Cereal Consumption Patterns in Urban Ethiopia: 2005 -2011[1]

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Abstract

This study investigated whether the increase in per capita income observed in Ethiopia over 2003/2004 to 2010/11 which coincided with a period of rising food prices led to a change in cereals consumption pattern of urban households. If increases in food prices have counteracted the increase in purchasing power for the same period, it signals significant implications for poverty reduction and dietary diversity efforts. Thus, employing the QUAIDS (Quadratic Almost Ideal Demand System) methodology for 2004/05 HICES (Household Income Consumption Expenditure Survey) and 2010/11 HCES data, cereal consumption patterns were analyzed for Urban Ethiopia. The findings reveal the per capita expenditure share of Teff, Wheat and Maize from total food expenditure increased significantly over the period while the share of Barely, Sorghum and other foods declined. The result from QUAIDS model shows that Wheat, Barley and Sorghum which were complements with Teff (high valued cereal)in 2004/05 become substitutes in the latter year suggesting increase in prices forced urban households to use cereals which were complementary to Teff as substitutes. In general, this suggests that there has not been a shift in the consumption pattern of households away from the traditional cereals to higher value added other food items for the period concerned.

Key words: Consumption, QUAIDS, Expenditure, Cereals, HICES
Jel Classification: D12,

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1. Introduction

Food inflation in Ethiopia increased over the years 2004 to 2008, reaching an all-time high in 2008. The annual food inflation increased from a mere 2.2% in 2004 to 18.2% in 2007 and rose further to 51% in 2008. In recent years, food inflation has shown some volatility and registered a minimum of -3.4 percent in 2009 and a maximum of 45.3 percent in 2011. Nominal prices of teff (staple food cereal) and wheat doubled between mid-2007 and mid-2008, while maize prices jumped by about four-fold over the same period (Nigussie et al., 2012). Real prices of these staple grains also increased significantly. The real price of teff, for instance, in mid-2009 was 30% higher, compared to mid-2007 (Rashid, 2010). This rise in price coincides with a general increase in international food price observed since 2003. In just two years, the FAO Food Price Index increased from 125.1 in June 2006 to 225.8 in June 2008. In February 2011, the index reached 240.2 exceeding the level of the second quarter of 2008 (FAO, 2013).

During the same period of 2004 to 2013, however, Ethiopia's economic growth averaged 10.3% per year and has resulted in more than 75% of rise in real GDP per capita (WDI, 2012). This robust economic growth is expected to bring about changes in consumption pattern by diversifying the consumption bundle of households away from staple food; the traditional cereals dominated food consumption to higher value added food items. In addition, increasing population and change in lifestyles of the urban people are likely to affect the consumption pattern of individuals.

Food consumption patterns in Ethiopia are diverse with distinct regional differences with no single crop dominating the national food basket (Kibrom, et al. 2010 & Guush et al. 2011). Part of the diversity in consumption patterns across Ethiopia can be explained by the variations in rural and urban livelihoods. Due to the inherent characteristics of living conditions in urban areas like high monetization, sensitivity of consumption to relative prices and supply changes, urban consumption patterns are more dynamic than in rural areas. In addition, consumption patterns are likely to change more quickly in urban than in rural areas due to the relatively increased exposure of urban areas to global food consumption patterns (Guush et al. 2011). But, the rise in food inflation is expected to reduce purchasing power and deter this change in consumption

pattern rather intensifying consumption of cereals, which in turn has implications for poverty and inequality reduction efforts of the government.

Various studies have investigated the food consumption patterns and the effect of increase in food price and income on welfare in Ethiopia. With the Ethiopian 1994 and 2004 Urban Household Survey (EUHS) and Working-Leser expenditure share model and simulation analysis Tadese (2010) found household consumption patterns in urban areas have started to shift from staple food grains to other high valued food products[4]. Using the 2004/05 Household Income Consumption and Expenditure Survey (HICES) and Quadratic Almost Ideal Demand System (QUAIDS) methodology, Kibrom et al (2010) shows that Ethiopian households display significant response to changes in prices and expenditure/income for food grains[5]. Using similar methodology and Ethiopian Rural Household Survey (ERHS), Nigussie et al. (2012) indicates that the price hikes in recent years increased welfare gain of rural households by about 10.5 percent on aggregate, as compared to less than 1% for the reference period (1994 - 2004).

These works, however, are aggregate and lack recent data especially on urban consumption patterns. In addition, they do not explicitly take in to account the effect of inflation and income on consumption pattern over time. This study looks at the impact of the increase in income and inflation on consumption patterns of cereals namely teff, wheat, barley, maize, and sorghum, in urban centers over the 2004/2005 to 2010/11 using two nationally representative household surveys (HICES 2004/5 and 2011) and QUAIDS model. It also investigates the consumption pattern of these food items among different income groups in urban areas.

The findings suggest that the increase in per capita income, urbanization and change in tastes and preferences in Ethiopia have not yet resulted in shift in consumption pattern of urban people away from cereal commodities. This is because of the fact that the increase in cereal food prices in urban areas during the same period forced the urban people to increase the per capita consumption expenditure of major cereal commodities namely teff, wheat and maize by

[4] The food items were disaggregated into cereals, pulses to spices, milk, meat and other animal products, vegetables, fruits, stimulants, sugar and honey.

[5] The disaggregation of the food grain is more detailed but creels were disaggregated into Teff, Wheat, Barley, Maize and Sorghum which is similar to the disaggregation we employed.

decreasing the per capita expenditure share of other food items and across all household quintile groups. The estimation results from QUAIDS model also indicate that teff, wheat and barley are normal goods both in 2005 and 2011 while maize and sorghum become inferior goods in 2011. Wheat, barley and sorghum which were complements with teff in 2004/5 show some degree of substitution in the latter period. The expenditure elasticity on teff is positive in both periods but decreases in value in 2011.

The next section briefly reviews the literature on food consumption. Section three presents a description of the data and the model used in the study. Section 4 presents the findings from the descriptive and econometric analysis, while the last section is devoted to conclusion.

2. Literature Review

The recent global rise in food prices and rapid economic development in some countries has renewed the interest in the empirical analysis of consumer demand both at international and national levels. In the analyses of the food consumption pattern of India in response to changes in income and prices using QUAIDS model and Food Characteristics Demand System (FCDS) model Kumar et al. (2011) revealed that income elasticities vary across income groups and are lowest for cereals group and highest for horticultural and livestock products. With increase in food price inflation, the demand for staple food (rice, wheat and sugar) may not be affected adversely but, that of high-value food commodities is likely to be affected negatively. The analysis of nine low-income countries by Ivanic and Martin (2008) suggests that the short-run impacts of higher staple food prices on poverty will differ considerably by commodity and by country, but, that poverty increases are much more frequent and larger than poverty reductions. Benfica (2012) found that increase in prices most severely affected urban households particularly the poorest both in aggregate consumption and also in terms of food consumption. In rural areas, relatively better off households are more negatively affected by overall price increases, but the poorest are the group that suffers the most with food price shocks.

Using the Ethiopian 1994 and 2004 Urban Household survey (EUHS); and Working-Leser expenditure share model and simulation analysis Tadesse (2010) found household consumption patterns in urban areas in Ethiopia have started to shift from staple food grains cereals, pulses, to

high value food products of spices, milk, meat and other animal products, vegetables, fruits, stimulants, sugar and honey and others. The finding revealed that demographic variables were found to be less important determinants of rural household demand for cereals. Abi and Surafel (2003) in their study of Quadratic food Engel curves with measurement error using the 1994 EUHS showed a sharp contrast to the findings from developed countries. Food share is found to increase with expenditure, and that it only starts to decline after some threshold level of expenditure.

With the 2004/05 HICS survey and QUAIDS model Kibrom et al (2010) shows that Ethiopian households display significant response to changes in prices and expenditure/income. The price elasticties of demand for cereals show difference between urban and rural areas. Nigussie et al. (2012) using similar model and ERHS data found the price hikes in recent years increased welfare gain of rural households by about 10.5 percent on aggregate, as compared to less than 1% for the reference period (1994 - 2004).

3. Data and Model Specification

3.1 Data

The study uses the urban households data associated with the food expenditure from the 2004/05 Household Income and Consumption Expenditure Survey (HICES) and the 2010/2011 Household Consumption Survey (HCES) collected by the Central Statistical Agency (CSA) as the most significant increase in food price was observed during this period.Additional information on the urban household demographics and asset variables were also extracted from Welfare Monitoring Surveys (WMS) of the two years. Consequently, our data base consists of 9,146,572 households in 2004/05 and 12,610,920 households in 2010/11, which accounts 14.2 percent and 16.6 percent of total urban population surveyed respectively. The food expenditure on this data set is then divided in to six groups focusing on cereals: teff, wheat, barley, maize, sorghum and other foods. Whenever it is possible, the food commodities which fall under mixed and processed cereals are disaggregated into the main cereals commodity groups. The other food group, therefore, includes commodities that could not be disaggregated in to the main cereal groups.

Since both the 2004/05 and 2040/11 surveys do not include price information, we used unit value as prices. We then calculate the unit value of each commodity as the ratio of expenditures and quantities for these households. Data on either expenditure or quantity or both, however, are not reported for some households as some households did not purchase the commodity during the survey period, while others did but part or all of the information on their purchase is not recorded. As a result, missing unit values are replaced by the mean unit value of the corresponding enumeration area.

The use of unit value, however, is not without problem. Quality differences within commodity groups and measurement errors in expenditures and quantities can lead to biased estimates even when they are assumed to be direct indicators of corresponding prices (Deaton, 1997). Teff, for instance, comes in different varieties and quality grades. These grades are valued differently by consumers. The unit value of teff thus reflects these quality differences. In addition, households'choice among goods differentiated by quality is likely to be influenced by prices. This problem is likely to be more pronounced when commodities are aggregated into groups with two or more components. In this regard, assuming group-separable preferences Deaton (1987; 1988) demonstrates that if the aforementioned quality effect is present, the unit value of a commodity group will have a less than proportionate response to the price of the group. Expenditures and quantities are also measured with errors. Unit values, being ratios of the two, are thus contaminated by those errors. Deaton (1988) illustrates that these errors are likely to be spuriously negatively correlated with recorded quantities. Estimating the relationship between quantities and unit values without accounting for measurement error can hence results in biased estimates of the price responses of demand.

Despite these problems, different studies in Ethiopia confirmed estimates of 'quality' elasticities of unit values and the level difference between unit values and prices do not appear to be very large. Kibrom et al. (2010) reported that for food commodities, these elasticities range from -0.018 for sorghum through to 0.1722 for 'sugar and salt. Abbi(2005) also reported elasticities of comparable magnitude for urban Ethiopia. Healso obtains estimates of 'price' elasticities of quantity demanded for urban Ethiopia that correct for these problems; and concludes "the quantitative significance of adjustments for 'quality' effects and measurement error associated with the use of unit values for cereals does not appear to be large". This is because "…Teff,

cereals, shiro, oil, meat, milk and butter have modest corrections followed by slight corrections for wheat, pulses, coffee and sugar" indicating that. Moreover, the level difference between unit values and prices may not be considerable. Capéau and Dercon (2005)also showed that out of the 15 crop specific mean unit values, only four fell outside the 95% confidence interval of the corrected 'price' estimates indicating that unit values and prices do not appear to be different.

3.2 Model Specification

The effect of price and income changes on consumption can be estimated using different demand functions. The most widely used demand models available for this are the Linear Expenditure System (LES) developed by Stone (1954); and the Almost Ideal Demand System (AIDS) developed by Deaton and Muellbauer (1980). Many studies favor the AIDS model mainly because LES model is too restrictive in that it can only be applied in the situation where the goods are all not inferior goods and assumes that the goods are gross complements. The subsequent development of demand systems has focused on improving the fit of the models to the observed data by introducing additional terms which are quadratic in expenditure, such as the Quadratic Almost Ideal Demand System (QUAIDS) by Banks et al. (1997). This model is more flexible and can still fulfill the restrictions imposed by economic theory. Therefore, so as to provide as realistic an empirical analysis as possible, we estimate the QUAIDS demand system model for Ethiopia.

The study uses a two-stage budgeting framework to model the consumption behavior of households. The idea is that allocation of expenditure occurs in two independent steps. In the first step, total expenditure is allocated between n broad groups of products; in the second stage, the group expenditure is allocated to elementary commodities within each group.The first step can be formally expressed as:

$$\mathrm{X} = \varphi(\mathbf{P}, \mathrm{y})$$

In which X is a n x 1 a vector of groups and P is a n x 1 vector of group price indexes. TheMarshallian demand function in the second stage can be formally expressed as:

$$\mathbf{q}_{\mathbf{r}} = \mathbf{h}_{\mathbf{r}}(\mathbf{p}_{\mathbf{r}}, x_{\mathrm{r}})$$

In which q_r is a $m_r x$ 1 sub vector of commodities in the rth group q; $p_r$is the equivalent subsector of r^{th}prices P, and x_r is the expenditure on the r^{th}product of x.

Weak separability of preferences assumption is a necessary and sufficient condition for the estimation of the demand function in a two-stage budgeting structure (Deaton and Muellbauer, 1980)has shown that under two hypotheses of weak separability of preferences, and low sensitiveness of the price index for each group to changes in the utility function, the two-stage budgeting system leads to an approximately correct budgetary allocation. Assuming that the preference of the household is structured in such a way that, in the first stage, the household decides on how much of its total income (expenditure) is to be allocated for food consumption, conditional on consumption of the non-food goods like health, transport, education,etc and the household demographic characteristics. In the second stage, the level of expenditure on food, as determined in the first stage, is allocated to food items, teff, wheat, barley, maize, sorghum and other foods.

The specific functional form of the QUAIDS model in budget shares form for the ith items is:

$$w_i = \alpha_i + \sum_{j=1}^{n} \Upsilon_{ij} lnp_j + \beta_i \left[ln \frac{fe}{a(p)} \right] + \frac{\lambda_i}{b(p)} \left[ln \frac{fe}{a(p)} \right]^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where α, β, γ, and λ are parameters to be estimated. $w_i$is the share of the i^{th}good in the consumer's budget; fe is total food expenditure following the framework of two stage budgeting, P_j is the price of jth good, and P is a properly defined price aggregator. This price aggregator is given by:

$$lna(p) = \alpha_0 + \sum_{j=1}^{n} \alpha_j lnp_j + \frac{1}{2} \sum_{j=1}^{n} \sum_{i=1}^{n} \Upsilon_{jn}\, lnp_j ln_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

and b(p) is the Cobb-Douglas price aggregator:

$$b(p) = \prod_{i=1}^{n} (p_i)^{\beta_i} = exp\left(\sum_{i=1}^{n} \beta_i \ lnp_i\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The additivity, homogeneity, and symmetry of the Slutsky matrix (cross price effects are the same across the good) restrictions which are derived from the standard demand theory are also imposed.

In terms of the model parameters, the adding-up property of the demand system is expressed as:

$$\sum_{i=1}^{n} \alpha_i = 1; \sum_{i=1}^{n} \beta_i = 0; \sum_{i=1}^{n} \lambda_i = 0; \sum_{i=1}^{n} \Upsilon_{ij} = 0 \ for \ all \ j \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

The homogeneity restriction implies that:

$$\sum_{j} \Upsilon_{ij} = 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Finally, imposing symmetry of the Slutsky matrix implies that:

$$\Upsilon_{ij} = \Upsilon_{ji} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Additivity ensures that total expenditure is equal to the sum of individual expenditure on different commodities and goods (Σw_i =1). Homogeneity guarantees that the demand functions are homogeneous of degree zero in prices. Finally, negative semi-definiteness and symmetry of the Slutsky matrix are necessary for integrability of the demand system to well-defined preferences.

a) Price and Income Elasticities of Food Demand

Banks et al (1997) shows that it is possible to drive the income elasticity and own price and cross price elasticity bydifferentiating the expenditure share commodity i in equation (1) with respect to the logarithm of food expenditure and the logarithm of prices.

Expenditure (income) elasticity is:

$$\mu_i = \frac{\partial w_i}{\partial lnm} = \beta_i + \frac{2\lambda_i}{b(p)}\left[ln\left(\frac{fe}{a(p)}\right)\right] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Own and cross price elasticities are:

$$\mu_{ij} = \frac{\partial w_i}{\partial lnp_j} = \Upsilon_{ij} - \mu_i\left(a_j + \frac{1}{2}\sum_{i=1}^{n}\Upsilon_{ij}lnp_i\right) - \frac{\lambda_i\beta_i}{b(p)}\left[ln\left(\frac{fe}{a(p)}\right)\right] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Nonetheless, it should be noted that when one introduces socio-demographics and household characteristics into the model, these variables affect elasticities in the same way that αidoes and indirectly through their impact on $a(p)$.

Consequently, the budget elasticities for the i commodities can be quantified as follows:

$$e_i = \frac{\mu_i}{w_i} + 1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Wheree_i measures the responsiveness of demand for a specific good to changes in expenditure.

Price elasticities can be derived either from the Marshallian demand equation or from the Hicksian demand equation. The Marshallian demand equation is obtained by maximizing utility subject to the budget constraint, while the Hicksian demand equation is derived by solving the dual problem of expenditure minimization at a certain utility level. As for the Marshallian/uncompensated price elasticity, positive e_{ij}^u indicates gross substitutes and negative e_{ij}^uindicates gross complements. A zero value of e_{ij}^usuggests independent goods.

The uncompensated price elasticity in the case of QUAIDS is defined as follow:

$$e_{ij}^u = \frac{\mu_{ij}}{w_i} + \delta_{ij}$$

Whereδ_{ij}represents the Kronecker delta.

Finally, the Slutsky equations allow us to derive Hicksian/compensated elasticities from Marshallian/uncompensated ones and vice versa:

$$e_{ij}^{c} = e_{ij}^{u} + e_i w_i$$

i) Zero Consumption[6]

There might be zero consumption on certain group of itemsin the data due to infrequent purchases, choice of not consuming goods given current prices and households' budget constraint, and misreporting. As pointed out by Pudney (1989) including such zero expenditure in our demand system estimation biases the estimates. Though aggregation over food items particularly for other foods helps to reduce the problem in our data, there is a possibility of zero consumption of teff by poorest quintile groups; and sorghum and maize by the richest quintile groups. Several approaches to solve this problem have been developed. We adopted the two-step approach initially proposed by Heien and Wessells (1990) and further modified by Shonkwiler and Yen (1999). A similar approach had been adopted by Kibrom et al. (2010), Nigussie et al. (2012) and Kibrom and Ibrahim (2012).

ii) *Endogeneity of total food expenditure* [7]

If total food expenditure is jointly determined with the budget shares of the specific commodities in the demand model, total expenditure becomes endogenous in the budget share equations. This may induce inconsistent parameter estimates if not taken care of (Blundell and Robin 1999). Thus to solve this problem the paper adopts an augmented regression technique recommend by Blundell and Robin (1999).Thisinvolvestwo steps. First, total expenditure is regressed on a set of exogenous variables including those which may directly influence budget shares. In the second step, the residual from this reduced-form regression is added, as an explanatory variable in the budget share equations together with total expenditure. The OLS estimator of the parameter of the total expenditure variable in this augmented regression is identical to the Two-Stage Least Squares (2SLS) estimator (Blundell and Robin 1999). Moreover, Blundell and Robin argue that

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[6 7]These two sections borrow a large part of the write ups from Nigussie et al. (2012) and Kibrom and Ibrahim (2012).

in the augmented regression, testing for the significance of the coefficient of the 'residual' obtained in the first regression serves as a test of the endogeneity of total expenditure in the share equations.

4. Results on Consumption Pattern and Demand Elasticities of Cereals

4.1 Consumption Pattern of Cereal at National Level and in Urban Areas

As per the descriptive statistics obtained from the HICES 2004/05 and HCES 2010/11, the composition of cereal foods at a national level appears to be fairly distributed in both years. Yet, in urban areas, this composition is dominated by teff. When other foods, which include fruits and vegetables and dairy products among others, are included in the analysis, most of the food expenditure in urban areas goes to other Foods. Figure 1 shows the composition of food expenditure at the national level and in urban areas.

The urban food expenditure (on cereals and other food products) is computed to be about 8.5 billion ETB (Ethiopian Birr) in 2005 with a mean annual per capita expenditure of 931.1 ETB. In 2011, this share rose to 39.9 billion ETB with a mean annual per capita expenditure of 3, 1632 ETB. Over the same period, however, the share of urban food expenditure from the total urban expenditure dropped from 44.8 per cent to 38.6 per cent. This shows that the share of urban food expenditure follows a similar trend like the share of the national food expenditure which declined from 54.3 per cent in 2005 to 48.8 per cent in 2011 (See Table 1).

Table 1: National and Urban Food Share Expenditure

	2004/05	2010/11
Urban Food Expenditure	8,516,272,435	39,890,978,017
Urban Expenditure	19,005,563,917	103,349,962,036
Urban population	9,146,572	12,610,920
National Food Expenditure	54,232,718,090	173,297,311,102
National expenditure	99,846,218,939	355,314,639,332
Urban Per Capita Food Exp.	931.1	3163.2
Urban Food to Urban Exp.	44.8	38.6
National Food to National Exp.	54.3	48.8

Source: Authors calculation using HICES 2004/05 and HCES 2010/11
Note: ETB =Ethiopian Birr

In urban areas, the per capita expenditure share of Teff, Wheat and Maize from total food expenditure increased significantly over the period. The share of Barely, Sorghum and Other foods, however, declined (Table 2). This may suggest that the increase in per capita income, urbanization and change in tastes and preferences in Ethiopia have not yet resulted in shift of consumption pattern of urban people away from cereal commodities. This is because the increase in cereal food prices in urban areas during the same period forced the urban people to increase the per capita consumption expenditure of major cereal commodities namely Teff, Wheat and Maize by decreasing the per capita expenditure share of other food items.

Table 2: Share of National and Urban Cereal expenditure form the total food expenditure

	2004/05		2010/11		Change, % 2004/05 -2010/11	
	National	Urban	National	Urban	National	Urban
Teff	8.8	16.1	12.0	21.4	37.1	33.4
Wheat	8.7	4.7	8.0	9.5	-8.6	101.8
Barley	4.3	1.0	2.4	0.8	-44.7	-17.8
Maize	8.5	1.8	7.5	2.3	-10.9	27.7
Sorghum	8.0	1.7	5.0	1.5	-38.1	-13.3
Other foods	61.7	74.7	65.1	64.5	5.5	-13.7

Source: Authors calculation using HICES 2004/05 and 2010/11 HCES 2010/11

4.2. Consumption Pattern of Cereals across Different Income Categories

When we look at the expenditure share of cereals across income categories, classified based on their overall expenditures, Teff dominated in the budgetary allocation of the total food expenditure for all income groups in both years. It was as high as 18.1% in 2005 for the rich household quintile group and 22% in 2011 for the richest household quintile group. Wheat takes the second position in budgetary allocation with its share of 6.6% and 11.8% in 2005 and 2011 respectively.

Over the period 2005 to 2011, the consumption of cereal commodities increased in the urban areas of Ethiopia (See Table 3 and Table 4). That means the increase in the price of cereal commodities led to the increase the share of these commodities by decreasing other Food commodities which includes fruit and vegetables, and dairy products among others. Looking at the components of cereals, the consumption of Teff, Wheat and Maize increased across all

household quintile groups while the consumption of Barely and sorghumshowed different pattern across different income categories. The consumption of barely increased for the poorest (q1) and the rich (q4) household quintile groups while it declined for the other income group.The consumption of sorghum increased for all except the richest income category. The detailed discussion for each cereal commodity is presented below.

Teff

In 2004/2005, households in the poorest quintile group spend 17.3% of their food expenditure on teff. This share is more than the richest (14.4%) household quintile group share. Households in the second quintile group spend the largest share, 18.1%, on Teff. The other household quintile groups take a comparable expenditure share, ranging from 16.8% to 17.3%. In 2010/2011, the richest quintile groups spend more on teff (22%) than the other income groups. In addition; the average per capita expenditure on teff consistently increases from the poorest to the richest quintile groups in both years. The average per capita expenditure of the richest quintile on Teff was almost threefold to that of the poorest quintile group in 2004/05 and this difference increased to fivefold in 2010/11.

Wheat

As of 2005, the share of wheat expenditure from the total food expenditure was the highest for the poorest income category, 6.6%. Among the income groups, the richest quintile group spends the smallest share of its food expenditure on wheat 3.7%.Though the poorest household still spends a larger share of its food expenditure on wheat in 2011, the richest household quintile group experienced a large (140.8 percentage points) increase in the share of their expenditure on wheat. Moreover, the average per capita expenditure on wheat increases consistently from the poorest to the richest quintile groups in both years. The average per capita expenditure of the richest quintile for wheat is almost twofold to that of the poorest quintile group in 2005 while it became more than threefold in 2011.

Barely

In 2005, barely accounts for the largest share of the budgetary allocation for the poorest household quintile. In 2011, however, it becomes the poor household quintile group which

spends more of its food expenditure on barely. The average per capita expenditure on barely increases steadily from the poorest to the richest quintile groups in both years. Of all the cereals commodities, the share per capita expenditure on barley in the total food expenditure is small across all income groups in both years. Over the period 2005 to 2011, the share of households per capital expenditure on barely for the poor (q2) and rich (q4) quintile group increased by 4% and 3.1% respectively while it declined for the other income groups.

Maize

Maize accounts for the largest share of the budgetary allocation for the poorest household quintile in both years. As of 2005, households in the poorest quintile group tend to spend nearly fivefold as much on maize as the richest quintile group. This difference further increased to almost six fold in 2011.During the period 2005-2011, the per capita expenditure share of maize in budgetary allocation increased across all income groups. The largest increase was registered by the non-poor household income quintile group, 104.3%. The per capita expenditure is also high among the three lower household income quintile groups.

Sorghum

Sorghum also accounts the largest share of the budgetary allocation for the poorest household quintile in both years. As of 2005, households in the poorest quintile group tend to spend nearly threefold as much on sorghum as the richest quintile group. This difference further increased to almost six fold in 2011. During the period 2005-2011, the per capita expenditure share of sorghum in budgetary allocation increased across all income groups except the richest household income group.

Other foods

Of all food consumption, other foods account the largest share of per capita food expenditure in all years. Over the period 2005 - 2011, the share of per capita food expenditure declined across all income groups. Given the increase in the share of per capita expenditure on teff, wheat, and maize across all income groups, the drop in other foods per capita expenditure is expected. The average per capital expenditure for other foods also increases consistently from the poorest quintile to the richest quintile in both years.

Table 3: Per capita cereal expenditure share in Urban Ethiopia across the five expenditure per capita groups

Cereal commodity	Income Group		Year 2005	Year 2011	Change, % 2005-2011
Teff	q1	Poorest	17.3	19.8	14.2
	q2	Poor	17.1	20.2	18.5
	q3	Non poor	16.8	20.2	19.9
	q4	Rich	18.1	20.6	14.2
	q5	Richest	14.4	22.0	53.4
Wheat	q1	Poorest	6.6	11.8	79.2
	q2	Poor	6.0	11.5	92.8
	q3	Non poor	5.0	10.8	114.5
	q4	Rich	4.9	10.0	102.9
	q5	Richest	3.7	8.8	140.8
Barley	q1	Poorest	1.4	1.1	-22.6
	q2	Poor	1.1	1.2	4.0
	q3	Non poor	1.3	1.1	-13.8
	q4	Rich	1.1	1.1	3.1
	q5	Richest	0.8	0.6	-14.9
Maize	q1	Poorest	4.1	7.2	75.9
	q2	Poor	2.7	5.5	98.5
	q3	Non poor	2.3	4.6	104.3
	q4	Rich	1.8	2.9	61.7
	q5	Richest	0.9	1.3	47.4
Sorghum	q1	Poorest	3.1	4.1	30.9
	q2	Poor	2.9	4.2	44.5
	q3	Non poor	2.1	3.2	47.7
	q4	Rich	1.5	2.1	40.7
	q5	Richest	1.1	0.7	-33.1
Other foods	q1	Poorest	67.4	56.0	-17.0
	q2	Poor	70.1	57.4	-18.2
	q3	Non poor	72.4	60.1	-17.0
	q4	Rich	72.7	63.3	-12.9
	q5	Richest	79.3	66.5	-16.1

Source: Authors calculation using HICES 2004/05 and HCES 2010/11

Table 4: Annual Per capita Cereal Expenditure of Urban Ethiopia inBirr across the Five Per capita Expenditure Groups

Cereal commodity	Income Group		Year		Change, % 2005-2011
			2005	2011	
Teff	q1	Poorest	85.9	220.5	-97.4
	q2	Poor	119.0	313.1	-96.0
	q3	Non poor	146.8	403.5	-93.5
	q4	Rich	177.6	528.2	-88.7
	q5	Richest	194.2	1047.4	-67.4
Wheat	q1	Poorest	32.7	131.9	-90.9
	q2	Poor	41.7	178.5	-85.2
	q3	Non poor	43.7	215.1	-73.5
	q4	Rich	48.7	257.2	-54.4
	q5	Richest	49.4	418.1	15.6
Barley	q1	Poorest	7.1	12.4	-54.9
	q2	Poor	7.9	18.4	-8.6
	q3	Noon poor	11.5	22.8	21.5
	q4	Rich	10.6	28.5	164.6
	q5	Richest	10.2	30.4	366.6
Maize	q1	Poorest	20.2	79.7	-63.2
	q2	Poor	19.1	84.4	-37.3
	q3	Non poor	19.7	92.5	3.4
	q4	Rich	17.4	73.1	49.1
	q5	Richest	11.8	61.2	190.3
Sorghum	q1	Poorest	15.5	45.7	-58.1
	q2	Poor	20.2	64.7	-30.2
	q3	Non poor	18.7	63.3	14.4
	q4	Rich	14.3	52.5	98.5
	q5	Richest	14.7	34.5	101.6
Other foods	q1	Poorest	333.7	622.7	-99.4
	q2	Poor	488.4	887.1	-99.1
	q3	Non poor	631.9	1203.2	-98.5
	q4	Rich	714.5	1620.9	-97.1
	q5	Richest	1,071.6	3160.8	-94.1

Source: Authors calculation using HICES 2004/05 and HCES2010/11

4.3 Demand Elasticities of Cereal Products

The results from the QUAIDS model after imposing the theoretical restrictions of additivity, homogeneity and symmetry, and applying Non-Linear Seemingly Unrelated regression (NLSUR) reveals that all own-price elasticities, except for Maize and Sorghum, are negative in 2005. These elasticities become negative for all cereals in2010/11 (Table 5 and Table 6). The findings of positive price elasticity for Maize and Sorghum in 2004/5 are not surprising given the nature of these commodities.

This could be due to the high consumption of the commodities by the poor household as a less-preferred staple good. The two lowest income quintile groups in 2005 consume sevenfold and nearly fivefold of Maize and Sorghum consumption of the rich respectively. If prices increase and the household is poor, its purchasing power is strongly affected. Consequently, the household will have to decrease consumption of less essential food items or commodities and will increase the consumption of the less preferred staple or inferior good to compensate. A similar conclusion has been reached by (Abebe and Andinet, 2013) whose study reveals that maize is close to being an inferior commodity. In 2011 the sign of own price elasticity for these cereals has changed to negative indicating they become less of a Giffen good.

Table 5: Marshallian Uncompensated Price Elasticities

Commodity Type	Year	Teff	Wheat	Barley	Maize	Sorghum	Other foods
Teff	**2005**	-0.66	-0.10	-0.16	0.09	-0.31	-0.07
	2011	**-1.09**	0.11	0.02	0.08	0.00	0.03
Wheat	**2005**	-0.13	**-2.74**	0.09	0.36	0.45	2.08
	2011	0.17	**-1.37**	-0.01	0.09	0.03	0.03
Barley	**2005**	-3.04	0.53	**-0.11**	-0.06	0.85	2.28
	2011	0.65	-0.06	**-1.56**	0.28	0.44	0.13
Maize	**2005**	1.36	1.06	-0.03	**1.42**	0.25	-3.11
	2011	0.70	0.39	0.07	**-1.71**	0.17	0.06
Sorghum	**2005**	-2.71	1.41	0.46	0.29	**1.81**	1.08
	2011	0.42	0.41	0.22	0.34	**-1.02**	0.11
Other foods	**2005**	-0.01	0.07	0.01	-0.10	-0.03	**-1.09**
	2011	-0.07	-0.01	-0.01	-0.03	-0.03	**-1.03**

Source: Authors calculation using HICES 2004/05 and HCES 2010/11

A comparison of price elasticity across the two periods reveals that own price elasticities seem to have increased in 2010/11 in absolute terms for most commodities. The cross price elasticities of teff and maize indicate they appear to be substitutes in both time periods. Wheat, barley and sorghum appear to be complements with teff in 2004/5 but show some degree of substitution in the latter period suggesting increase in prices forced urban households to use cereals which were complementary to Teff as substitutes. Maize and wheat appear to be substitutes in both periods but the degree of substitution appears to have been higher in 2005.

Table 6: Hicksian - Compensated Price Elasticities

Commodity Type	Year	Teff	Wheat	Barley	Maize	Sorghum	Other foods
Teff	2005	**-0.45**	-0.04	-0.15	0.11	-0.29	0.82
	2011	**-0.86**	0.22	0.03	0.11	0.02	0.48
Wheat	2005	-0.15	**-2.74**	0.09	0.36	0.44	2.00
	2011	0.46	**-1.23**	0.00	0.13	0.06	0.59
Barley	2005	-3.11	0.51	**-0.12**	-0.07	0.84	1.95
	2011	0.68	-0.05	**-1.55**	0.29	0.44	0.19
Maize	2005	1.19	1.02	-0.04	**1.40**	0.24	-3.82
	2011	0.78	0.44	0.08	**-1.70**	0.18	0.22
Sorghum	2005	-3.11	1.31	0.44	0.25	**1.78**	-0.66
	2011	0.29	0.35	0.22	0.33	**-1.03**	-0.15
Other foods	2005	0.19	0.12	0.02	-0.08	-0.01	**-0.24**
	2011	0.25	0.15	0.00	0.02	-0.01	**-0.41**

Source: Authors calculation using HICES 2004/05 and HCES 2010/11

Expenditure elasticities exhibit variation across the five cereals and across the two periods. Teff tends to have positive expenditure elasticity in both periods but indicating that it was more of a luxury in 2005 than it is in 2010/11. Though Wheat unexpectedly has negative income elasticity in 2004/5, it becomes positive in 2010/11 indicating Wheat shifted from inferior commodity to normal goods. Maize and Sorghum seem to be inferior commodities with negative expenditure elasticities in 2005. In 2011 income elasticity of Sorghum remains negative while it becomes marginally positive for maize. This is also compatible with the results found for own price elasticities of maize and sorghum. Other foods in both periods are found to be highly income elastic.

Table 7: Income/Consumption Elasticity of Major Cereals in Urban Ethiopia: 2004/5 - 2010/11

	Teff	Wheat	Barley	Maize	Sorghum	Other foods
2004/5	1.20	-0.11	-0.44	-0.96	-2.34	1.15
2010/11	0.86	1.07	0.12	0.31	-0.49	1.18

Source: Authors calculation using HICES 2004/05 and HCES 2010/11

5. Conclusion and Policy Recommendation

During the period of 2004 to 2013, Ethiopia's economic growth averaged 10.3% per year and has resulted in more than 75% of rise in real GDP per capita (WDI, 2012). This robust economic growth expected to bring about change in consumption pattern by diversifying the consumption bundle of households away from staple food, the traditional cereals dominated food consumption to higher value added food items. The rise in food inflation during the same period can affect purchasing power and may deter this change in consumption pattern and rather increase consumption of cereals commodities.

The result indicates that, over the period 2005 to 2011, the per capita expenditure share of Teff, Wheat and Maize from total food expenditure increased significantly while Barely and Sorghum showed different pattern across different income groups. The Other food category, however, declined during the period. The estimation results from QUADIS model also indicate Wheat, Barley and Sorghum which were complements with teff in 2004/5 show some degree of substitution in the latter year. Maize and wheat, however found to be substitutes in both periods but the degree of substitution appears to have been higher in 2005. This may suggest that increase in prices forced urban households to use cereals which were complementary to Teff as substitutes. The expenditure elasticity of teff is positive in both periods but decreases in value in 2011, suggesting the propensity of teff staying a luxury good in Urban Ethiopia is declining.

These suggests the increase in per capita income, urbanization and change in tastes and preferences in Ethiopia have not yet resulted in shifting consumption pattern of urban people away from cereal commodities. This is because of the increase in cereal food prices in urban areas during the same period may forced the urban household to increase the per capita

consumption expenditure of teff, wheat and maize by decreasing the per capita expenditure share of other Food items. This suggests that efforts to reduce poverty in Ethiopia should also focus not only agricultural production but also stabilizing consumer purchasing power.

Appendix 1:

Annual food expenditure in Urban Ethiopia across the five expenditure per capita groups in Ethiopian Birr

Cereal commodity	Income Group		year		Change, %
			2005	2011	2005-2011
Teff	q1	Poorest	170,052,390	188,872,801	11.1
	q2	Poor	180,397,087	409,543,307	127.0
	q3	Non poor	160,733,472	819,743,812	410.0
	q4	Rich	305,040,356	1,720,342,999	464.0
	q5	Richest	551,007,051	5,402,336,800	880.4
Wheat	q1	Poorest	64,823,151	112,931,852	74.2
	q2	Poor	63,237,672	233,510,127	269.3
	q3	Non poor	47,903,235	437,046,605	812.4
	q4	Rich	83,569,260	837,541,690	902.2
	q5	Richest	140,174,688	2,156,537,105	1438.5
Barley	q1	Poorest	14,143,850	10,650,748	-24.7
	q2	Poor	12,047,506	24,002,399	99.2
	q3	Non poor	12,645,749	46,372,300	266.7
	q4	Rich	18,256,888	92,971,080	409.2
	q5	Richest	28,811,090	156,594,744	443.5
Maize	q1	Poorest	39,886,995	68,232,785	71.1
	q2	Poor	29,028,152	110,404,518	280.3
	q3	Non poor	21,627,554	187,909,856	768.8
	q4	Rich	29,802,776	238,031,269	698.7
	q5	Richest	33,534,737	315,743,921	841.5
Sorghum	q1	Poorest	30,734,213	39,120,507	27.3
	q2	Poor	30,582,199	84,667,801	176.9
	q3	Non poor	20,478,418	128,676,990	528.4
	q4	Rich	24,613,451	171,059,824	595.0
	q5	Richest	41,655,564	177,935,708	327.2
Other foods	q1	Poorest	660,538,508	533,318,955	-19.3
	q2	Poor	740,497,217	1,160,343,305	56.7
	q3	Non poor	692,079,752	2,444,438,631	253.2
	q4	Rich	1,227,264,244	5,279,196,868	330.2
	q5	Richest	3,041,105,209	16,302,898,711	436.1

Source: Authors calculation using HICES 2004/05 and HCES 2010/11

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