the expenditure share equation for good i for household h, and ued_{ij} is the uncompensated elasticity of demand of good i with respect to a change in the price of good j. It is obvious that, in order to compute the CV, we first needed to estimate the appropriate demand elasticities. We estimated a demand system for all food groups. Demand elasticities were derived from the Almost Ideal Demand System (AIDS) approach (Deaton & Muellbauer 1980; Lamber *et al*.

2006). The presentation here is brief; for an in-depth analysis of consumer behaviour and demand-system analysis, see the classic monograph by Deaton and Muellbauer (1980). We considered a consumer's demand for a set of *k* goods for which the consumer had budgeted *m* units of currency. The quadratic AIDS model of Banks *et al*. (1997) is based on the system of equations of expenditure share equation for good *i*:

$$w_i = \alpha_i + \sum_{j=1}^{k} \gamma_{ij} lnp_j + \beta_i \ln\left(\frac{m}{a(\boldsymbol{p})}\right) + \frac{\lambda_i}{b(\boldsymbol{p})}\left[\ln\left(\frac{m}{a(\boldsymbol{p})}\right)\right]^2 \quad i = 1,2 \dots k, \tag{3}$$

where $w_i = p_i Q_i/\mathrm{m}$, with Q_i the quantity of good *i* consumed by a household, $\boldsymbol{p}$ is a vector whose *i*th element is p_i, the price of good *i* for *i* = 1, …, k, $\ln(a(\boldsymbol{p}))$ is a transcendental price index given by the linear combination of the commodities price and all the possible interactions, $b(\boldsymbol{p}) = \prod_{i=1}^{k}(p_i)^{\beta_i}$ and $\lambda(\boldsymbol{p}) = \lambda_i lnp_i$. Sociodemographic variables are typically incorporated into demand system analysis by expressing the constant terms in the share equations as a linear function of sociodemographic variables. So, instead of α_i we will have a linear combination of *H* covariates, $\sum_{j=1}^{H} \alpha_{ij} X_{ij}$.

This system of expenditure share equations requires nonlinear system estimation techniques because of the price index, $lna(\boldsymbol{p})$. Therefore, we considered a linear approximation based on the Stone index, as in Moschini (1995). Instead of using the translog $\ln(a(\boldsymbol{p}))$, we replaced it with $lna^*(\boldsymbol{p})$:

$$\ln\big(a^*(p)\big) = \sum_{i=1}^{n} \overline{w}_i \ln(p_i), \tag{4}$$

where $\overline{w}_i$ is the average budget share of good *i* over all households. Second, we set $b(\boldsymbol{p}) = 1$ to avoid nonlinearity in the $b(\boldsymbol{p})$. These two assumptions make our system of equations linear in parameter.

One of the econometric challenges in the analysis of consumption survey data is to properly handle the large number of "zero" purchases. Some households may never consume the good. The zero purchase may simply reflect a corner solution, or the good was too pricey during the week the survey was conducted. Shonkwiler and Yen (1999) developed a two-step strategy to handle the censoring problem, which we follow here. In order to derive an equation for the observed budget share, BS_i, an analytical expression for the unconditional expectation of BS_i is required. The unconditional mean accounts for both the probability of observing a positive consumed amount of a certain good and the quantity actually consumed. The unconditional mean is defined as the conditional mean value multiplied by the probability of a positive observation. If we denote the density and the cumulative functions of the standard normal distribution by $\varphi(.)$ and $\Phi(.)$ respectively, the unconditional mean of BS_i is:

$$E[\, BS_{ih}] = \Phi(z'_{ih}\kappa_i) w_{ih} + \theta_i\, \varphi(z'_{ih}\kappa_i), \tag{5}$$

where *h* indexes households and *z* includes observed characteristics. The system of equation (5) provides the basis for the censored quadratic AIDS budget share system. The first step consists of estimating the parameters κ_i, which are directly related to the binary decision on whether to purchase. Consistent estimates of κ_i can be obtained by using the probit model to explain the binary outcome. By replacing κ_i with its estimate, we then recover the parameters in the system of equation (5).

Finally, we present the formulas for the elasticities of the quadratic AIDS model with demographic variables. The uncompensated price elasticity of good *i* with respect to changes in the price of good *j* is:

$$ued_{ij} = \frac{\mu_{ij}}{E[BS_i]} - \delta_{ij} \text{ where } \mu_i = \frac{\partial E[BS_i]}{\partial \ln(p_j)} \; and \; \delta_{ij} = 1[i = j] \quad (6)$$

If the demand is inelastic ($|ued| < 1$), the decrease in the purchased quantity will be relatively smaller than the increase in price. Hence, the consumer's total expense for the good in question increases. The opposite is the case at a price increase of a good for which the demand is elastic.

The expenditure (income) elasticity for good *i* is:

$$xed_i = \mu_i / E[BS_i] + 1 \text{ where } \mu_i = \partial E[BS_i] / \partial \ln(m) \quad (7)$$

Income elasticity shows the percentage increase in the demand for a given good as a result of a percentage increase in income.

To better understand the implications of the price increases on a household's welfare, we computed the impact of the simulated price increases on three major poverty indicators. We followed Caracciolo *et al*. (2014) and first took the poverty line as given. After the shock, individuals face a new poverty line. This poverty line is individual specific and is obtained by adding the amount of the compensating variation for each individual to the original poverty line. We used this new poverty line to assess the impact of a price shock on three poverty indicators: (i) the head count ratio (HCR); (ii) the poverty gap (PG) index and (iii) the Sen (1976; 1997) poverty index. The HCR is the percentage of the population living below the poverty line; the PG is the mean income shortfall with respect to the poverty line, expressed as a percentage of the poverty line (households above the poverty line are not considered): $PG = 1/G \sum_{i=1}^{G} (\frac{p - y_g}{p})$, where G is the total population of poor, p is the poverty line and y_g is the income of poor household g. The Sen index considers simultaneously both the HCR and the PG while taking into account the underlying distribution throughout the Gini coefficient of the income distribution of the poor. The higher the percentage/index, the worse the poverty outcome: Sen = HCR [PG + (1 - PG) Gini].

3. Results

We start by describing some fundamental food consumption patterns of poor households in Lesotho. Table 2 shows the share of food expenditure that goes to each food group. Cereals are the main staple in Lesotho and the good that absorbs half of households' food budget, while 20% of it goes to fruits and vegetables, with minor shares devoted to animal products. Cereals, vegetables, legumes and fats are the staples that make up almost 90% of a household's food expenditure.

Table 2: Share of expenditure by food group

	Cereals	Tubers	Meat	Milk	Eggs	Fats/oils	Fruit/ vegetables	Legumes	Rest
Expenditure share	0.49	0.02	0.08	0.01	0.01	0.06	0.20	0.06	0.06

We now comment on the estimation results for the price and expenditure elasticities, which are used subsequently as inputs for the welfare impacts of the food price increases. Tables 3 and 4 illustrate the uncompensated price elasticities of demand for the treated and controls respectively. The numbers in bold in the main diagonal of each table refer to the own-price demand elasticity, while the off-diagonal elements are cross-price elasticities. We note that there are no significant differences in the own-price elasticity between treated and control households for most goods. It may be that the cash transfer is not large enough to substantially influence the behavioural parameters of the consumption function.

Typically, the price elasticity of demand for staple foods lies between -1 and 0, becoming less elastic for more fundamental staples on which households rely most heavily. This can be seen on the main diagonal, where the goods that make up most of the diet in Lesotho, such as cereals, vegetables and legumes, have the smallest elasticities in absolute value, whereas the demand for meat and milk is much more elastic. In particular, a 1% increase in the market price of cereals will automatically translate into a 1% decrease in the quantity of consumed cereals, while a 1% increase in the price of meat prompts a reduction of 3% in its consumption (Table 3). A large own-price elasticity indicates that people are not vulnerable to increases in the price of a given commodity (Deaton 1997). This entails that households with elasticities larger than one in absolute value will be in a better position to counteract price changes and less vulnerable to them. In our context, a price elasticity higher than unity implies that the percentage reduction in quantities consumed will be higher in magnitude than the percentage increase in price, leading to a reduction in the expenditure on that commodity. On the other hand, households with less than unity in price elasticity will be unable to substitute away from the good as it becomes more expensive, and they will have to increase expenditure on the good. This puts vulnerable households in dire straits and increases their food insecurity because they are already allocating high shares (65%) of their total expenditure to food.

The cross-price elasticities in the first column show changes in the quantity consumed of a good as a result of a one percent increase in the price of cereals. Looking, for instance, at the first column of Table 3, an increase in the price of cereals would cause households to substitute away from this good and increase consumption of tubers, meat and milk, as demonstrated by the positive cross-price elasticities on these goods. On the other hand, the cross-price elasticity of vegetables and fruits, and of eggs and legumes is almost null, indicating that households would stick to the consumption of vegetables and tubers to substitute for the reduction in cereals.

Table 3: Demand elasticities: treated

	Cereals	Tubers	Meat	Milk	Eggs	Fats/oils	Fruit and veg	Legumes	Rest
Cereals	**-1.0**	0.1	0.1	0.1	0.0	-0.1	0.1	0.0	0.0
Tubers	6.8	**-1.4**	-7.8	4.1	-1.6	3.0	-1.7	-1.2	6.2
Meat	2.5	0.6	**-3.0**	2.3	-0.7	1.6	-2.0	-1.4	1.3
Milk	11.5	0.4	-1.2	**-8.7**	0.4	-5.6	2.7	8.8	-9.5
Eggs	-0.2	-1.7	-1.8	1.3	**2.0**	-7.4	2.6	7.2	-4.5
Fats and oils	-0.8	-0.1	0.4	-0.3	0.0	**-1.1**	0.2	0.1	-0.1
Fruit and veg	-0.2	-0.2	-0.2	-0.3	-0.2	0.0	**-1.0**	0.0	-0.1
Legumes	-0.4	-0.3	0.3	-0.6	-0.2	0.0	0.9	**-1.4**	-0.2
Rest	0.6	-0.6	0.2	-0.9	0.2	0.2	-0.8	0.3	**-0.9**

Table 4: Demand elasticities: controls

	Cereals	Tubers	Meat	Milk	Eggs	Fats/oils	Fruit and veg	Legumes	Rest
Cereals	**-1.1**	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2
Tubers	-1.0	**-0.5**	0.1	1.8	-5.1	1.2	-0.3	0.2	-3.2
Meat	0.9	-0.1	**-1.2**	-0.2	-0.4	0.1	1.1	0.1	0.0
Milk	-9.2	2.9	-3.7	**11.9**	-12.0	10.7	-7.4	-1.6	-25.6
Eggs	2.1	-1.8	-1.5	-1.1	**-4.6**	1.2	8.8	0.2	4.4
Fats and oils	-0.6	0.1	0.1	-0.2	0.7	**-1.0**	-0.5	0.2	0.3
Fruit and veg	-0.2	-0.1	-0.1	-0.1	-0.3	-0.1	**-0.8**	0.0	0.1
Legumes	0.1	-0.2	-0.3	-0.1	2.5	0.0	-0.3	**-0.9**	-0.3
Rest	2.2	-0.5	0.4	0.5	-1.8	-0.3	-0.7	0.0	**-3.0**

Finally, the own price elasticity of eggs in the treated group and the one of milk in the control group are positive. It is hard to think of these as Giffen goods, since these are unusual cases because they form such a large part of the budget of households that any change in their price has a very large income effect that overwhelms the substitution effect. Most likely, these estimates may be driven by a failure in the model to capture the correct slope for these goods, or due to erratic data. Some

suggestive evidence for the latter reason may be the fact that milk and eggs are the goods with the highest share of households reporting zero consumption (90%), and to which households dedicate the smallest share of the budget (1%).

We next looked at changes in consumed quantities that occur due to income changes. This is usually measured by the income elasticity of demand. Here we use expenditure elasticities as a proxy for income elasticity, since it is easier to obtain a reliable estimate for total expenditure from household surveys than for total income. The expenditure elasticity of demand indicates the change in the quantity demanded of a good for a given change in total expenditure. Table 5 reports expenditure elasticity estimates by food group and treatment arm. For the full sample, an increase of 1% in expenditure/income translates to an increase of approximately 0.7% in consumed cereals. Higher incomes, as proxied by expenditures, are also associated with higher consumption of the rest of food groups, except for meat. Our sample covers mostly subsistence farmers, the better-off part of which may find consuming meat from own production a cheaper alternative to buying it in the market. This may explain the negative correlation between income and bought quantities of meat.

Table 5: Demand elasticities with respect to expenditure

	Cereals	Tubers	Meat	Milk	Eggs	Fats/oils	Fruit and veg	Legumes	Rest
Treated	0.8	2.3	-3.6	10.8	16.4	1.8	1.9	2.6	0.4
Controls	0.6	5.0	-2.3	34.3	1.1	1.6	2.0	1.9	1.7
Full sample	0.7	4.1	-2.2	17.6	6.7	1.8	1.9	2.1	1.1

We now turn to the results related to the main goal of the paper by providing evidence of the potential impact of higher food prices on household welfare and by examining the extent to which policy responses are able to protect the poor. One such policy measure is income support through cash transfers, which can help counteract a fall in consumption resulting from the erosion of purchasing power caused by inflation in food prices. To quantify the increase in income that is needed to protect the poor households' purchasing power we used the compensating variation (CV) method, a well-known approach in microeconomic theory aimed at measuring the impact of price changes on consumer welfare (Deaton 1989). The compensating variation for simulated price shocks in cereals of + 20%, + 40% and + 60% is computed following formula 2 in the methodology section. The results are shown for the treated and the controls in the fourth row of Tables 6 and 7 respectively. For the treated, we see that, to counteract a 20% increase in the price of cereals, the necessary increase in total income in order to keep utility unchanged is 8.8%. For cereal price increases of 40% and 60%, total income has to increase by 15.5% and 20.3% respectively. Therefore, on average, for every 1% increase in the price of cereals, total income would have to increase by 0.4% to keep utility unchanged. The magnitude of the CV is in line with previous research on the negative welfare impacts of episodes of rapid rise in food prices (Caracciolo *et al*. 2014; Kane *et al*. 2015).

Once we estimated by how much total income has to increase, we suggest recourse to Lesotho's social protection system as a possible way of integrating total income. In particular, we suggest increasing the size of the CGP cash transfer, as the programme specifically targets the poorest of the poor. Therefore, let us assume that the necessary increase in total income to keep utility unchanged would derive from the exogenous component of income represented by the cash transfer, while all other sources of income (crop, livestock, non-farm enterprise and wage labour) remained stable. In this scenario, the amount of the cash transfer, which represents only a fifth of total monthly expenditure, would have to increase by 0.4% * 5 = 2% for every percentage point increase in the price of cereals in order to keep household utility from falling. The actual increase registered thus far in Lesotho's retail maize price, viz. approximately 15% at the national level, would call for a 30% top-up of the amount of the CGP cash transfer.

Following previous literature on the topic, and in order to complete the picture of the impacts of food price increases on household welfare, we also estimated the impact of each of the simulated cereal

price increases on three chosen poverty indicators: the Head Count Ratio (HCR), the Poverty Gap (PG) index and the Sen poverty index (Caracciolo *et al*., 2014). The individual poverty line here is set at $1.90 a day (2011 PPP). The three indicators were first computed for the actual prices and incomes (benchmark scenario). After the shock, households faced a new poverty line, which is household-specific and is obtained by adding the amount of the compensating variation for each household to the original poverty line. We used this new poverty line to assess the impact of a price shock on welfare represented by the three poverty measures. Tables 6 and 7 show the simulation results for the beneficiaries and the control group respectively. Regardless of the price scenario, all poverty measures are slightly higher for the control group. For instance, the HCR in the benchmark scenario is 85.7% for the treated and 86.4% for the controls. Also, the cereal price increases lead to a deterioration in all poverty indicators for both the treated and the controls. The increase in the head count ratio, for example, is higher among the controls. However, the deterioration in all poverty indicators in response to an increase in the price of cereals is very small. The reason for this may lie in the fact that the sample refers to the poorest households among the poor, with an already extreme poverty rate (85.7%). Therefore, an increase in the price of cereals may be unable to push consumption expenditure below some subsistence lower bound. Moreover, households may adopt their consumption patterns by moving away from the items that have become more expensive to meet the overall budget constraint.

Table 6: Impact of simulated cereal price shocks on poverty measures: treated

	Benchmark	**0.2**	**0.4**	**0.6**
HCR	0.857	0.862	0.864	0.866
PG	0.404	0.408	0.412	0.415
Sen	0.507	0.513	0.516	0.519
CV		0.088	0.155	0.203

Table 7: Impact of simulated cereal price shocks on poverty measures: control

	Benchmark	**0.2**	**0.4**	**0.6**
HCR	0.864	0.878	0.882	0.883
PG	0.408	0.416	0.420	0.422
Sen	0.504	0.518	0.522	0.525
CV		0.086	0.151	0.195

We conclude this paragraph with a note of caution. Economic shocks such as falling income in a recession or dramatic increases in food prices can lead to changes in purchasing behaviour that are not necessarily predicted by elasticity estimates calculated with data collected under normal market conditions or different types of market stressors. Our data were collected in 2011 and 2013, thus any extrapolation of the findings to the current situation must be interpreted with care, bearing in mind that some of the observed and unobserved characteristics of the sample may have changed in the meantime.

4. Conclusions

During 2015 and 2016, Lesotho experienced a large increase in the price of maize, the main staple food in the country. The main factor that has contributed to the deteriorating food security has been the drought induced by El Niño, which is increasingly affecting countries in Southern Africa. Its most unwelcome effect is clear: a decrease in the consumption of staple foods. Rising food prices reduce consumer access to food. This effect is most severe among poor households, who spend a higher share of their income on food.

This study used a demand system to simulate the effects of an increase in the price of staple foods. We based our analysis on data collected for the evaluation of the Child Grants Programme. We found that, for every 1% increase in the price of cereals there is an equivalent reduction in the consumption

of that staple. As for the possible policy measures to counteract the impacts of the current price surge, we observed that, in order to maintain household utility unchanged, every percentage increase in the price of cereals would need to be matched by a 0.4% increase in income. If increases in total income would have to come only from the exogenous component provided by the cash transfer while other sources remain stable, the amount of the cash transfer would have to increase by 2% for every percentage point increase in the price of cereals. The increase registered thus far (December 2015) in the retail maize price is approximately 15% at the national level, which would call for an increase of almost 30% in the amount of the cash transfer. Once we estimated by how much total income should increase to protect households from the price increase, we proposed that total income be integrated through public transfers from Lesotho's social protection system. In particular, we suggest an increase in the transfer size of the CGP as one possible response to the food security crisis, since the programme targets the poorest of the poor, the group of the population that is bound to suffer the consequences of the current price increases the most.

References

Banks J, Blundell R & Lewbel A, 1997. Quadratic Engel curves and consumer demand. Review of Economics and Statistics 79: 527–39.

Caracciolo F, Depalo D & Macias JB, 2014. Food price changes and poverty in Zambia: An empirical assessment using household microdata. Journal of International Development 26: 492–507.

Deaton A, 1997. The analysis of household surveys: A microeconometric approach to development policy. Baltimore Md: Johns Hopkins University Press.

Deaton A, 1989. Rice prices and income distribution in Thailand: A non-parametric analysis. Economic Journal 99(395): 1–37.

Deaton A & Muellbauer J, 1980. An almost ideal demand system. American Economic Review 70: 312–26.

Food and Agriculture Organization of the UN (FAO), 2015. Food price monitoring and analysis. Available at http://www.fao.org/giews/food-prices/price-warnings/detail/en/c/379308/

Friedman J & Levinsohn J, 2001. The distributional impacts of Indonesia's financial crisis on household welfare: A "rapid response" methodology. NBER Working Paper No. 8564, Cambridge MA.

Kane GQ, Tene GLM, Ambagna JJ, Piot-Lepetit I & Sikod F, 2015. The impact of food price volatility on consumer welfare in Cameroon. WIDER Working Paper 2015/013, UNU-WIDER, Helsinki.

Lambert R, Larue B, Yelou C & Criner G, 2006. Fish and meat demand in Canada: Regional differences and weak separability. Agribusiness 22(2): 175–99.

Lesotho Bureau of Statistics, 2016. Consumer price Index – November 2016. Statistical Report No. 36, Maseru, Lesotho.

Lesotho Disaster Management Authority, 2015. LESOTHO price watch – December 2015. Maseru, Lesotho.

Leyaro V, 2009. Commodity price changes and consumer welfare in Tanzania in the 1990s and 2000s. CREDIT Research Paper No. 10/01, Centre for Research in Economic Development and International Trade, University of Nottingham, Nottingham UK.

Moschini G, 1995. Units of measurement and the Stone Index in demand system estimation. American Journal of Agricultural Economics 77(1): 63–8.

Pellerano L, Moratti M, Jakobsen M, Bajgar M & Barca V, 2014. Child grants programme impact evaluation: Follow-up report. Oxford: Oxford Policy Management.

Sen AK, 1976. Poverty: An ordinal approach to measurement. Econometrica 44(2): 219–31.

Sen AK, 1997. Hunger in the contemporary world. Discussion paper DEDPS/8, London School of Economics and Political Science.

Shonkwiler JS & Yen ST, 1999. Two-step estimation of a censored system of equations. American Journal of Agricultural Economics 81: 972–82.

Tafere K, Taffesse SA, Tamru S, Tefera N & Zelekawork P, 2010. Food demand elasticities in Ethiopia: Estimates using household income consumption expenditure (HICE) survey data. ESSP II Working Paper 11, IFPRI, Addis Ababa.

World Food Program (WFP), 2015. Market update. WFP, Rome.