The Effect of Home Food Production on the Food Expenditure Patterns of Ugandan Households

Gilbert Werema
Texas Woman's University

Alexey Pomelnikov
Texas Woman's University

Abstract

To draw policy implications about poverty, this research looks at how Ugandan families spend money on food and how changes in income and prices affect consumer behavior at a disaggregated level. The data for the three food categories came from the 2000 Uganda National Household Survey, and the LA/AIDS framework was used to evaluate the price and income elasticities. Poor families spend a larger percentage of their income on food as their household size increases, shifting spending away from the income-elastic food group—sugar, oil, fish, and dairy products—and toward the income-inelastic staple food group—meat, cereals, fruits, and vegetables. The families who grow their food also react more strongly to changes in income and price. Consumer substitution within the starchy food categories increases for those with lower incomes due to price adjustments. These results will prompt planners to propose several policies to ensure people receive the necessary nourishment.

Keywords: Income, Price, Demand, Food Policy, LA_AIDS Model

Introduction

The global food crisis of the 1990s led to an increase in food prices all over the world. Indeed, the expected rapid increases in food prices, particularly those of grains and cereals, had devastating effects on populations, especially in developing countries. For instance, between 1995 and 1996, there was a significant increase in food prices, particularly in grains and cereals, which resulted in a global food crisis (FOOD AND AGRICULTURE ORGANIZATION, 1997). This, in turn, led to the emergence of food insecurity and a surge in poverty cases (J. Craig Jenkins and Stephen J. Scanlan, 2001; Joachim Braun, 2007; Joachim von Braun and Leonardo Paulino, 1990; Stringer, 2000). Among the countries badly affected by the crisis was Uganda. According to UNHS (1997), households spent an average of 51 percent of their expenditure on food, leaving minimal funds for other goods and services essential for human welfare. Secondly, in Uganda, there exists a lack of diversity in food consumption patterns. According to the Uganda Bureau of Statistics, almost 80 percent of food expenditure was on cereals, pulses, roots and tubers, vegetables, and oils. Figure 1.1 shows that "between 1991 and 1992, inflation increased by 58 percent in Uganda. As rates of inflation were increasing, Figure 1.2 shows that caloric intake in Uganda declined between 1990 and 1997. In 1990, the per capita calorie intake stood at 2337 and fell to 2208 in 1997. The World Health Organization (WHO) estimates that an adult male needs 3000 kcal, while an adult female needs 2100 kcal. Figure 1.3 indicates that from 1990 to 1994 51% of calorie intake in Uganda was derived from cereals and roots. There is evidence therefore that rising food prices have serious implications for poverty and food security.

This research aims to investigate the food demand patterns of Ugandan families to assess the impact of price fluctuations on consumer behavior at a disaggregated level and to evaluate its policy implications for poverty and food security. The Working (1943) model will be employed to estimate aggregate expenditures and price elasticities for aggregate demand concerning food and non-food commodities, while the Linear Approximation of an Almost Ideal Demand System (LA/AIDS) will be econometrically tested for 14 food groups utilizing data from the 1999/2000 Uganda National Household Budget Survey (UNHS) provided by the Uganda Bureau of Statistics (UBOS).

Literature Review

Several studies have shown how changes in prices have affected the nature of food consumption in Uganda over the last three decades. According to Ulimwengu and Ramadhan (2009), Ugandan households were almost unaffected by the 2008 wave of soaring world food prices. The Ugandan local market prices indicated a possibility of high volatility in the first quarter of 2009. This increase in food prices' volatility at the household level may benefit net producers but hurt net consumers. However, the net consumption impact due to increased food prices is not as clear as might have been reported in various studies. According to Boysen (2016), price elasticities suggest that poor rural households, if they do not focus on the cheapest foods, are generally well-positioned to offset the increases in staple prices through substitution. Price changes lead to greater consumer substitution within the starchy food groups at lower incomes (Werema, 2019). While disposable monthly income had a positive effect on the probability of consumption and level of expenditure on fast food, household size, education level, and distance from workplace to restaurant negatively influenced the probability of fast-food consumption and level of expenditure on fast food (Heckman, 1979). While most Ugandans are net food consumers, the very significant amount and diversity of basics eaten from home production helps to offset the negative

effect at the household level of increasing global prices (Benson et al., 2008). Research based on current pricing data and an estimated impact on consumption poverty reveals that impoverished families in Uganda frequently act as net buyers of food basics, resulting in welfare losses when food prices escalate (J. Craig Jenkins & Scanlan, 2001). Furthermore, the majority of rural families, as well as those in metropolitan areas, experience the most significant welfare losses. Jenkins and Scalan conclude that price rises throughout a spectrum of basic items have not been a beneficial buffer. Using data from Uganda's Living Standards Measurement Study (LSMS), it has been projected the 2030 demand for matooke, cassava and potatoes, maize/coarse grains, wheat and rice, vegetables, meat, and fish will rise (Intriligator et al., 1996).

The above studies confirm that a rise in income and demographic changes will significantly increase the demand for these food items. The limiting factor in the studies is the assumption that similar patterns of expenditure across regions and household expenditure groups, home production, and low-income versus high-income households. They fail to show the impact of rising prices on households. Enhanced comprehension of consumer reactions to escalating costs via a disaggregated study is essential for aiding policymakers in formulating improved policies.

Methodology

This study will apply the LA/AIDS model developed by Deaton and Muellbauer (1980a, 1980b). To begin, an AIDS model for the 14 food commodities is estimated as follows:"

$$w_i = \alpha_i + \sum_j \gamma_{ij} \ln(pj) + \beta_j \ln(\frac{x}{p}) + \mu_i \ , \ i = 1,\ldots..14 \tag{1}$$

where "w_i (≥ 0) is the budget share of food product i, p_j is the price of food commodity j, x is the total expenditure on food commodity in question, μ_i's are random disturbances assumed with zero mean and constant variance, and P is a translog price index defined by;

$$\log P = \alpha_i + \sum_k \alpha_k \ln p_k + \frac{1}{2} \sum_k \sum_l \gamma_{kl} \ln p_k \ln p_l \tag{2}$$

$k = 1,\ldots..,14 \quad i = 1,\ldots\ldots,14$

The model defined by Equations (1) to (2) is called the AIDS model. However, there are some estimation difficulties arising from Equation (2) due to "non-linearity in parameters. To avoid the problem of nonlinearity, Asche and Wessells (1997) used the "Stone index as one of the most commonly adopted methods for LA/AIDS estimation. Accordingly, Moschini (1995) proposed the following "log-linear analog of the Laspeyres price indexes;"

$$\ln(P^*) = \sum_j w_i \ln(p_i) \ , \qquad i=1,\ldots..,14 \tag{3}$$

where w is the budget share among 14 commodities. The Stone index is an approximation proportional to the translog, which means that $P = \varphi P^*$ where $E(\ln(\varphi)) = \alpha_0$. The LA/AIDS model with the Stone index is, therefore,

$$w_i = \alpha_t^* + \sum_j \gamma_{ij} \ln(p_j) + \beta_t \ln(\frac{x}{p^*}) + \mu_t^* , \quad (4)$$

where $\alpha_i^* = \alpha_t - \beta_i \alpha_i$ and $\mu_i^* = \mu_i - \beta_i(\ln(\varphi) - E(\ln(\varphi)))$.

According to Moschini (1995), "prices will never be perfectly collinear. He found that applying the Stone index will introduce the units of measurement error." To overcome this measurement error problem, Moschini (1995) suggested "the log-linear analog of the Laspeyres price index be obtained by replacing w_i in Equation (3) with $\overline{w}_i$, which implies budget share. The Laspeyres price index, therefore, becomes a geometrically weighted average of prices;"

$$\ln(P^L) = \sum_i \overline{w}_i \ln(P_i) \quad (5)$$

When (5) is substituted into (4), it yields an LA/AIDS model with the Laspeyres price index as follows:

$$w_i = \alpha_i^{**} + \sum_j \gamma_{ij} \ln(p_j) + \beta_i(\ln(x) - \sum_j \overline{w}_j \ln(p_j)) + \mu_i^{**} \quad (6)$$

where $w_i = \alpha_i^{**} = \alpha_i - \beta_i(\alpha_0 - \sum_j \overline{w}_j \ln(p_j))$

"To conform to microeconomic theory, the adding-up, homogeneity, and symmetry properties of a demand function can be imposed on the LA/AIDS parameters. The adding-up restriction is satisfied with the given"

$$\sum_i w_i = 1 \text{ for all j;}$$

$$\sum_i \alpha_t = 1, \sum_i \beta_t = 0, \text{ And } \sum_k \gamma_{kj} = 0 \quad (7)$$

The "homogeneity restriction is satisfied for the LA/AIDS model," if for all j,

$$\sum_k \gamma_{jk} = 0 \quad (8)$$

Symmetry is satisfied by:

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

In this study, weak separability is assumed to allow a two-stage budget process. Food demand will be estimated by applying the Working (1993) model in stage one and LA/AIDS in stage two. To include socio-demographic factors in this study, the basic LA/AIDS model that has been specified

must be extended. This is done by following "Pollak and Wales (1978, 1981), who modified the original cost function so that the constant term becomes;

$$\alpha = \alpha + \sum_{j=1}^{n} p_j d_j \qquad (10)$$

where "d_j Represents household characteristics." This method is known as "a linear demographic translation and is used to preserve the linearity of the system." As a result, "the derived system of share equations" takes the form:

$$w_i = \alpha_i^{***} + d + \sum_j \gamma_{ij} \ln(p_j) + \beta_i (\ln(x) - \sum_j \overline{w}_j \ln(p_j) + \mu_i^{***} \qquad (11)$$

The diary records method of data collection in the UNHS report numerous instances of zero expenditure. Since "including zero observations in an econometric estimation without special treatment will result in biased and inconsistent estimators, the problem of zero expenditure needs to be tackled" (Intriligator et al., 1996). To handle the problem, an application of the Generalized Heckman Procedure is followed (Heckman, 1979). This approach involves a two-step estimation procedure that yields consistent and efficient parameter estimates. First, "the estimation of probability for a given household buying any good by using all observations via a probit regression. These predicted probabilities are used to calculate Mill's ratios (λ) for each household-food commodity pair. In turn, Mill's ratio (λ) is an instrumental variable that embodies the censoring latent variables in the demand function.

The Data

The data for commodity groups described in this analysis were collected by the Uganda National Household Survey (UNHS)" conducted nationally by the Uganda Bureau of Statistics. This survey covers the fiscal year 1999-2000. For the whole country, the sampling design adopted was a stratified, two-stage design. All districts without an Enumeration Area (EA) frame underwent a three-stage sample selection procedure. The household served as the first "sampling unit" in districts with a two-stage sampling design, while the EA of the 1991 population census" served as the second sampling unit. In those districts with a three-stage sampling design, the first stage of the sampling unit was the parish, the second was the LC-1 village, and the third was the household. Approximately ten thousand seven hundred households in all districts were surveyed, except for Kitgum, Gulu, Kasese, and Bundibugio.

Results and Conclusion

This research aimed to investigate the food demand patterns of Ugandan families, assess the impact of price fluctuations on consumer behavior at a disaggregated level and evaluate the policy implications for poverty and food security.

Urban families markedly vary from their rural counterparts alone in their intake of fruits and vegetables. Low-income Ugandan families tend to replace consumption within certain food categories, particularly the starchy food category. For example, at lower income levels, families replaced cereal, matooke, maize, sugar, and rice whereas at average income levels, the substitutions occurred among cereal, rice, sugar, and maize. The incorporation of matooke as an

alternative to these starchy staples, particularly for low-income customers, suggests a higher degree of replacement within the starchy food category.

High-income Ugandans consume more quantities of rice, fruits, vegetables, and soft drinks compared to those with lower incomes. Low-income households mostly consumed matooke, maize, and cereals, corroborating other studies in Africa that show higher-income consumers are transitioning away from coarse grains like sorghum and millet. Notably, families situated in border regions consume more matooke, sugar, oils, fruits and vegetables, dairy products, alcohol, and pulses than those in interior districts.

Household food purchases, especially for rural families, show heightened sensitivity to fluctuations in price and income, particularly for matooke products. This sensitivity arises from the capacity of these food-producing families to replace bought food with home-produced alternatives. Research indicates that domestic food production would enhance nutritious consumption in Uganda. This research will aid planners in "formulating policies to guarantee sufficient nutritional intake throughout Uganda since food and nutritional security are a primary priority of the present administration" (NFNC, 2002).

The constraint of this research is that the data is not quite recent. Subsequent research will use more recent data to examine the impact of mobile phone growth and usage on consumption patterns in Uganda.

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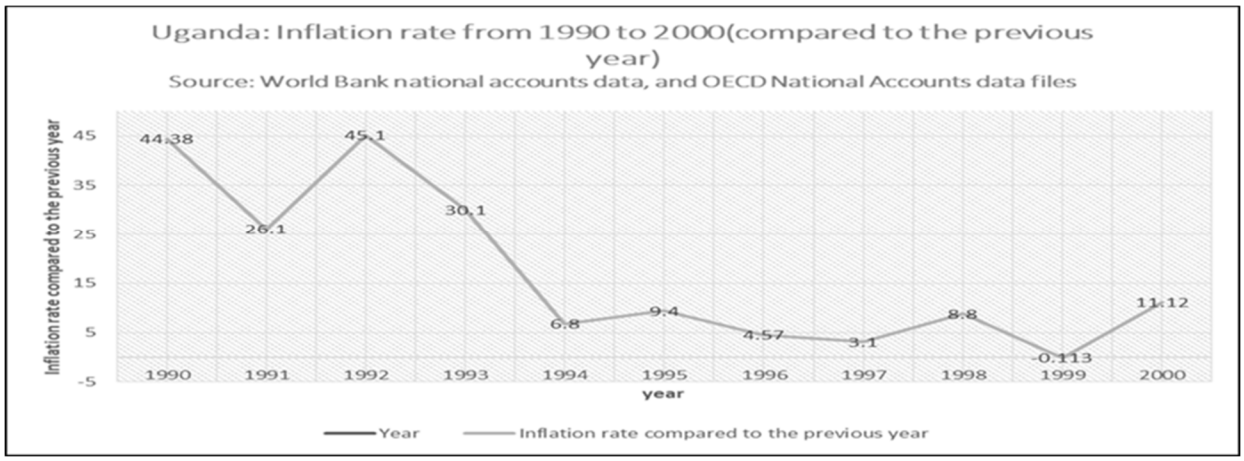
Appendix

Figure 1.1. Inflation



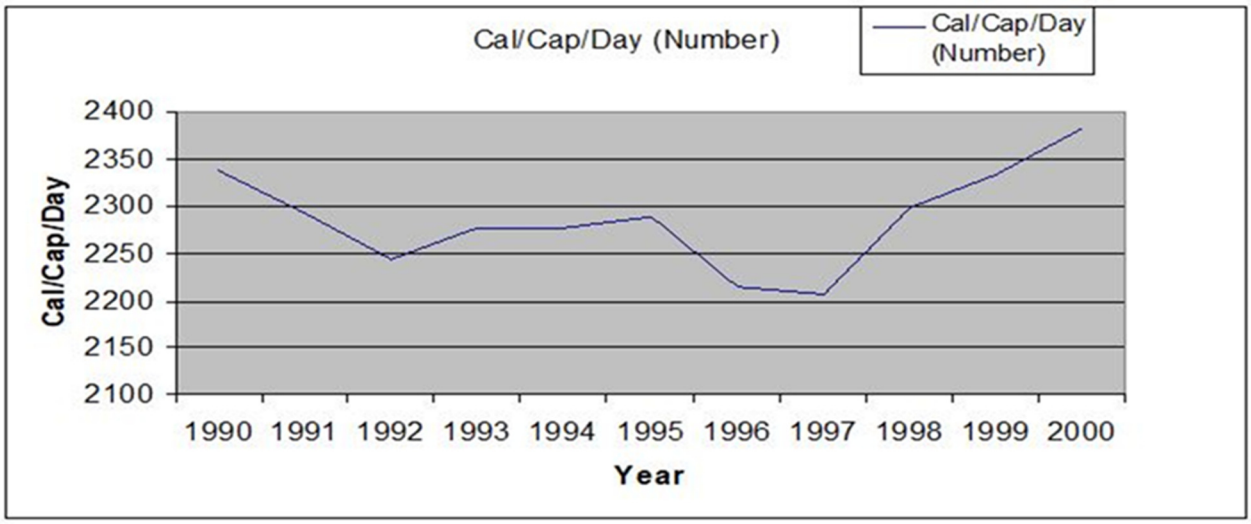
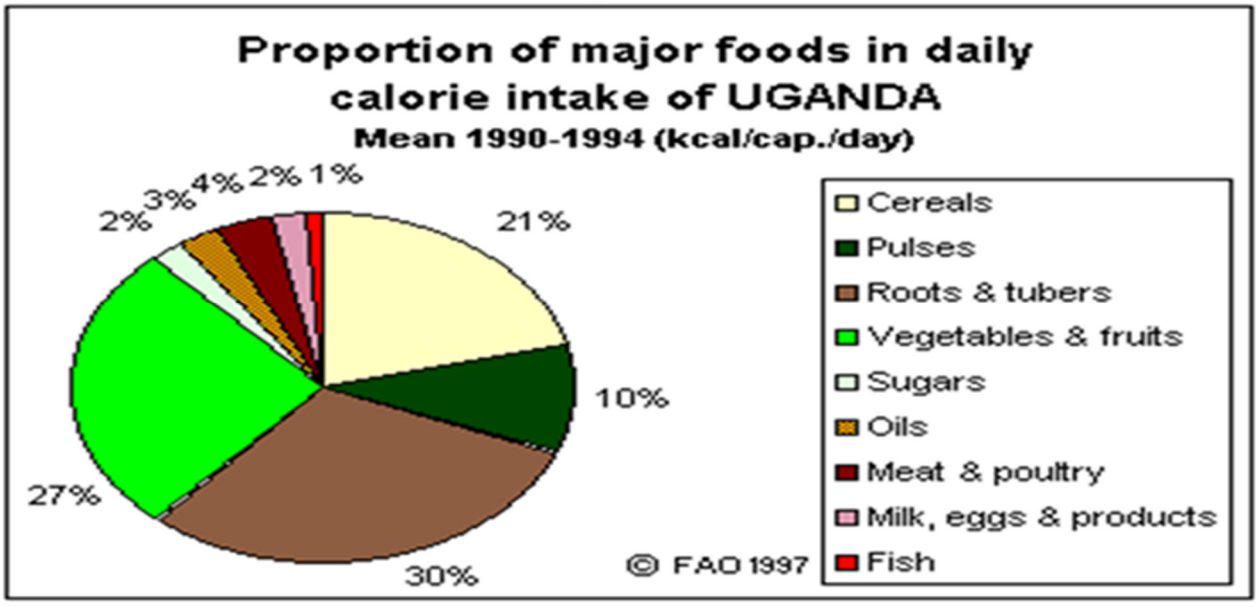


Figure 1.2. "Per capita per day calorie intake, 1990-2000, was calculated and plotted by the author using FOOD AND AGRICULTURE ORGANIZATION (1997) Food Balance Sheets 1994-1996, Rome, Italy.

Figure 1.3: UGANDA: Share of Food Consumption



Source: FAO/GIEWS