International Journal of Business and Social Research
Volume 07, Issue 05, 2015

Food Consumption in Uganda: Regional Distribution Effects

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ABSTRACT

Rising incomes have lowered poverty rates and influenced food consumption patterns in Uganda. Additionally to incomes and prices and household demographics, changes in lifestyles, such as urbanization, home-production and other factors, shape consumption by location. Our study evaluates the consumption of 14 food groups, focusing on staple foods and using the LA/AIDS framework. We found that urban families consume more matooke sugar, other cereals, oils, fruits and vegetables, fish, dairy products, other foods, and pulses than their counterparts in the rural areas. Households located in border districts more likely purchase maize, matooke, and meat than those in non-border areas.

Keywords: Consumer economics, food distribution, macroeconomics, marketing, public economics.
Available Online: 8th August 2015.
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1.0 INTRODUCTION

Uganda has experienced relatively high economic growth rates averaging 5.5% between the years 1990 and 2000. A general rise in incomes has lowered the poverty rates and impacted food consumption patterns in Uganda. However, when different regions of the country are scrutinized, the monthly shares of food expenditures as a proportion of food expenditures range from 35% in Kampala to 49%, 55%, 59%, and 55% in Central, Eastern, Northern, and Western regions respectively. This means that consumption and expenditure patterns will differ by regions.

These regional consumption patterns are influenced by factors such as incomes, prices, household demographics, changes in lifestyles such as urbanization. In addition, Kenya, Uganda, and Tanzania decided to restore a previous trading alliance, called the East African Community (EAC), in January 2001, aiming to promote free trade within the region. When trade is liberalized, the impact is usually first felt in a country's border markets. The most important impact may be on the distribution of commodity prices, so border effects will be examined as a possible determinant for consumption patterns.

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The main objective of this study was to analyze food consumption patterns of Ugandan households relative to key location variables, such as region of household, urbanization status of the household, and border-effects. Our study will evaluate the demand for 14 food commodity groups. A study of this nature is important because it offers improved information to producers, wholesalers, retailers, and policy makers about food consumption patterns in Ugandan households. It will assist these stakeholders to anticipate such demand shifts and hence incorporate them food demand projections. Since improving food and nutritional security is a major objective of the government of Uganda, this study will also assist policy planners to identify policies that ensure proper and adequate nutritional intake throughout Uganda and also in designing food subsidy programs that can be pursued by the government.

2.0 LITERATURE REVIEW

There are limited studies that have been conducted in Africa concerning food consumption patterns. Almost all of those studies have been conducted using household level data and have targeted specific geographical areas of the countries in question and thus very few studies covered whole countries.

Savadogo and Brandt utilized the 1982-1983 survey of 65 households in Ouagadougou, Burkina Faso and specified a demography augmented LAAIDS model which had Engel aggregation restrictions imposed. The main results showed that two-thirds of the cereal budget was allocated to rice and wheat.

Arulpragasam (1994) with data from survey of 1725 household in Conakry, Guinea that took place in 1990 to 1992 using demography augmented LAAIDS model. His results indicated that in terms of food as a percentage of total expenditure, among the poor it was 57% and 47 for the non-poor.

Dorosh et al. (1994) used a demography-augmented LAAIDS model with symmetry and homogeneity restrictions imposed to test for food aid and poverty alleviation in Mozambique.

They estimated income and price elasticities using survey data collected in the year 1991-1992 from 1816 households in the greater Maputo, Mozambique. The results from this study show that expenditure on food, as a percentage of income, was 80% for the poor and 65% for the non-poor.

The only study that covered the whole country was the one by Welwita et al. (2003). This study used demography augmented LAAIDS model to analyze food demand patterns in Tanzania and covered the whole country. They obtained income elasticities 0.885 for edible oils, 0.846 for cereals, and -1.012 for milk.

3.0 EMPIRICAL METHODS AND DATA

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

$$w_i = \alpha_\iota + \sum_j \gamma_{ij} \ln(pj) + \beta_j \ln(\frac{x}{p}) + \mu_\iota \text{ , i = 1… 14} \qquad (1)$$

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 which is defined by:

$$\log P = \alpha_\iota + \sum_k \alpha_\kappa \ln p_k + \frac{1}{2}\sum_k \sum_l \gamma_{\kappa\lambda} \ln p_k \ln p_l \qquad (2)$$

k = 1,…., 14 i = 1,……,14

The model defined by the Equations (1) to (2) is called the AIDS model. However, the price index in Equation (2) raises difficulties of estimation because of non-linearity in parameters. To avoid the non-linearity problem, Asche and Wessells (1997) suggested the application of the Stone index, which is widely used for LA/AIDS estimation. Moschini (1995) suggested the creation of a log-linear analog of the Laspeyres price indexes as:

$$\ln(P^*) = \sum_j w_i \ln(p_i) \ , \qquad i=1,\dots,14 \qquad (3)$$

where w is the budget share among 14 commodities. The Stone index is an approximation proportional to the translog, which means that P = φP* where E (ln (φ)) = α_0. The LA/AIDS model with the Stone index is, therefore,

$$w_i = \alpha_\iota^* + \sum_j \gamma_{ij} \ln(p_j) + \beta_\iota \ln(\frac{x}{p^*}) + \mu_\iota^* \ , \qquad (4)$$

where $\alpha_i^* = \alpha_\iota - \beta_i \alpha_i$ 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 analogue of the Laspeyres price index be obtained by replacing w_i in Equation (3) with $\overline{w}_i$, which implies mean budget share. The Laspeyres price index, therefore, becomes a geometrically weighted average of prices:

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

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

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

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 given $\sum_i w_i = 1$ for all j;

$$\sum_i \alpha_\iota = 1, \ \sum_i \beta_\iota = 0, \text{ And } \sum_k \gamma_{kj} = 0 \qquad (7)$$

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

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

Symmetry is satisfied by:

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

In this study, weak separability is assumed so as 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) where they 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 1999/2000 Uganda National Household Budget Survey data from the Uganda Bureau of Statistics were used (UBOS, 2005). Survey data are generally insufficient to determine whether a zero value represents a household that never consumed an item, does not consume the item given the household's income, or consumes the item infrequently (Madalla, 1983). Since some households in this survey reported zero consumption, this study uses the Heckman two-step model to correct for zero consumption (Heckman, 1979). In the first step, probit equations representing the decision to consume a positive amount of certain food groups are estimated. The estimated probit parameters were then used to construct correction factors – Inverse Mills Ratios – for the system of demand equations estimated by LA/AIDS in the second step (Heien and Wessells, 1990). Elasticities were calculated according to Green and Alston (1990).

4.0 RESULTS AND IMPLICATIONS OF LOCATIONAL EFFECTS

The food budget shares in Uganda are similar to other budget surveys done in Africa (Teklu, 1996). Expenditures in the urban and rural areas shows that high-income and low-income households differ widely in the proportion of income they allocate to their food budgets; low-income households spend over 60% of their income on food, while higher-income households spend slightly less than one-half of their income on food, as is the case for urban areas in Uganda. The highest food expenditure group comprised meat products, 14.1%, followed by fish products at 10.1%. Expenditures on maize constituted 9.2%, while 9.1% was spent on sugar products, 8.1% on rice, 7.6% on other foods, 6.5% on dairy products, and 5.7% was spent on matooke and pulses, respectively. Finally, 4.4% of the expenditure was on cereals, 4.2% was spent on fats and oils, 4.1% on fruits and vegetables, and 2.0% on soft beverages.

Meat, especially bovine meat, is the staple food among the pastoral communities of Northern, Eastern, and Western Uganda. The budget share for fish may reflect both availability and preference. Uganda has an abundance of lakes and rivers. A typical Ugandan diet consists of Ugali, a stiff maize porridge. Amongst the starchy cereals, maize is popular in urban areas. Also popular in the Ugandan diet, especially in the Central region, is matooke, with the fourth highest budget share. Matooke is usually eaten with groundnut stew and this may explain the reason why pulses, although highly aggregated, also have high share values. Rice, unlike maize that is grown in many regions of the country, is cultivated in limited areas. Local production of rice is normally unable to meet the domestic demand and thus some rice is imported.

Compared to the Central Region, purchases of matooke are less likely in the Eastern, Northern, and Western Regions (Table 1a). Households in the Central Region have traditionally consumed more matooke than any other region, but this relationship is reversed when maize is the food crop in question. Compared to the Central Region, the Eastern, Northern, and Western Regions show a greater probability for consuming maize. The Eastern Region alone exhibits a lesser likelihood for consumption of rice than does the Central Region, perhaps explained by the availability of the product grown in this region (Table 1a).

Households located in border districts demonstrate a greater likelihood of purchasing maize, matooke, and meat (Tables 1a, 1b). Border district households also more likely consume more sugar, oils, fruits and vegetables, dairy products, and beverages than do households in the interior districts, while the quantities of staples consumed, such as maize, cereal, and rice, are less likely consumed. Households located in the border districts also exhibit greater probabilities of purchasing alcohol, rice, cereal, matooke, meat, and fish.

Households that produce some of the food they consume, as expected, have a negative influence on the probability of purchase of matooke, maize, rice, dairy products and a positive influence on food groups that they may be unable to produce on their own – sugar, oils, fruits and vegetables, meat, fish, beverages, alcohol, pulses, and other foods. People living in urban areas consume more matooke, sugar, other cereals, oils, fruits and vegetables, fish, dairy products, other foods, and pulses than their counterparts in the rural areas. The positive cereal coefficient may be an indication that the status of bread consumption outweighs the effect of consuming sorghum and millet and thus supports prior findings. Contrary to other studies' inferences, the consumption of rice for Ugandan households residing in urban settings suggests a negative correlation.

The expenditure coefficients for maize, fat and oil, dairy, and pulses are negative in the LA/AIDS estimations, implying that these food categories are necessities (Tables 2a, 2b). On the other hand, the expenditure coefficients for sugar, fish, cereal, fruit and vegetables, meat, and alcohol are positive, which implies that these foods are luxuries. Results further showed that Ugandans with higher incomes consume more rice, fruits and vegetables, and soft beverages than their low-income counterparts. Low-income households consumed more staple food products, such as matooke, maize, and cereals.

In this study (Tables 2a, 2b), there was a positive and significant correlation between households located in urban areas and the consumption of fruit and vegetables. There was also a strong and positive correlation between these households and the consumption of matooke, maize, sugar, cereal, fats and oil, fish, dairy products, and alcohol. Households that reside in the border districts of Uganda consume significantly higher amounts of matooke, sugar, oils, fruits and vegetables, dairy products, alcohol and pulses than do households in the interior districts.

Education attainment of the head of household had a positive, significant correlation with food consumption. When the individual food groups are scrutinized (Tables 2a, 2b), households with heads that possess a higher education consume significantly higher amounts of maize and alcohol. Female headed households consumed more maize, rice, dairy products, sugar, beverages, and pulses, but less matooke, cereals, fats and oils, fish, and meats than male-headed households. There was also a positive and significant correlation between households with children under the age 6 (N1) and the consumption of food products, such as dairy products, meat, matooke, fats and oil, and fruits and vegetables. Households with members aged 13 to 19 (N3) and aged 20 to 55 (N4) consumed significantly larger amounts of matooke and fats and oils than their counterparts aged over 55 (N5) and the consumption of maize, cereal, rice, and beverage is important to households with these age groups.

Households that engaged in production of matooke experienced significant, reduced consumption shares of this food product relative to households that were not engaged in matooke production. Seasonal coefficients had significant explanatory influence in the consumption of meat, fish, and sugar. The expenditure elasticities for food and for all food groups are positive, implying that food is a normal good. The point elasticity estimates for matooke, maize, cereal, fish, meat, and pulses are greater than unity, implying that for these food categories, an increase in total food expenditures will result in more than proportionate increase in expenditure shares. On the other hand, estimates for rice, sugar, fruit and vegetables, meat, dairy products, and soft beverages are all less than unity, implying that an increase in future expenditures on food will result in less than proportionate increases in expenditures on these food groups.

Own-price elasticities for all food groups carried the expected negative sign. Own-price elasticities for alcohol, pulses, dairy, fruits and vegetables, and fats and oil are elastic, while staple food products, such as matooke, maize, rice, sugar, and cereals, are inelastic to price changes. Ugandan consumers consider pulses, dairy, meat, oils, sugar, rice, and maize as substitutes for cereals. However, cereal demand complements fruits and vegetables, soft beverages, and alcohol. Ugandan consumers view vegetables as a complement of rice, cereals, meat, dairy, beverages, and pulses, while pulses complement meat, vegetables, and fish consumption.

5.0 CONCLUSIONS

Ugandan households dwelling in urban settings differ significantly from their rural counterparts only in their consumption of fruits and vegetables. Low-income Ugandan households appear to substitute consumption within particular food groups, such as the starchy food group. For example, at low incomes, households substituted between cereal, matooke, maize, sugar, and rice, whereas at mean incomes, the household substitution is between cereal, rice, sugar, and maize. The inclusion of matooke as a substitute for these starchy staples, especially for low-income consumers, leads us to conclude that there is greater substitution within the starchy food group.

Ugandans with higher incomes consume more rice, fruits and vegetables, and soft beverages than their low-income counterparts. Low-income households, on their part, consumed more matooke, maize, and cereals, supporting previous studies in Africa that show higher income consumers shifting away from coarse grains, such as sorghum and millet. Significantly, households that are located in border areas consume greater quantities of matooke, sugar, oils, fruits and vegetables, dairy products, alcohol and pulses compared to interior districts.

Food purchases for households producing food (rural households) are more sensitive to price and income changes, especially as far as matooke is concerned. This sensitivity follows from these food-producing households being able to substitute home produced food for purchased food. As other studies have shown, home food production will lead to improved nutritional intake in Uganda. Because food and nutritional security is a major objective of the current government (NFNC, 2002), this study will also assist planners to identify policies that ensure adequate nutritional intake throughout Uganda.

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Table 1a: Probit estimates of parameters for Ugandan household food purchases, 1999/2000.

Dependent Variable	**Stage 2**													
Decision to	**MATOKE**		**MAIZE**		**RICE**		**SUGAR**		**CEREAL**		**OILS**		**FRUIT & VEGE**	
Purchase:	**1**		**2**		**3**		**4**		**5**		**6**		**7**	
Explanatory variables	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**
Intercept	0.371[a]	3.63	3.275[a]	9.17	1.684[a]	14.47	1.537[a]	9.82	-3.653[b]	-2.04	1.688[a]	11.67	-1.228	-1.82
EASTERN	0.500[a]	5.86	0.024[c]	1.85	-0.052[a]	-4.90	0.183[a]	8.65	0.608[b]	2.14	-0.017	-1.41	-0.096	-2.98
NORTHERN	-0.737[a]	-4.67	0.891[a]	6.53	0.214[a]	8.72	0.402[a]	9.99	0.603[b]	2.14	0.066[a]	3.95	-0.155	-3.21
WESTERN	0.079[a]	4.53	0.102[a]	5.01	0.042[a]	4.14	0.256[a]	9.32	0.317[b]	2.11	0.236[a]	8.58	-0.177[a]	-3.22
BORDER	0.265[a]	5.49	-0.795[a]	-6.31	0.006	0.64	-0.120[a]	-7.20	0.076[b]	2.16	-0.041[a]	-3.06	0.236[a]	3.18
PCFEXP	0.008[a]	4.91	0.024[a]	6.03	0.013[a]	5.80	0.015[a]	7.79	0.011[b]	2.20	0.015[a]	7.03	0.003[a]	2.48
PROD	0.156[a]	4.95	0.010	0.81	0.116[a]	7.33	-0.080[a]	-5.67	0.521[b]	2.13	-0.079[a]	-5.24	1.008[a]	2.99
URBAN	0.117[a]	4.65	-0.259[a]	-6.07	-0.278[a]	-7.80	-0.189[a]	-8.56	0.030[b]	2.10	-0.201[a]	-7.71	-0.241[a]	-2.87

Notes: Superscripts a, b and c indicate statistical significance at 99, 95 and 90 percent levels, respectively. Data source: UNHS 1999/2000

Table 1b. Probit estimates of parameters for Ugandan household food purchases, 1999/2000.

Dependent Variable	**Stage 2**													
Decision to	**MEAT**		**FISH**		**DAIRY**		**BEVERAGES**		**ALCOHOL**		**OFOODS**		**PULSES**	
Purchase:	**8**		**9**		**10**		**11**		**12**		**13**		**14**	
Explanatory variables	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**
Intercept	-1.221[c]	-1.80	1.222[a]	7.28	-3.691[b]	-1.99	1.455[a]	26.47	-2.646	-1.01	1.057[a]	7.21	-8.211[a]	-7.94
EASTERN	0.084[b]	2.26	-0.013	-0.95	-0.164[b]	-2.06	0.141[a]	6.59	0.165	1.05	0.014[b]	2.23	0.399[a]	8.39
NORTHERN	0.073[b]	2.16	-0.023	-1.05	0.143[b]	2.07	0.267[a]	7.36	0.366	1.06	-0.007	-1.21	1.482[a]	8.61
WESTERN	-0.057[b]	2.11	0.282[b]	2.28	0.297[b]	2.06	0.345[a]	7.81	-0.114	-1.04	-0.006	-1.17	0.118[a]	7.10
BORDER	0.062[b]	2.21	0.050[c]	1.80	0.160[b]	2.06	-0.001	-0.10	0.043	1.05	-0.001	-0.13	-0.234[a]	-8.21
PCFEXP	0.012[b]	2.35	-0.004	-1.41	0.019[b]	2.09	-0.012[a]	-6.32	-0.001	-0.98	0.001	1.59	0.025[a]	8.36
PROD	0.363[b]	2.07	-0.027	-1.32	0.456[b]	2.06	-0.084[a]	-5.36	0.278	1.05	-0.046[a]	-3.65	3.186[a]	8.38
URBAN	-0.031[b]	-2.00	-0.028	-1.42	-0.405[b]	-2.05	-0.167[a]	-6.91	0.071	1.06	0.007	1.29	-0.068[a]	-5.24

Notes: Superscripts a, b and c indicate statistical significance at 99, 95 and 90 percent levels, respectively. Data source: UNHS 1999/2000

Table 2a: Estimated parameters of Heckman two-stage LA/AIDS model (UNHS 1999/2000).

variable	**Stage 1**				**Stage 2**											
Budget share		**FOOD**		**NON- FOOD**		**Matooke**		**Maize**		**Rice**		**Sugar**		**Cereal**		**Fats & Oils**
variable	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**	**coeff**	**t-stat**
Intercept	0.406^{a}	6.50	0.585^{a}	8.68	-0.008	-0.09	-0.083^{c}	-1.86	0.094^{c}	1.91	0.032	0.74	-0.392^{a}	-2.59	0.005	0.18
CENTRAL	-0.021^{a}	-7.64	0.024^{a}	8.48	0.020	0.44	-0.029	-1.22	0.018	0.70	-0.025	-1.03	0.009	0.20	0.014	0.90
EASTERN	0.009^{a}	3.16	-0.003	-0.94	-0.049	-0.94	-0.039^{c}	-1.67	-0.005	-0.19	-0.050^{b}	-2.14	0.059	1.20	-0.003	-0.18
WESTERN	-0.012^{a}	-4.22	0.016^{a}	5.18	-0.019	-0.43	0.011	0.43	0.010	0.36	-0.060^{b}	-2.49	0.068	1.44	0.025	1.57
BORDER	0.002	0.81	-0.002	-0.67	0.092^{b}	2.42	0.035^{c}	1.88	0.001	0.03	0.042^{b}	2.23	0.062^{c}	1.81	0.032^{a}	2.61
HHSIZE	0.001	1.32	-0.001	-1.10	-0.021^{b}	2.09	-0.007	-1.19	-0.008	-1.34	0.002	0.38	-0.015	-1.52	-0.005	-1.37
HHAGE	-0.000	-0.98	0.000	0.89	0.001^{b}	1.96	-0.000	-0.05	0.000	0.24	0.000	0.87	-0.000	0.00	0.000	0.06
HHFEM	0.005^{c}	1.89	-0.005^{c}	-1.83	-0.045^{c}	-1.70	0.007	0.49	0.017	1.06	0.000	0.01	-0.027	-0.99	0.009	0.99
HHHMS	-0.002^{b}	-1.97	0.002^{b}	2.08	-0.004	-0.24	0.009	1.13	-0.014^{c}	-1.70	0.004	0.49	-0.008	-0.53	-0.006	-1.22
N1 (<6)	-0.004^{a}	-2.65	0.004^{a}	2.58	0.024^{c}	1.70	0.004	0.55	0.012	1.42	0.001	0.12	0.012	0.88	0.008^{c}	1.67
N2 (7 to 12)	-0.002	-1.53	0.002	1.23	0.019	1.16	0.012	1.35	0.004	0.38	-0.000	-0.04	0.017	1.04	0.003	0.21
N3 (13 to 19)	-0.002	-1.25	0.002	1.13	0.047^{a}	3.02	0.008	0.96	0.010	1.08	-0.000	-0.06	0.017	1.09	0.005	0.82
N4 (20 to 54)	-0.001	-0.53	0.001	0.52	0.038^{b}	2.08	0.013	1.40	0.000	0.02	-0.002	-0.21	0.029	1.61	0.013^{c}	1.95
PROD	-0.039^{a}	-7.26	0.044	1.34	-0.046^{c}	-1.70	-0.003	-0.22	0.040^{b}	2.33	0.027^{c}	1.81	0.046	1.47	-0.011	-1.09
TCEXP1	-0.001^{a}	-7.30	0.001^{a}	7.34	0.001	0.54	0.002^{c}	1.65	0.002^{c}	1.89	0.000	0.22	0.001	0.26	0.000	0.27
TCEXP2	0.000^{a}	5.68	-0.000^{a}	-5.62	-0.000^{a}	-2.85	-0.000^{c}	-1.63	0.000	0.05	-0.000	-1.21	-0.000	-0.54	-0.017	-0.62
URBAN	0.004^{c}	1.67	-0.004	-1.52	0.001	0.05	0.012	1.17	-0.006	-0.58	0.004	0.37	0.010	0.53	0.006	0.89
QUARTER	-0.001	-0.30	0.001	0.41	-0.035	-0.98	-0.026	-1.41	0.003	0.15	0.011^{c}	1.79	0.015	0.43	-0.006	-0.48
HHEducation	0.004^{b}	1.94	-0.005^{b}	-2.11	-0.020^{c}	-1.63	0.014^{b}	2.12	-0.012^{c}	-1.75	-0.010	-1.49	-0.017	-1.42	-0.003	-0.66
lTCEXPp	-0.055^{a}	-6.86	0.055^{a}	4.90	0.010	0.78	-0.014^{b}	-1.98	-0.006	-0.74	0.001	0.15	0.010	0.79	-0.001	-0.15
lpmatook					0.060^{b}	2.43	-0.000	-0.04	-0.001	-0.05	-0.000	-0.08	0.013	0.53	0.023^{a}	2.65
lpmaize					0.068	1.27	0.026	0.89	0.030	0.96	0.040	1.38	0.010	0.20	0.032	1.68
lprice					-0.062	-1.03	0.018	0.58	-0.008	-0.23	-0.005	-0.16	0.061	1.05	-0.022	-1.00
lpsugar					-0.071^{b}	-2.04	0.004	0.21	0.003	0.14	-0.006	-0.30	-0.017	-0.51	0.003	0.25
lpcereal					0.179^{b}	2.51	-0.050	-1.32	0.014	0.34	-0.021	-0.55	0.015	0.21	0.005	0.18
lpfoil					-0.004	-0.31	-0.005	-0.71	0.006	0.83	-0.019^{a}	-2.77	-0.007	-0.56	-0.002	-0.45
lpfeg					0.006	0.26	0.008	0.67	-0.013	-1.06	0.013	1.17	-0.001	-0.05	0.008	1.04
lpmeat					-0.298^{a}	-2.82	-0.048	-0.85	-0.147^{b}	-2.36	-0.098^{c}	-1.74	-0.099	-0.95	-0.042	-1.12
lpfish					-0.016	-1.16	0.000	0.01	0.001	0.07	-0.002	-0.27	0.005	0.36	0.001	0.22
lpdairy					0.552^{b}	2.06	0.098	0.72	0.384^{b}	2.56	0.017	0.12	0.409^{c}	1.66	0.213^{b}	2.41
lpbev					0.002	0.24	-0.001	-0.45	0.003	0.84	-0.005	-1.47	-0.001	-0.15	-0.000	-0.11
lpalcohol					0.047	0.84	-0.037	-1.23	0.007	0.21	-0.037	-1.27	0.043	0.79	0.066^{a}	3.39
lppulses					-0.001	-0.02	-0.008	-0.42	-0.042^{b}	-2.04	-0.004	-0.20	0.033	0.98	-0.017	-1.41
MR	-0.061^{a}	-5.73	0.950^{a}	7.45	-0.008	-0.19	0.007	0.35	0.004	0.32	-0.006	-0.31	0.132^{a}	2.78	0.024^{b}	2.25

Notes: Superscripts a, b and c indicate statistical significance at 99, 95 and 90 percent confidence levels, respectively.

Table 2b: Estimated parameters of Heckman two-stage LA/AIDS model (UNHS data, 1999/2000)

variable	Stage 2													
Budget share	Fruit & veg		Meat		Fish		Dairy		Beverages		Alcohol		Pulses	
variable	coeff	t-stat	coeff	t-stat	Coeff	t-stat	Coeff	t-stat	coeff	t-stat	coeff	t-stat	coeff	t-stat
Intercept	0.169	1.53	-0.126	-0.67	-0.067	-1.17	-0.102	-1.21	0.080[a]	2.81	0.050	0.06	-0.034	-0.29
CENTRAL	-0.021	-0.66	-0.114	-1.51	0.027	0.90	0.039	1.48	-0.013	-0.83	-0.110	-1.52	0.031	1.24
EASTERN	-0.048	-1.49	-0.103	-1.35	0.010	0.32	-0.022	-0.83	-0.031[b]	-2.01	-0.112	-1.21	-0.007	-0.28
WESTERN	-0.007	-0.21	-0.056	-0.73	-0.030	-1.02	-0.007	-0.26	0.009	0.56	0.009	0.12	0.009	0.34
BORDER	0.063[b]	2.53	0.144[b]	2.46	0.027	1.21	0.078[a]	3.85	-0.006	-0.49	0.047	0.86	0.048[b]	2.56
HHSIZE	-0.007	-0.96	-0.014	-0.84	0.004	0.61	-0.003	-0.49	-0.006[c]	-1.69	0.044[a]	2.68	-0.010[c]	-1.69
HHAGE	-0.000	-0.85	0.001	0.63	0.000	0.34	-0.001[c]	-1.62	0.000[b]	1.97	-0.003[b]	-2.48	0.000	1.12
HHFEM	-0.003	-0.16	-0.032	-0.69	-0.023	-1.29	0.017	1.09	0.011	1.16	-0.034	-0.79	0.019	1.30
HHHMS	-0.009	-0.81	-0.024	-0.96	0.005	0.52	0.002	0.24	-0.006	-1.11	-0.015	-0.66	-0.000	-0.05
N1 (<6)	0.025[b]	2.48	0.048[b]	2.04	-0.004	-0.46	0.020[b]	2.39	0.007	1.56	-0.015	-0.70	0.007	0.89
N2 (13 to 19)	0.004	0.31	0.023	0.82	0.006	0.51	-0.010	-0.98	-0.005	-0.91	-0.037	-1.37	0.003	0.35
N3 (20 to 54)	-0.005	-0.43	0.006	0.23	0.000	0.00	0.008	0.83	0.012[b]	2.23	-0.050[b]	-2.02	0.010	1.20
N4 (20 to 54)	0.012	0.92	0.015	0.50	0.003	0.30	0.003	0.27	0.008	1.34	-0.072[b]	-2.47	0.012	1.24
PROD	-0.042	-0.81	0.103[c]	1.93	-0.019	-1.04	-0.007	-0.41	0.021[b]	2.27	0.058	0.68	0.040	0.98
TCEXP1	0.001	0.78	0.001	0.17	-0.000	-0.08	-0.001	-0.70	0.001[c]	1.64	-0.000	-0.02	0.000	0.37
TCEXP2	0.000	0.18	-0.000	-1.35	-0.000[c]	-1.66	-0.000	-0.84	0.000[c]	1.75	-0.000	-1.03	0.000	0.28
URBAN	0.032[b]	2.22	-0.004	-0.14	0.003	0.24	0.002	0.15	-0.002	-0.32	0.010	0.29	-0.005	-0.46
QUARTER	-0.000	-0.00	0.033[c]	1.70	0.015	1.99[b]	0.020	0.96	0.018	1.45	0.028	0.50	-0.027	-1.39
HHHED	-0.002	-0.20	-0.044[b]	-2.18	-0.005	-0.65	-0.007	-1.01	-0.002	-0.50	0.017	0.88	-0.006	-0.87
lTCEXPp	0.000	0.05	0.019	0.90	0.004	0.49	-0.004	-0.51	-0.009[b]	-2.08	0.033	1.60	-0.005	-0.70
lpmatook	0.041[b]	2.25	0.037	0.87	-0.002	-0.16	0.049[a]	3.38	0.001	0.08	-0.069[c]	-1.73	0.026[c]	1.88
lpmaize	0.092[b]	2.37	0.055	0.60	-0.018	-0.49	-0.025	-0.77	0.022	1.18	-0.147[c]	-1.74	0.025	0.85
lprice	-0.035	-0.83	0.070	0.70	0.028	0.71	0.037	1.07	-0.011	-0.52	0.282[a]	3.03	-0.025	-0.76
lpsugar	-0.027	-1.12	-0.054	-0.95	0.006	0.27	0.012	0.59	-0.001	-0.12	-0.088	-1.57	-0.021	-1.11
lpcereal	0.009	0.18	0.081	0.68	-0.013	-0.28	0.040	0.94	-0.050[b]	-2.06	-0.123	-1.04	-0.038	-0.98
lpfoil	0.006	0.65	-0.015	-0.70	-0.013	-1.61	-0.008	-1.07	0.004	0.96	-0.037[c]	-1.82	0.009	1.22
lpfeg	0.005	0.31	-0.004	-0.12	0.010	0.72	0.026[c]	1.94	-0.025[a]	-3.39	0.014	0.40	-0.011	-0.89
lpmeat	-0.210[a]	-2.65	-0.313[c]	-1.77	-0.021	-0.30	-0.120[c]	-1.91	-0.064[c]	-1.77	0.294[c]	1.75	-0.146[b]	-2.51
lpfish	0.007	0.73	0.018	0.78	0.013	1.45	0.012	1.54	0.001	0.14	0.034	1.57	-0.003	-0.40
lpdairy	0.346[b]	1.99	0.817	1.87	0.109	0.65	0.305	2.06	-0.007	-0.08	0.057	0.15	0.1462	1.06
lpbev	-0.007	-1.54	0.006	0.59	0.005	1.24	-0.008[b]	-2.22	0.009[a]	4.32	0.007	0.73	0.001	0.19
lpalcohol	0.000	0.01	-0.050	-0.54	0.006	0.16	0.049	1.50	0.026	1.39	-0.091	-1.00	0.006	0.18
lppulses	-0.040	-1.61	-0.020	-0.34	0.013	0.56	0.014	0.71	0.012	0.99	0.030	0.56	0.016	0.83
MR	-0.053	-0.98	0.073	1.42	0.057[b]	2.43	0.073[b]	2.55	0.009	0.72	0.012	0.05	0.027	0.60

Notes: Superscripts a, b and c indicate statistical significance at 99, 95 and 90 percent confidence levels, respectively.