Economic Development and Food Demand in Central and Eastern European Countries: The Case of Romania[1]

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Abstract

A brief description of recent economic development and food security in Romania is provided in the present study. We further employ several quantitative methods to analyze recent food demand patterns. We first assess Engel curves by nonparametric Kernel regression and then estimate an Almost Ideal Demand System for aggregated food groups. Computed elasticities are consistent with the economic theory and four out of five food groups are perceived as luxuries by low-income, rural households. All the price elasticties are negative and lower than1 meaning a price inelastic demand except for the dairy products with a price elastic demand. Majority of the cross-price elasticities have positive values revealing a possible substitution effect among food groups. Demographic effects such as family size, number of kids, and age of the households head seem to have statistically significant impact on the food expenditures.

1. Introduction

Food demand both in developed and developing countries has been actively researched for over a century. Recently this topic has received an increased attention due to food price spikes, economic growth in developing countries, and economic stagnation in developed countries. These events made both economists and policy makers more interested in assessing the impact of changes in income and commodity prices on food expenditures and consumption patterns. Estimation of food demand systems is closely related to food security issues. Information on food demand responses to growing global commodity prices and income changes can help policy makers adopt policies that reduce the food and nutritional insecurity for whole countries and specifically for the vulnerable low income groups within the countries.

Of all Central and East European Countries that are now members of the EU, Romania is affected by relatively higher problems with food and nutritional security. There is higher poverty rate in Romania (24.8%) in the year 2007 than in other new member states, such as Bulgaria (22.0%), Czech Republic (9.6%), Hungary (12.3%) or Slovakia (10.6%). Poverty rate in Romania was still higher in rural areas where it reached 40%in 2007 (estimated on cash income, the consumption from own resources being excluded). Households in rural areas depend heavily on their own production of food rather than buying it on the markets. With the value of own food production included, poverty rate in rural areas would fall from 40% to30%.. Romanian economic reforms and EU accession resulted in relatively high economic growth after 2001. This was accompanied by a growth in food consumption both in terms of quantity and quality, mainly in products that are considered important from the nutritional point of view, such as meat, dairy products and fruits. However, the share of food expenditures remains still at very high level of 36% of household disposable income.

In the literature, analyses of food demand systems have been conducted not only for developing countries where the food security problems are the gravest but as well for developed countries where some vulnerable regions and income groups are heavily affected by food and nutritional security problems (e.g., Molina, 1994 for Spain; Banks et al., 1996; 1997 for the UK; Moro and Sckokai, 2000 for Italy; Abdulai, 2002 for Switzerland). However, food demand responses to income and price shocks have not been widely studied in the new EU member states. Despite the importance and current relevance of the issue there are only a few older studies on food demand in Romania. Meyerhoefer et al. (2006) estimate a complete demand system from the Romanian household survey data; Petrovici and Ritson (2000) analyzing the Engel's law in Romania after the transition process; Hubbard and Thomson (2006) estimate the welfare changes for food consumers resulting from rising food prices and changing incomes.

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As under-nutrition and malnutrition exist to a considerable degree in both developed countries and developing and transition countries a study of the food security situation in the new EU member states is timely and the case of Romania is particularly relevant.

2. Economic development and food demand patterns

In Romania, the food security concerns have been almost always present, due to the lower incomes and higher poverty rates in comparison to the other new member states (NMS) of the EU. Whereas the food security situation has considerably improved during the period of high economic growth in 2000s in most countries of Central and Eastern Europe, food insecurity problems still exist in certain regions and within certain population groups of Romania.

Table 1 offers a summary of the main macroeconomic and food security indicators. The time period between 2004 and 2008 was characterized by high rates of economic growth followed by a sharp recession in 2009 and 2010, the growth recovery being achieved in 2011. GDP growth in Romania was higher than the EU 27 average. Although there was an increase in peoples' income, (we present the average income of 3rd quintile), Romanian incomes are still far below the EU 27 average levels. However, such increases in incomes led to a considerable drop in the share of food expenditures out of total expenditures. This is shown in Table 2 where the food expenditure ratios are reported by type of household segmented by income and residence area. Although, such ratios decreased between 2004 and 2011, their levels are still one of the highest among the new EU member states.

Table 1 Development of macroeconomic and food security indicators in Romania

	2004		2007		2011	
Indicator	RO	EU 27	RO	EU 27	RO	EU 27
Real GDP growth (% p.a.)	8.5	2.6	6.3	3.2	2.3	1.7
Inflation rate (% p.a.)	11.9	2.3	4.9	2.4	5.8	3.1
Income of third quintile (Euro)	n.a.	n.a.	1,927	15,686	2,449	16,862
At-risk-of-poverty rate (60% of median) (%)	n.a.	n.a.	24.8	16.5	22.2	16.9
Food expenditure (% share of total expenditure)						
National	39.3		34.4		34.2	
Urban	37.3		33.0		33.1	
Rural	41.5		36.0		35.5	
The poorest	52.9		46.0		45.6	
The richest	27.1		23.7		24.7	

Note: RO stands for Romania.
Source: Eurostat and Household Budget Survey of Romania (2004- 2011); authors' calculations

Whereas the overall inflation decreased between 2004 and 2011 (see Table 1), food price inflation as measured by harmonized index of consumer prices for food and non-alcoholic beverages was higher in Romania than in the EU27. It has been argued in other studies for transition economies, that high food prices actually push households into poverty and lead to higher inequality (see, e.g., Lokshin and Popkin, 1999).
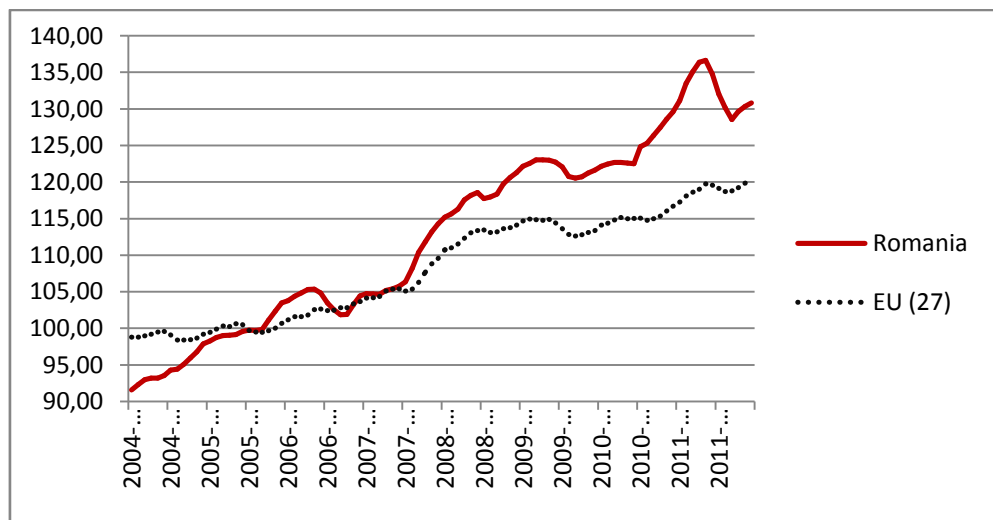
Figure 1 Harmonized Index of Consumer Prices: Food and Non-Alcoholic Beverages for Romania and EU 27 (2005=100)
Source: Eurostat (2004-2011)

Furthermore, the issue of poverty and inequality is closely related to the food insecurity problems. As pointed out by Macours and Swinnen (2008), poverty rates are likely to differ between urban and rural areas, especially in transition countries. At-risk-of-poverty rate is presented in Table 1. Even though this poverty indicator did improve between 2004 and 2011 in Romania, it is still considerably high compared to the average of the EU 27.

Recent food demand patterns in Romania can be characterized by an increase in food consumption in both quantitative and qualitative terms, mainly in the products considered important from the nutritional point of view, such as meat, fish, dairy products, and fruits (see Figure2). It is estimated (NIS, 2012) that the average daily food consumption per capita was about 2500 kcal in the last decade, with an increasing tendency of the share of calories of animal origin from 530 kcal in early 2000s to 620 kcal in the years 2008-2009. The consumption of calories of animal origin decreased in the last two years of the investigated period (2010 and 2011), most likely as an effect of the decrease of household incomes with the occurrence of the economic crisis.
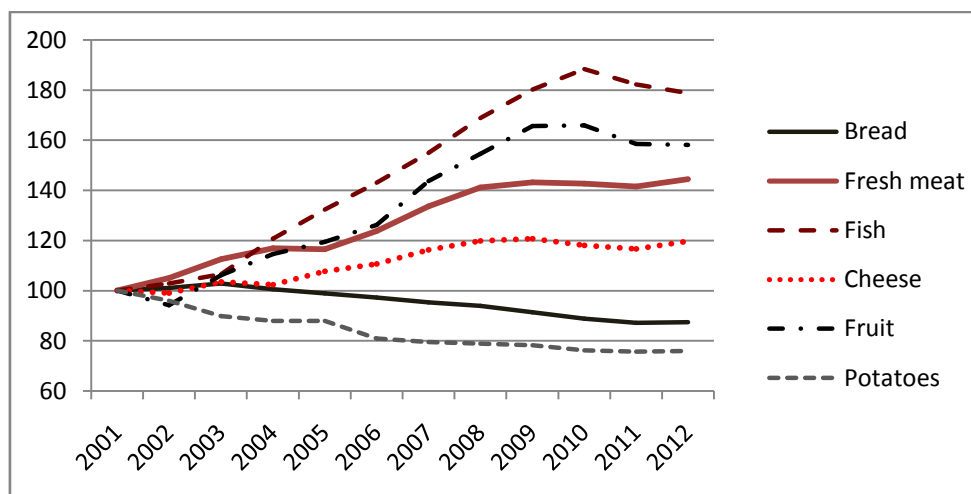
Figure 2 Evolution of the main foodstuffs consumption (2001=100%)
Source: Household Budget Survey of Romania (2001-2012)

Although there is a clear increasing trend in consumption of main foodstuffs (see Figure 2), composition of the diet is still quite monotonous, especially for the low income households (1[st]quintile of the income distribution). As can be seen in Figure 3, the poorest households spend on average the highest budget share on cereals (32%), followed by other food products (21.8 %), meat and fish (17.8%) and both on dairy products, and fruits and vegetables equally by 14%. On the other hand, the richest households spend on average 27 % of their budget on meat and fish products, followed by other food products (20%), and cereal products (19%). They spend equally around 17% both on dairy products and fruits and vegetables products. As it has been showed in the nutrition literature, consumption of diverse foods is a good indicator of the food and nutritional security (see e.g. Hatloy et al., 1988). Therefore a monotonous food intake of the low income households, with high share of cereal products and lack of meat and fruits and vegetables in their diet still needs to get improved.
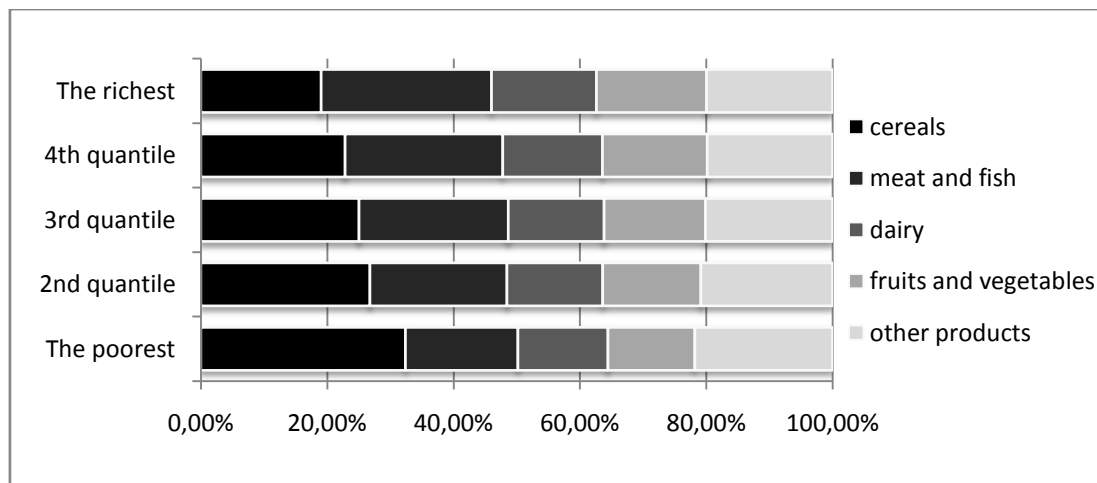
Figure 3 Composition of food consumption in Romania by income groups
Source: Household Budget Survey of Romania (2011); authors' calculations

Romania showed a great potential towards improved food consumption, especially during the period of economic growth. However, economic stagnation after financial crisis, rising food prices, high expenditures on food and poverty have influenced the recent food demand patterns in Romania. Therefore, it is of utmost importance to explore the food demand to a further extent with an advanced quantitative analysis and to estimate the food demand elasticties as they are important from the perspective of the food policy making.

3. Methodology: Almost Ideal Demand System

In the microeconomic literature there are several approaches to estimate food demand system. The most used are, for example, Linear Expenditure System (LES) proposed by Stone (1954); Indirect Translog System (ITS) by Christensen et al. (1975) or Almost Ideal Demand System (AIDS) by Deaton and Muellbauer (1980). The standard AIDS was extended by the quadratic expenditure term (QUIADS) in the work of Banks et al. (1997). Whereas LES, ITS and AIDS represent a "rank two" models, QUIADS exhibits a "rank three" model.[2] It has been argued that a higher rank of the logarithm of expenditure term can better addresses possible nonlinear shapes of Engel curves. However, Meyer et al. (2011) compare computed elasticities from several demand systems, based on the Monte Carlo simulation, and show that "rank three" models do not necessarily provide better results than "rank two" models. We employ AIDS model rather than its quadratic version as preliminary analysis has not showed any significant non-linear patterns of the Engel curves (except for the cereal products).

In the current paper we employ standard Almost Ideal Demand System (AIDS) with a focus on the second stage of the demand system for the aggregated food categories. The set of budget share equation is characterized as follows:

$$w_i = \alpha_i + \sum_{j=1}^{k} \gamma_{ij} \ln p_j + \beta_i \ln \left\{ \frac{m}{a(p)} \right\}, \qquad i = 1, \ldots, k \qquad (1)$$

with the price index of transcendental logarithmic function:

$$\ln a(p) = \alpha_0 + \sum_{i=1}^{k} \alpha_i \ln p_i + \frac{1}{2} \sum_{i=1}^{k} \sum_{j=1}^{k} \gamma_{ij} \ln p_i \ln p_k. \qquad (2)$$

For consistency with the microeconomic theory and to reduce the number of parameters to be estimated adding-up, homogeneity and symmetry restrictions are imposed. The fact that $\sum_{i}^{k} w_i = 1$; the adding-up condition, requires that $\sum_{i}^{k} \alpha_i = 1, \sum_{i}^{k} \beta_i = 0$, and $\sum_{i}^{k} \gamma_{ij} = 0 \quad \forall j$. Since demand functions are homogeneous of degree zero in (p, m) we have $\sum_{j}^{k} \gamma_{ij} = 0 \; \forall j$. Finally, the Slutsky symmetry also implies that $\gamma_{ij} = \gamma_{ji} \forall i \neq j$. These conditions are trivially satisfied for a model with n goods when the estimation is carried out on a subset of $n-1$ independent equations. The parameters of the dropped equation are then computed from the restrictions and the estimated parameters of the $n-1$ expenditure shares. Parameters of the demand system are estimated by iterated feasible generalized nonlinear least-squares method using Stata's `quaids` command (Poi, 2012).

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[2]See, for example, Gorman (1981) or Lewbel (1991) on the concept of Engel curves ranking.

3.1 Almost Ideal Demand System with demographic variables

The standard Almost Ideal Demand System can be extended by demographic variables based on the scaling approach introduced by Ray (1983) and later modified by Poi (2002). The budget share equation of the modified AIDS model can be written as follows:

$$w_i = \alpha_i + \sum_{j=1}^{k} \gamma_{ij} \ln p_j + \left(\beta_i + \eta_i' z\right) \ln \left\{\frac{m}{\bar{m}_0(z)a(p)}\right\} \tag{3}$$

with scaling function $\bar{m}_0$ defined as: $\bar{m}_0(z) = 1 + \rho' z$, where ρ represents a vector of parameters that have to be estimated. See Poi (2012) for further decomposition of the scaling function. By taking the first differences of the equation (3) with respect to $\ln m$ and $\ln p_j$ we obtain the elasticities of a demand system. The expenditure elasticity for a particular good is computed as:

$$\epsilon_i = 1 + \frac{1}{w_i}\left(\beta_i + \eta_i' z\right). \tag{4}$$

The uncompenstated price elasticity for good I with respect to changes in the price of good j is derived as:

$$\epsilon_{ij} = -\delta_{ij} + \frac{1}{w_i}\left(\gamma_{ij} - [\beta_i + \eta_i' z] \times \left(\alpha_j + \sum_j \gamma_{ij} \ln p_j\right)\right), \tag{5}$$

where δ_{ij} is the Kronecker delta taking value 1 if $i = j$ and 0 otherwise. Finally, the compensated price elasticities are imputed by using the Slutsky identity: $\epsilon_{ij}^C = \epsilon_{ij} + \epsilon_i w_i$.[3]

4. Data: Household Budget Survey of Romania

We use data collected by the National Institute of Statistics (NIS) through the Household Budget Survey. The Household Budget Survey (HBS) provides necessary information for social policy and the standard of living analysis, for defining consumer price index weights, and for estimating household consumption in the national accounts.

HBS is organized as a quarterly survey on a sample of 9360 dwellings, distributed into independent monthly sub-samples of 3120 dwellings each (NIS, 2012). HBS contains sections with detailed information on the following:

- Household's location and territory (county), residence area (rural, urban) and the period of data collection (month and year);

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[3]Since both (4) and (5) include w_i in the denominator of the fraction, we trim each observation with $w_i = 0$ for the particular food group, otherwise the expenditure elasticity would be infinitely high. We also trim extreme values of food expenditures and food prices entering the model.

- Individual characteristics of a household members such as, number of members per family, number of dependent persons (children), age, educational level, vocational training, ethnic group, occupational status, etc.;
- Balance of foodstuffs and beverages consumed per each household containing consumptions by origin sources (bought, from own production, from stocks, loans). For the estimation purposes, we exclusively use the quantities only of purchased food products (we do not consider the self consumption);
- Balance of a household's incomes mainly containing the entries in cash and the incomes in kind, expressed in value terms (cash entries from salaries, pensions, social services, sale of farm products, from other activities, etc.);
- Balance of household expenditures containing both the cash expenses and the expenses in kind, expressed in value terms.

To estimate the food demand system for Romanian households we use cross-sectional data for years 2004, 2007 and 2011 obtained from the Romanian Household Budget Survey (HBS). For each of these three years, we use data corresponding to the first quarter of the particular year. We have chosen year 2004 representing the first year of the series for which homogenous data exist within the HBS framework, year 2007 representing the year of Romania's EU accession as well as a year with a significant economic growth, and year 2011 representing a time period after financial crises.

The main variables entering the model are budget shares of the particular food groups, logarithms of prices and food expenditures. The demand system is also augmented with demographic variables such as location (rural/urban) of the household, family size, number of adults, number of children, and age of household head. Summary statistics of the main variables are reported in Table 2.

Table 2 Descriptive statistics of the main variables

	2004		2007		2011	
Variable	Mean	SD	Mean	SD	Mean	SD
Income	600.31	690.35	922.50	775.16	1,333.38	1,264.87
Foodexp	200.81	141.27	267.40	176.46	395.10	235.92
Nonfood	0.61	0.19	0.66	0.17	0.66	0.16
w_{cereal}	0.34	0.18	0.26	0.14	0.25	0.13
w_{meat}	0.18	0.13	0.24	0.13	0.23	0.11
w_{dairy}	0.14	0.11	0.15	0.10	0.15	0.09
w_{fruits}	0.13	0.10	0.14	0.09	0.16	0.09
w_{other}	0.21	0.11	0.22	0.11	0.21	0.10
p_{cereal}	2.07	0.44	2.40	0.67	4.10	1.02
p_{meat}	7.82	2.26	9.82	2.71	12.50	3.18
p_{dairy}	3.70	2.84	4.41	2.82	6.29	3.67
p_{fruits}	2.23	1.18	2.81	1.36	3.90	1.42
p_{other}	3.31	1.73	3.72	1.75	5.51	3.28
Famsize	2.73	1.52	2.49	1.38	2.27	1.31
Urban	0.52	0.50	0.51	0.50	0.50	0.50
Kids	0.47	0.84	0.36	0.75	0.27	0.68

Age	55.01	15.78	55.96	16.22	57.81	16.05

Source: Household Budget Survey of Romania (2004, 2007, 2011); authors' calculations
Note: Monetary values are presented in Romanian national currency, when 1 Romanian Leu ≈ 0.22 €.

4.1 Aggregation and price specification

In order to avoid working with zero consumption levels and to reduce the amount of estimated parameters, we have aggregated food items into five main food groups: cereal products and bread, meat and fish products, dairy products, fruits and vegetables, and other food items. In the economic literature there are no clear guidelines how to aggregate specific food groups. It is purely a researcher's decision based on the similarity of the food items.

Usually, national household expenditure surveys do not contain information on goods' prices. Prices of food items are computed as ratios between expenditures and corresponding quantities. Aggregated price indexes for all five food groups are computed as geometric means of food items using expenditure shares as weights (see e.g. Abdulai, 2002). However, such household specific prices for aggregated food groups differ between households because of the quality effects and this issue can be addressed by imputing so called quality adjusted prices (see e.g.Cox and Wohlegant, 1986and Park et al., 1996). Based on the aforementioned procedure we impute quality adjusted prices for Romanian households for each food group as follows:

$$p_{ji} = \beta_0 + \beta_1 NE_i + \beta_2 SE_i + \beta_3 S_i + \beta_4 SW_i + \beta_5 W_i + \beta_6 NW_i + \beta_7 C_i + \beta_8 Urb_i + \beta_9 Y_i + \beta_{10} Fsize_i + \varepsilon_{ji}, \tag{1}$$

where p_{ji} is the price of *j*th aggregated food group for *i*th household; NE_i is dummy variable representing *i*th household residing in the North-West; SE_i in the South-East; S_i in South; SW_i in South-West; W_i in West; NW_i in North-West and C_i in Central part; Urb_i is dummy variable representing households living in urban area; Y_i is net monthly income of *i*th household; $Fsize_i$ represents *i*th households size. To avoid the problem of colinearity, we have omitted one category from regional dummies. Thus, the reference household is located in the Bucuresti region. Then, the quality adjusted price for the *j*th food group is imputed as: $p_{ji} = \hat{\beta}_0 + \varepsilon_{ji}$, with $\hat{\beta}_0$ and ε_{ji} being the computed constant and error term from the corresponding price/quality regressions.

5. Results and discussion

We estimate an Almost Ideal Demand Systems for three specific years (2004, 2007 and 2011). We present the estimated parameters in Appendix 2. Majority of the estimated parameters are statistically significant at the chosen level. Relevant demographic variables are used as controls. To formally test for a significance of the demographic controls, we perform a Wald test. In all cases, we reject the null hypothesis that the particular demographic controls (family size, number of kids, nonfood expenditures and age of the households head) are jointly statistically insignificant with p-values of the Chi-square test below the conventional level.

Computed expenditure and price elasticties are presented in Table 3 for years 2004, 2007 and 2011. We present the food demand elasticities only for a "representative" low income household (1st quintile of the income distribution) residing in rural area.[4]

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[4]The present results are only a small fraction of all the results produced. Due to the space limitation we do not present all the results and they can be obtained from the authors upon a request.

Table 3 Estimated price (compensated) and expenditure elasticities

	C	MF	DP	FV	OF	Expenditure
			2004			
C	**-0.465**	0.004	0.142	0.130	0.189	**0.665**
MF	0.005	**-0.387**	0.313	-0.090	0.159	**1.767**
DP	0.310	0.290	**-1.032**	0.281	0.151	**1.143**
FV	0.321	-0.095	0.308	**-0.836**	0.302	**1.170**
OF	0.375	0.126	0.133	0.243	**-0.877**	**1.022**
			2007			
C	**-0.543**	0.048	0.167	0.121	0.207	**0.531**
MF	0.058	**-0.442**	0.245	-0.023	0.162	**1.500**
DP	0.265	0.318	**-1.027**	0.246	0.198	**1.104**
FV	0.235	-0.036	0.291	**-0.791**	0.301	**1.249**
OF	0.277	0.163	0.159	0.202	**-0.801**	**0.942**
			2011			
C	**-0.622**	0.085	0.188	0.159	0.189	**0.585**
MF	0.114	**-0.457**	0.265	-0.119	0.197	**1.387**
DP	0.318	0.345	**-1.082**	0.209	0.210	**1.095**
FV	0.299	-0.169	0.231	**-0.602**	0.241	**1.289**
OF	0.283	0.221	0.183	0.189	**-0.876**	**0.988**

Source: Household Budget Survey of Romania (2004, 2007, 2011); authors' calculations
Note: C=cereal products; MF= meat and fish; DP= dairy products and eggs; FV= fruits and vegetables; OF= other food.

Estimated expenditure elasticties are higher than 1 in for 4 out of 5 food groups meaning that meat and fish, dairy products, fruits and vegetables and other food products are luxury goods for low income, rural households in Romania. On the other hand, cereal products are a necessity. Low income rural households in Romania cannot afford high quality diet and therefore they must stick with monotonous consumption of cereals (as presented in Figure 3).

All compensated own-price elasticties are negative which is consistent with the economic theory. Low income, rural household in Romania are most price sensitive towards dairy products (-1.032, -1.027 and -1.082) meaning a price elastic demand. Demand for the other 4 food groups is price inelastic. Large majority of the cross-price compensated price elasticties are positive, which means that these groups of products are substitutes. This can be explained by the high aggregation level of food groups.

Food consumption of poor rural households in Romania is significantly constrained by low pecuniary incomes. These households purchase on the market only foodstuffs that they cannot produce by themselves on their agricultural plots or luxury products for special occasions. Consumption of dairy products is characterized both by high income elasticity of demand and by high share of consumption of self-produced products. Therefore dairy products bought on the market are those that cannot be produced by the household itself and are therefore luxurious products.

Table 4 Share of self-consumption in total consumption, in the rural household (2011)

Commodity	Share (%)
Bread	15%
Fresh meat	50%
Milk	56%
Cheese	53%
Eggs	83%
Fresh fruits	45%
Vegetables	60%

Source: Household Budget Survey of Romania (2011)

Demand for food in Romania is strongly influenced by high share of self-consumption (subsistence) especially in rural areas (see Table 4). The more elastic food demand in rural areas for some food items indicates that there is a potential demand for certain processed food products (more sophisticated). It is expected that rural development policies implemented after the Romanian accession to the EU have led to an increase in cash income of rural households and to an improvement of the food intake in terms of quality and diversity.

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Appendix 1: Variables definition

Variable	Definition
Income	Net monthly household income (Romanian Leu)
Foodexp	Monthly food expenditure (Romanian Leu)
Nonfood	Ratio of nonfood expenditure to total income(expenditure)
w_{cereal}	Budget share of cereal products and bread
w_{meat}	Budget share of meat and fish products
w_{dairy}	Budget share of dairy products and eggs
w_{fruits}	Budget share of fruits and vegetables
w_{other}	Budget share of other food products
p_{cereal}	Price of cereal products (Leu/kg)
p_{meat}	Price of meat and fish products (Leu/kg)
p_{dairy}	Price of dairy products and eggs (Leu/kg)

p_{fruits}	Price of fruits and vegetables (Leu/kg)
p_{other}	Price of other food products (Leu/kg)
Famsize	Number of person per household
Urban	1 if a household resids in urban are; 0 otherwise
Kids	Number of household members below age 16
Age	Age of the households head

Source: Household Budget Survey of Romania (2004, 2007 and 2011)

Appendix 2: Estimated coefficients of AIDS

Parameter	2004		2007		2011	
	Coef.	S.E.	S.E.	S.E.	Coef.	S.E.
alpha						
α_1	-0.275***	0.035	-0.275***	0.025	-0.282***	0.021
α_2	0.542***	0.029	0.558***	0.024	0.495***	0.020
α_3	0.254***	0.018	0.252***	0.015	0.230***	0.014
α_4	0.270***	0.017	0.315***	0.015	0.385***	0.015
α_5	0.209***	0.018	0.150***	0.017	0.173***	0.015
beta						
β_1	-0.089***	0.005	-0.077***	0.004	-0.077***	0.004
β_2	0.063***	0.004	0.059***	0.004	0.047***	0.004
β_3	0.016***	0.003	0.015***	0.003	0.012***	0.002
β_4	0.015***	0.003	0.019***	0.003	0.024***	0.003
β_5	-0.004	0.003	-0.015***	0.003	-0.006**	0.003
gamma						
γ_{11}	0.145***	0.010	0.113***	0.008	0.089***	0.007
γ_{21}	-0.110***	0.007	-0.092***	0.005	-0.075***	0.005
γ_{31}	-0.019***	0.004	-0.009***	0.003	0.000	0.003
γ_{41}	-0.017***	0.005	-0.019***	0.003	-0.015***	0.004
γ_{51}	0.001	0.004	0.008**	0.004	0.001	0.003
γ_{22}	0.109***	0.007	0.109***	0.006	0.094***	0.006
γ_{32}	0.031***	0.003	0.023***	0.003	0.026***	0.003
γ_{42}	-0.028***	0.004	-0.024***	0.003	-0.046***	0.004
γ_{52}	-0.002	0.003	-0.016***	0.003	0.001	0.003
γ_{33}	-0.030***	0.003	-0.031***	0.003	-0.040***	0.003
γ_{43}	0.023***	0.002	0.019***	0.002	0.012***	0.003
γ_{53}	-0.005**	0.002	-0.003	0.002	0.003*	0.002
γ_{44}	0.004	0.004	0.013***	0.003	0.042***	0.004
γ_{54}	0.018***	0.002	0.011***	0.002	0.007***	0.002
γ_{55}	-0.011***	0.003	-0.001	0.003	-0.012***	0.002
eta						
$\eta_{fam\,1}$	-0.008***	0.000	-0.008***	0.000	-0.009***	0.000
$\eta_{fam\,2}$	0.004***	0.000	0.004***	0.000	0.005***	0.000
$\eta_{fam\,3}$	0.003***	0.000	0.003***	0.000	0.002***	0.000

$\eta_{fam\,4}$	0.001***	0.000	0.002***	0.000	0.003***	0.000
$\eta_{fam\,5}$	0.000**	0.000	0.000	0.000	0.000*	0.000
$\eta_{kids\,1}$	-0.001*	0.001	-0.001	0.001	0.000	0.001
$\eta_{kids\,2}$	0.002***	0.001	0.002***	0.001	0.002***	0.001
$\eta_{kids\,3}$	-0.002***	0.000	-0.002***	0.000	-0.002***	0.000
$\eta_{kids\,4}$	0.000	0.000	0.000	0.000	-0.001**	0.000
$\eta_{kids\,5}$	0.001***	0.000	0.001**	0.000	0.001***	0.000
$\eta_{nonfood\,1}$	0.006***	0.001	0.002***	0.000	0.005***	0.001
$\eta_{nonfood\,2}$	-0.003***	0.001	-0.001*	0.000	0.000	0.001
$\eta_{nonfood\,3}$	-0.002***	0.000	-0.001***	0.000	-0.002***	0.001
$\eta_{nonfood\,4}$	0.000	0.000	-0.001***	0.000	-0.001	0.001
$\eta_{nonfood\,5}$	-0.001	0.000	0.000	0.000	-0.002***	0.001
$\eta_{age\,1}$	0.000	0.000	0.000	0.000	0.000*	0.000
$\eta_{age\,2}$	0.000	0.000	0.000*	0.000	0.000**	0.000
$\eta_{age\,3}$	0.000***	0.000	0.000***	0.000	0.000***	0.000
$\eta_{age\,4}$	0.000***	0.000	0.000	0.000	0.000	0.000
$\eta_{age\,5}$	0.000***	0.000	0.000***	0.000	0.000***	0.000
rho						
ρ_{fam}	-0.008	0.022	-0.086***	0.019	-0.059***	0.012
ρ_{kids}	-0.116***	0.029	-0.010	0.036	-0.025*	0.015
$\rho_{nonfood}$	0.090***	0.019	0.025***	0.005	0.036***	0.002
ρ_{age}	0.008	0.006	0.005	0.004	-0.001	0.002

Source: Household Budget Survey of Romania (2004, 2007, 2011); authors' calculations.
*P(<0.1); **P(<0.05); ***P(<0.01).