Food demand and consumption patterns in the new EU member states: The case of Slovakia

Marian Rizov[1], Anrej Cupak[2], Jan Pokrivcak[2]

[1] Middlesex University Business School, London, UK
[2] Slovak University of Agriculture, Nitra, Slovakia

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[a] Middlesex University Business School, London, UK
[b] Slovak University of Agriculture, Nitra, Slovakia

Abstract

We estimate a food demand system for Slovakia using a recent household budget survey data over the period 2004-2011. The Quadratic Almost Ideal Demand System (QUAIDS) augmented with demographic, regional and expenditure controls is employed based on preliminary non-parametric Engel curve analysis. In most samples demand for meat and fish and fruits and vegetables is expenditure and own-price elastic. On average all five food groups are found to be normal goods. Rural and low-income households appear more expenditure and price sensitive compared with the urban and high-income ones. Overall the food security situation in Slovakia has improved since the country's EU accession.

Key words: Food demand, QUAIDS, elasticity, Slovakia

Contact address:
M. Rizov
Middlesex University Business School
The Burroughs
London NW4 4BT

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Introduction

Food demand has been actively researched for over a century both in developed and developing countries as the focus has usually been on how income and prices influence food expenditure and consumption patterns. Policy makers dealing with food security issues are often interested in studies that examine the response of households to price and income changes. While predominantly food demand analyses have been concerned with situations in developing countries, there are also several food demand studies employing household data from developed European countries (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 in the middle-income former socialist countries, now new member states of the European Union (EU), have not been widely studied with micro data.[1] 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 EU new member states (NMS) is timely.[2]

Food supply and demand in Europe have been importantly influenced by the Common Agricultural Policy (CAP), which is driven by the EU's commitment to support long-term food supply and meet the European and growing world food demand (European Commission, 2010). As a result of CAP and rising incomes the share of European household expenditure

[1] An exception is the study of Janda et al., (2009) who estimate a complete demand system using Czech Household Budget Survey data; there are also a few partial demand analysis on selected food groups (e.g., Hupkova et al., 2009 and Zetkova and Hoskova, 2009 for Slovakia; Szigeti and Podruzsik, 2011 for Hungary).
[2] In Europe, about 5% of the overall population is at risk of malnutrition, and among vulnerable groups—the poor, the elderly, and the sick—this percentage is even higher (Reisch et al., 2013). In the NMS malnutrition and general poverty is the highest; for instance, in 2011, poverty rate ranged between 20% in Slovakia and 40% in Romania as poverty rates considerably differ between urban and rural areas and across income groups.

on food has been steadily declining over the years. However, international food prices have recently risen and are likely to remain high primarily because of the escalating cost of inputs and surging world demand. In 2005, a year after the accession of the first wave of NMS, food expenditure in the EU was between 10% and 35% of total household consumption budget, with the smallest shares in the EU-15 and the largest in the NMS (EEA, 2005). Consequently, the price index for food in the EU rose by almost 20% between 2005 and 2012 (Eurostat, 2012). Rising food prices create serious difficulties, especially for vulnerable, low-income households that spend a substantial proportion of their income on food.

As a large number of vulnerable households are located in the NMSs, this paper aims to shed light on the food security situation of households in Slovakia, a typical middle-income east European NMS. We follow Banks et al. (1997) and employ the Quadratic Almost Ideal Demand System (QUAIDS) augmented with demographic and other household controls to examine the food expenditure patterns across income groups and types of region. The main contribution of the paper is the combination of using extended QUAIDS methodology and household longitudinal data from Slovakia. Compared to other demand systems, QUAIDS is more appropriate since it allows for non-linearity in the Engel curves which is important when analysing a disaggregate food demand system as evident from our preliminary non-parametric analysis. Using household (micro) data is important as managing food security requires not only understanding how policies influence the availability of food and income at national level but also how individual households can cope with income and price shocks. Our analysis of Slovak household demand patterns suggests that food security situation has improved since Slovakia's EU accession. However, food commodities important for healthy diet such as meat and fish and fruits and vegetables remain expenditure and own-price elastic. There also is important heterogeneity in sensitivity to income and price shocks across subsamples of rural and urban and low- and high-income households that need to be taken into account by policy-makers.

Method: Quadratic Almost Ideal Demand System

Several demand systems have been popular for modelling the allocation of total expenditures among commodities given certain budget. These include the Linear Expenditure System (LES) (Stone, 1954), the Rotterdam model (Barten 1964), the Indirect Translog System (ITS) (Christensen et al., 1975), and the Almost Ideal Demand System (AIDS) (Deaton and Muellbauer, 1980). LES is unable to describe demand behaviour consistent with the Engel's law where as income increases a good can change from normal to inferior one. The Rotterdam model is consistent with demand theory, however, since it is not derived from specific utility or expenditure function, the model is inconsistent with utility maximising behaviour. ITS has the advantage of a flexible functional form but poses a major estimation problem due to relatively large number of independent parameters. AIDS satisfies the restrictions of demand theory and its estimation is less complicated than other models.

Based on non-parametric analysis of consumer expenditure patterns Banks et al. (1996; 1997) show that the correct approximation of Engel curves requires a higher order logarithmic term of expenditure and propose QUAIDS which nests AIDS and also satisfies the restrictions of demand theory. QUAIDS thus allows as income increases a good to change from normal to inferior one. Household preferences follow the indirect utility function:

$$\ln V = \left\{\left[\frac{\ln m - \ln a(\mathrm{p})}{b(\mathrm{p})}^{-1} + \lambda(\mathrm{p})\right]\right\}^{-1}, \quad (1)$$

where the term [ln*m* - ln*a*(p)]/*b*(p) is the indirect utility function of the PIGLOG[3] demand system, *m* is household income, and a(p), *b*(p) and λ(p) are functions of the vector of prices p.

[3] Demand with expenditure shares that are linear in log total expenditure alone have been referred to as Price-Independent Generalised Logarithmic (PIGLOG) by Muellbauer (1976).

To ensure the homogeneity property of the indirect utility function, it is required that a(p) is homogenous of degree one in p, and b(p) and λ(p) are homogenous of degree zero in p. The price index ln$a$(p) has the usual translog form

$$\ln a(\mathrm{p}) = \alpha_0 + \sum_j \alpha_j \ln p_j + \frac{1}{2}\sum_i \sum_j \gamma_{ij} \ln p_i \ln p_j,$$

b(p) is the simple Cobb-Douglas price aggregator defined as

$$b\,(\mathrm{p}) = \prod_i p_i^{\beta_i},$$

and λ(p) is defined as

$$\lambda\,(\mathrm{p}) = \sum_i \lambda_i \ln p_i \text{ where } \sum_i \lambda_\mathrm{i} = 0.$$

By applying Roy's identity to the indirect utility function (1), the budget shares in the QUAIDS are derived as

$$\omega_i = \alpha_i + \sum_j \gamma_{ij} \ln p_j + \beta_i \ln\left[\frac{m}{a(\mathrm{p})}\right] + \frac{\lambda_i}{b(\mathrm{p})}\left\{\ln\left[\frac{m}{a(\mathrm{p})}\right]\right\}^2. \quad (2)$$

For theoretical consistency and to reduce the number of parameters to be estimated adding-up, homogeneity and symmetry restrictions are commonly imposed. The fact that $\sum_i \omega_i = 1$, called the adding-up condition, requires that $\sum_i \alpha_i = 1$, $\sum_i \beta_i = 0$, $\sum_i \lambda_i = 0$ and $\sum_i \gamma_{ij} = 0 \;\; \forall j$. Moreover, since demand functions are homogeneous of degree zero in (p, m) $\sum_j \gamma_{ij} = 0 \;\; \forall j$. And Slutsky symmetry 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.

Majority of previous studies extend the system with demographic variables following Pollak and Wales (1981) where the demographic effects shift the intercept α_i in equation (2). However, we follow the scaling approach introduced by Ray (1983) which has been implemented by Poi (2012) into QUAIDS. This approach has the advantage of having strong theoretical foundations and generating expenditure share equations that closely mimic their counterparts without demographics. For each household the expenditure function $e(\mathrm{p}, \mathrm{z}, u)$, underlying the budget shares is written as the expenditure function of a reference household $e^R(\mathrm{p}, u)$, scaled by the function $m_0(\mathrm{p}, \mathrm{z}, u) = \bar{m}_0(\mathrm{z})\varphi(\mathrm{p}, \mathrm{z}, u)$ to account for the household characteristics where z represents a vector of s characteristics and u is direct utility. The first term of m_0 ($\bar{m}_0(\mathrm{z})$) measures the increase in a household's expenditures as a function of z, not controlling for any differences in consumption patterns. The second term ($\varphi(\mathrm{p}, \mathrm{z}, u)$) controls for differences in relative prices and the actual goods consumed; a household with two adults and two infants will consume different goods than one comprising four adults.

Furthermore, we extend the vector z with a food expenditure control the rationale for which is the following. In estimating a food demand system the implicit assumption is that the consumer's utility maximisation decision can be decomposed into two separate stages where in the first stage, the allocation of total expenditure between food and other commodity groups (housing, transport, entertainment, etc) is decided. In the second stage, the food expenditure is allocated among different food groups. The price and expenditure elasticities obtained from such a two-stage budgeting process are conditional or partial elasticities in the sense that a second-stage conditional demand system is estimated. To obtain unconditional elasticity estimates correction for the first stage budgeting decision is needed. Therefore, besides standard demographic variables, the share of food expenditure in the net disposable income is also added to the vector z.

The budget share equation (2) augmented with demographic effects becomes:

$$\omega_i = \alpha_i + \sum_j \gamma_{ij} \ln p_j + (\beta_i + \eta'_i \mathrm{z}) \ln\left[\frac{m}{\bar{m}_0(\mathrm{z})a(\mathrm{p})}\right] + \frac{\lambda_i}{b(\mathrm{p})c(\mathrm{p},\mathrm{z})}\left\{\ln\left[\frac{m}{\bar{m}_0(\mathrm{z})a(\mathrm{p})}\right]\right\}^2, \qquad (3)$$

where $c(\mathrm{p}, \mathrm{z}) = \prod_j p_j^{\eta'_j z}$, η'_j represents the j^{th} column of parameter matrix η. The adding-up condition requires that $\sum_j \eta_{sj} = 0 \;\; \forall s$.

Similar to Banks et al. (1997) the expenditure and price elasticities are obtained by partially differentiating equation (3) with respect to ln*m* and lnp_j respectively:

$$\mu_i \equiv \frac{\partial \omega_i}{\partial \ln m} = \beta_i + \eta'_i \mathrm{z} + \frac{2\lambda_i}{b(\mathrm{p})c(\mathrm{p,z})} \ln\left[\frac{m}{\bar{m}_0(\mathrm{z})a(\mathrm{p})}\right] \text{ and} \quad (4)$$

$$\mu_{ij} \equiv \frac{\partial \omega_i}{\partial \ln p_j} = \gamma_{ij} - \mu_i\left(\alpha_j + \sum_k \gamma_{jk} \ln p_k\right) - \frac{\lambda_i(\beta_j + \eta'_j \mathrm{z})}{b(\mathrm{p})c(\mathrm{p,z})}\left\{\ln\left[\frac{m}{\bar{m}_0(\mathrm{z})a(\mathrm{p})}\right]\right\}^2 \quad (5)$$

Then the expenditure and the uncompensated price elasticities are computed as $e_i = \mu_i/\omega_i + 1$ and $e_{ij}^u = \mu_{ij}/\omega_i - \delta_{ij}$ respectively; δ_{ij} represents Kronecker delta taking value 1 if $i=j$ and 0 otherwise. Using the Slutsky equation, we can finally compute compensated price elasticities: $e_{ij}^c = e_{ij}^u + e_i\omega_j$.

Data: Slovak Household Budget Survey

We apply QUAIDS to Slovak Household Budget Survey (HBS) data. The HBS data is commonly used for social policy and the standard of living analysis, for defining consumer price index weights, and for estimating household consumption in the national accounts. Our dataset consists of eight annual rounds, from 2004 to 2011. The survey provides detailed information on household incomes and expenditures on food and non-food goods and services. The data also contain detailed information on quantities consumed by each household, its location and size as well as individual household member characteristics such as age, education, occupation, marital status. Each of our annual samples contains approximately 4700 households, however, the samples do not form a (real) panel as surveyed households are randomly selected from the population each round.

The information on food consumption is collected on a one-month recall basis. We aggregate food commodities consumed into five food groups: cereals, meat and fish, dairy products and eggs, fruits and vegetables, and other food products. The other food products group comprises of food commodities such as fats, oils, condiments, and sugar. As economic theory does not provide any guidance on the number or composition of aggregated food groups, the construction of the food groups used in this analysis was influenced partially by past studies of the European food sector and by a classification reflecting the similarity (substitutability) of food items from a consumer's viewpoint. A major advantage to our food-grouping scheme is that it reduces the total number of parameters in the model and avoids the problem with zero consumption, thus making the demand system estimation simple.

Since prices were not provided by HBS, implicit prices for individual food commodities were derived from the purchased quantity and expenditure data. Price indices for the aggregated food groups were computed using the geometric mean with expenditure shares as weights (e.g., as in Abdulai, 2002). Each price obtained is effectively a value to quantity ratio, which is called 'unit value' by Deaton (1989). The price calculated this way is household specific, representing household purchase decisions. Thus, the variation in food-group prices is due to differences in items consumed in each group and variation in prices of each item across households. The latter is due to quality differences, seasonal effects, and regional market conditions.[4]

Table 1 reports summary statistics for the variables used in the QUAIDS estimations. It is evident that between 2004 and 2011 there was a significant change in incomes and prices in Slovakia. Incomes doubled as well as the prices of the cereals and other food products groups while prices of meat and fish, diary, and fruits and vegetables increased more modestly which is reflected in the less than doubled total food expenditure.[5] The household consumption patters do not appear to have changed substantially over the period as evident from food expenditure shares which have remained quite stable as only the fruits and

[4] It is noteworthy that the price elasticities computed from unit values might be overestimated because of the quality effect incorporated in unit values (Deaton, 1989). To address the issue we also estimates quality adjusted prices following Park et al. (1996). The QUAIDS results with quality adjusted prices do not differ significantly from the results with unadjusted unit value prices.

[5] Food prices in Slovakia did not grow gradually over time; there were significant increases between 2004 and 2009, especially in the prices of meat and fish and other food products groups, followed by more modest decreases in the follow-up period, since the adoption of the Euro.

vegetables expenditure share shows a more significant increase. Detailed examination of the data suggests that the quantities consumed remained relatively stable too; the tendency for substitution of low-fat milk for whole milk is noteworthy though. This fact taken together with the noticeable increase in the fruits and vegetables expenditure share seems to indicate a shift of Slovak consumers towards a healthier diet.

Table 1 Definition of variables and summary statistics

		2004		2011	
Variable	Definition	Mean	SD	Mean	SD
Netincome	Net monthly household income (€)	565.16	(394.47)	1053.95	(603.00)
Foodexp	Total monthly household food expenditure (€)	115.74	(60.89)	173.43	(87.28)
Expratio	Ratio of household food expenditure and net income	0.25	(0.14)	0.19	(0.10)
HH_size	Household size	2.91	(1.43)	2.68	(1.36)
N_children	Number of children (below age 16) in the household	0.53	(0.86)	0.46	(0.81)
N_adults	Number of adult (above age 18) household members	2.22	(0.96)	2.10	(0.92)
Age_head	Age of the household head	51.03	(14.79)	52.26	(14.57)
Urban	Dummy: 1 if household resides in urban area and 0 otherwise	0.62	(0.48)	0.58	(0.49)
w_{cereal}	Expenditure share on cereals	0.20	(0.07)	0.21	(0.07)
w_{meat}	Expenditure share on meat and fish	0.30	(0.11)	0.28	(0.10)
w_{dairy}	Expenditure share on dairy products	0.19	(0.07)	0.18	(0.07)
w_{fruits}	Expenditure share on fruits and vegetables	0.12	(0.07)	0.15	(0.07)
w_{other}	Expenditure share on other food products	0.19	(0.07)	0.18	(0.07)
p_{cereal}	Price of cereals (€)	0.87	(0.28)	1.76	(0.57)
p_{meat}	Price of meat and fish (€)	2.71	(0.55)	3.91	(0.81)
p_{dairy}	Price of dairy products (€)	1.28	(1.03)	1.77	(0.83)
p_{fruits}	Price of fruits and vegetables (€)	0.71	(0.35)	1.20	(0.52)
p_{other}	Price of other food products (€)	1.85	(1.07)	3.13	(1.62)

Note: For 2004 values the exchange rate used is 1€ = 40,045 Slovak crowns. There are eight regions in Slovakia, Bratislava, Trnava, Trencin, Nitra, Zilina, Banska Bystrica, Presov, and Kosice which are approximately equally represented in the survey.

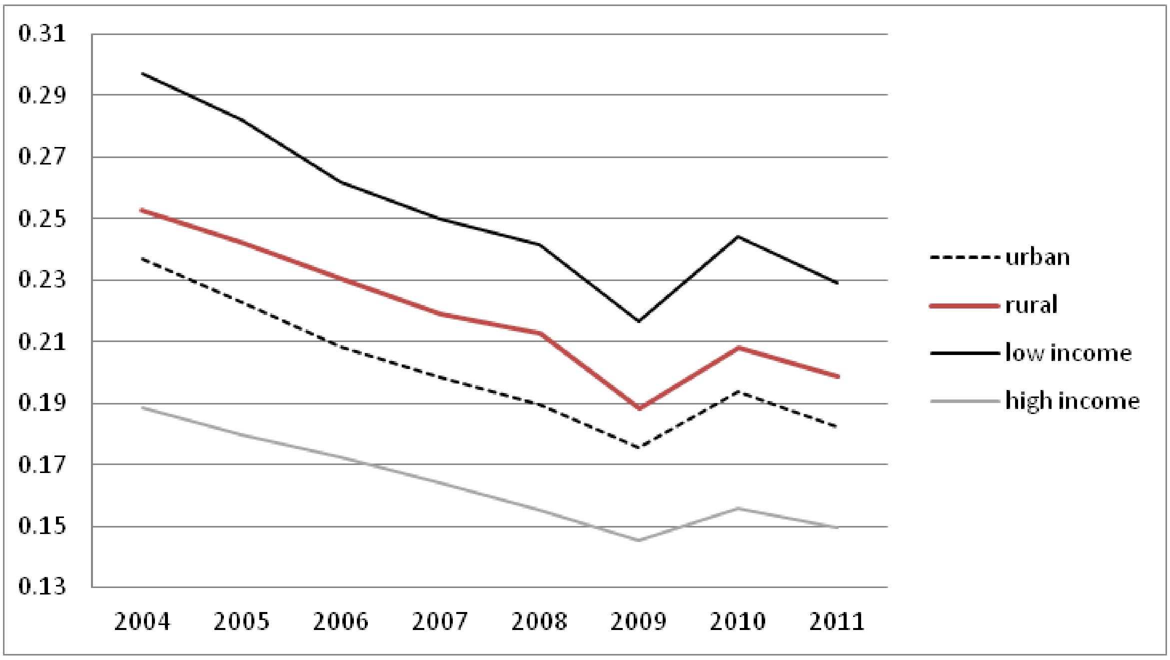

Figure 1 Ratio of household food expenditure and net income

In terms of food security there is also evidence of improvement. Figure 1 shows that the ratio of food expenditure and total income has been steadily declining since the Slovak accession to the EU in 2004. For the low-income subsample (households with income below the median) the ratio has dropped from 30% down to 22% in 2009 when the Euro was adopted, consequently followed by a relatively small hike in 2010. The trend for the high-income subsample is very similar but the levels are quite different – the drop is from 19% to 14%, which is comparable with EU-15 levels. There are differences between rural (20% in 2011) and urban (18% in 2011) household food expenditure rations as these differences are less pronounced compared with the income-based subsamples while the declining trend is the same confirming that the improvement in food security situation as indicated by the food expenditure ration is a nationwide trend.

Estimation results

We start our econometric analysis by first estimating the Engel curves for the five food groups by rural and urban subsamples using a non-parametric Kernel regression as in Banks et al. (1997). The shapes of the Engel curves are consistent with the theory. An increase in income is associated with a monotonic decline in the share of expenditure on cereals while there is a positive relationship between increase in income and the expenditure share of meat and fish suggesting that these food commodities are perceived as luxury. However, the patterns of the Engel curves for dairy products and for fruits and vegetables appear non-linear with inverted-U shape. The Engel curve for other food products group is also highly non-linear. This preliminary analysis suggests that our choice of QUAIDS for estimating food demand behaviour in Slovakia is justified.

We estimate QUAIDS with Stata software using the code developed by Poi (2008; 2012). Parameter estimates are obtained for the full sample and for subsamples of rural and urban households and of low-income and high-income households by round. In estimated samples large majority of own and cross-price parameters and linear expenditure parameters are statistically significant at conventional levels. The majority of the quadratic expenditure terms are also significant at 5% or better. Taken together the estimated expenditure parameters suggest that meat and fish, and for the rural households in early rounds also fruits and vegetables, are luxury. The demographic and regional control variables are generally significant and have the expected effects. For example, household size has a positive effect on the expenditure share of cereals and negative effect on the share of meat and fish. The effect of the expenditure ratio control is also highly significant in most equations and samples as it is, for example, positive in the cereals equations and negative in the meat and fish equations. Due to space limitation the QUAIDS estimated parameters are not reported here but can be obtained from the authors.[6]

[6] To formally test the validity of QUAIDS, we performed specification tests comparing restricted models with linear Engel curves for all food groups and the alternative models with quadratic Engel curves. The Chi-square tests rejected the restricted models in all samples.

Table 2 Average estimated demand elasticities

	Cereals	Meat and fish	Dairy products	Fruits and Vegetables	Other food products
		Compensated			
Cereals	**-0,517**	0,292	0,065	0,122	0,038
Meat and fish	0,199	**-0,731**	0,246	0,102	0,186
Dairy products	0,045	0,426	**-0,784**	0,164	0,149
Fruits and Vegetables	0,276	0,064	0,291	**-0,852**	0,218
Other food products	-0,017	0,399	0,107	0,180	**-0,668**
		Uncompensated			
Cereals	**-0,681**	0,047	-0,088	0,008	-0,109
Meat and fish	0,003	**-1,032**	0,062	-0,034	0,006
Dairy products	-0,129	0,168	**-0,947**	0,041	-0,007
Fruits and Vegetables	-0,076	-0,465	-0,037	**-1,098**	-0,100
Other food products	-0,161	0,186	-0,026	0,080	**-0,795**
	Expenditure	Shares			
Cereals	**0,823**	0,199			
Meat and fish	**0,997**	0,299			
Dairy products	**0,874**	0,185			
Fruits and Vegetables	**1,771**	0,138			
Other food products	**0,717**	0,179			

Table 2 reports compensated and uncompensated price elasticities and expenditure elasticities calculated from the QUAIDS parameters. These elasticieties are averages over the eight rounds (2004-2011) used. The expenditure elasticities of all food groups are positive as the largest in magnitude are the elasticities of fruits and vegetables (1.77) and meat and fish (about unity). Both compensated and uncompensated own-price elasticities are negative and thus consistent with demand theory. While all compensated own-price elasticities are smaller than unity in absolute value, the uncompensated own-price elasticities of meat and fish and fruits and vegetables are greater than unity revealing elastic demand. This finding is consistent with our results for expenditure elasticities and effects of the demographic variables and expenditure ratio. The majority (nineteen out of twenty) of cross-price elasticities are positive albeit relatively small in magnitude suggesting that the respective food groups are substitutes, thus, confirming that our food group classification is appropriate.

The fact that the signs of several (ten out of nineteen) compensated elasticities are different from the signs of the uncompensated elasticities suggests that income effects are important in consumer demand decisions. The overall effect of price changes on demand responses is most relevant for capturing food security and aggregate welfare effects. Therefore, in Figure 2 we present the evolution of the uncompensated own-price elasticities for the five food groups over time. The general impression from the figure is that since 2004 the own-price elasticities have declined, most significantly for meat and fish, followed by fruits and vegetables and diary products. These observations suggest that Slovak households have become less prone to food price shocks by 2011. There is a pronounced hike in household price sensitivity around 2009-2010 – the period when Slovakia adopted the Euro currency.

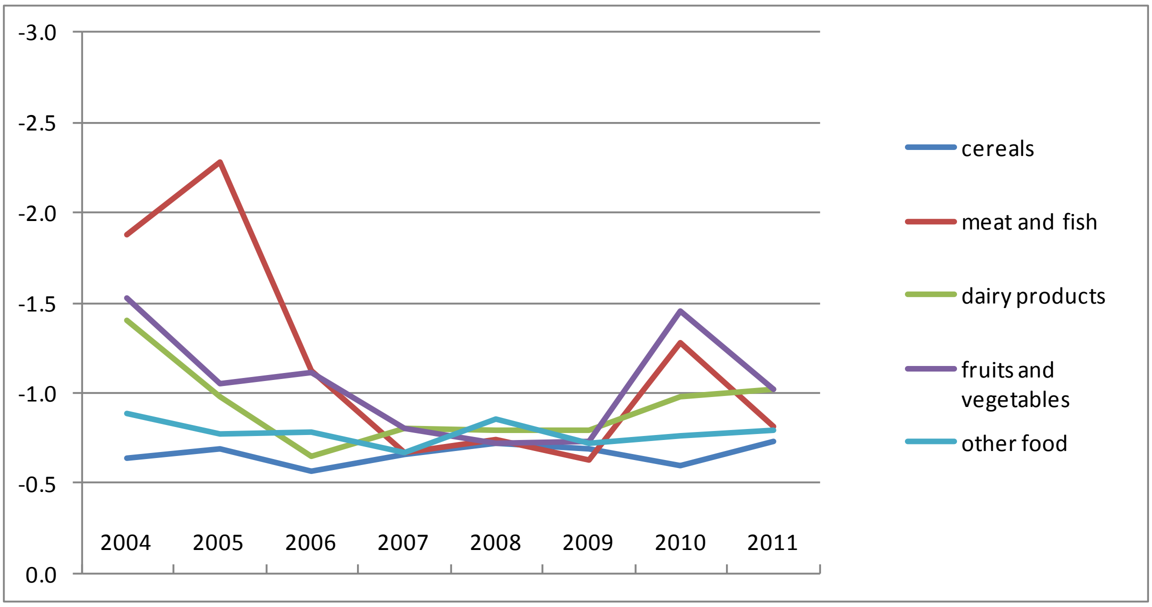

Figure 2 Uncompensated own-price elasticities

Our results from the analysis by subsamples of households further demonstrate the substantial heterogeneity of demand responses. The compensated and uncompensated price elasticities and expenditure elasticities calculated from the QUAIDS parameters for rural and urban and low-income and high-income households are reported in Appendix Table 1 and 2;

in Appendix Figure 1 we present the evolution of the uncompensated own-price elasticities for the five food groups over time by household subsample. Generally, we can observe higher sensitivity and volatility of responses in the rural and especially low-income household subsamples throughout the period, since the Slovak EU accession. There is a substantial hike in the price sensitivity of meat and fish demand of low-income households during 2008, the beginning of the economic crisis. High-income households have experienced increased price sensitivity of their fruits and vegetables and meat and fish demand in the post-Euro period while urban household experienced similar effects on their demand for dairy products, fruits and vegetables and other food products.

Conclusion

We analyse the food demand patterns of Slovak households since the accession of Slovakia to the EU in 2004. Our study is one of the few food demand analysis for the new EU member states using QUAIDS, extended with household characteristics, regional and expenditure controls. The longitudinal BHS data employed covering an eight year period allow us to reveal changes in demand behaviour over time as well as cast light on the food security situation at micro level. In terms of food security a noteworthy nationwide trend is the continuous reduction in the food expenditure and income ratio. By 2011 the food expenditure ration has dropped to about 15% for high-income households – a level comparable with demand patterns in the richer EU-15. The ration is still quite high though, at about 23%, for the low-income households.

The results show that Slovak households are price and income responsive as food expenditure patterns vary across types of household. All five food groups analysed have positive expenditure elasticities as their magnitudes suggest that cereals, diary products and other food products are necessities while fruits and vegetables and meat and fish are luxuries for some groups of households. In line with demand theory, all own price elasticities are negative while majority of the cross-price elasticities are positive albeit smaller in magnitude suggesting that even though the commodities from the five food groups are substitutes the substitution possibilities might be quite limited. Furthermore, the results from subsamples by household type reveal that the demand sensitivity of low-income and rural households is higher compared with high-income, urban households.

Our findings are generally consistent with studies from other developed countries where food security does not present a significant challenge. For example, Michalek and Keyzer (1992), Abdulai (2002), and Chern et al. (2003) find that for the majority of population food demand is price and income inelastic and food is perceived as necessity rather than luxury. Considering the fact that in Slovakia average expenditure elasticities for all food groups surpass in magnitude the own-price elasticities, policy tools for enhancing income generating activities might be more effective compared to policies that are targeted at price reductions. Hence, in order to improve the household diet, especially to increase consumption of fruits and vegetables, income-oriented policies might be appropriate.

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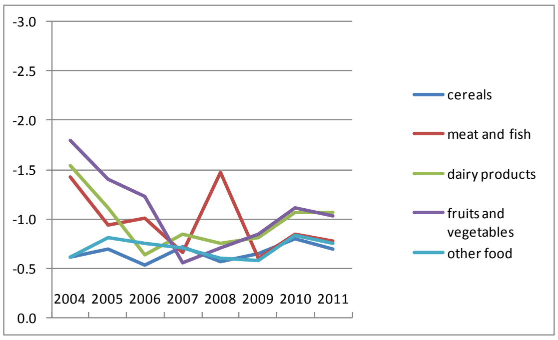
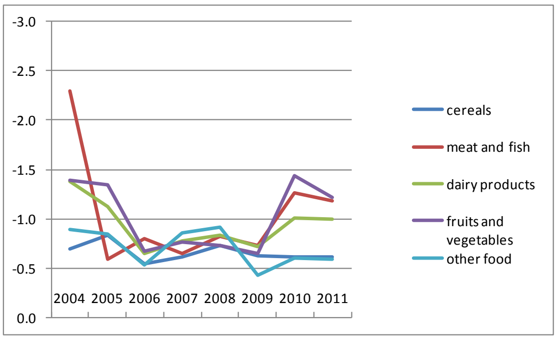
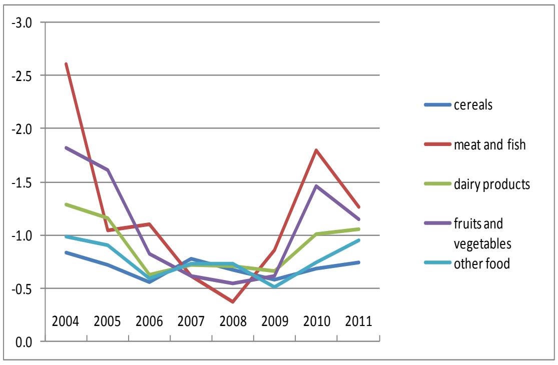
Appendix Figure 1: Uncompensated own-price elasticities



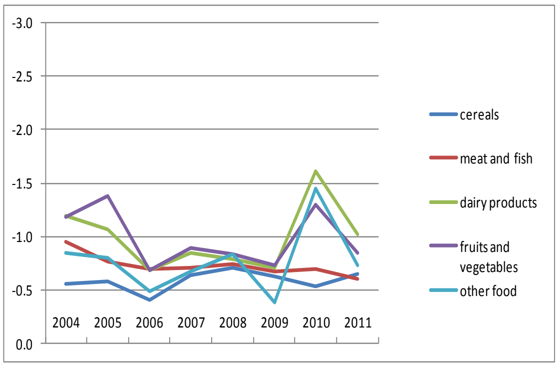
(a) Low-income households



(b) High-income households



(c) Rural households



(d) Urban households

Appendix Table 1

Food demand elasticities of urban households

	Cereals	MF	Dairy	FV	Other
			Compensated		
Cereals	**-0,402**	0,120	0,154	0,075	0,050
MF	0,096	**-0,541**	0,166	0,143	0,138
Dairy	0,071	0,356	**-0,825**	0,199	0,198
FV	0,152	0,189	0,268	**-0,766**	0,154
Other	0,064	0,227	0,210	0,135	**-0,636**
			Uncompensated		
Cereals	**-0,629**	-0,232	-0,071	-0,110	-0,156
MF	-0,044	**-0,766**	0,024	0,030	0,007
Dairy	-0,090	0,107	**-0,988**	0,067	0,050
FV	-0,115	-0,231	-0,001	**-0,985**	-0,092
Other	-0,121	-0,060	0,027	-0,020	**-0,803**
	Budget	Mean shares			
Cereals	**1,196**	0,187			
MF	**0,751**	0,296			
Dairy	**0,854**	0,189			
FV	**1,422**	0,154			
Other	**0,977**	0,173			

Food demand elasticities of rural households

	Cereals	MF	Dairy	FV	Other
			Compensated		
Cereals	**-0,534**	0,271	0,084	0,111	0,067
MF	0,262	**-0,759**	0,244	0,050	0,201
Dairy	0,043	0,421	**-0,783**	0,166	0,155
FV	0,279	0,075	0,277	**-0,887**	0,252
Other	-0,030	0,465	0,086	0,176	**-0,695**
			Uncompensated		
Cereals	**-0,721**	0,002	-0,075	0,006	-0,099
MF	-0,024	**-1,169**	0,006	-0,103	-0,053
Dairy	-0,110	0,202	**-0,913**	0,081	0,019
FV	-0,040	-0,385	0,007	**-1,060**	-0,035
Other	-0,142	0,304	-0,010	0,113	**-0,795**
	Budget	Mean shares			
Cereals	**0,886**	0,212			
MF	**1,341**	0,304			
Dairy	**0,724**	0,179			
FV	**1,509**	0,116			
Other	**0,534**	0,189			

Appendix Table 2

Food demand elasticities of low-income households

	Cereals	MF	Dairy	FV	Other
			Compensated		
Cereals	**-0,480**	0,197	0,123	0,114	-0,022
MF	0,176	**-0,666**	0,245	0,080	0,173
Dairy	0,043	0,465	**-0,852**	0,196	0,091
FV	0,255	0,056	0,295	**-0,850**	0,268
Other	-0,005	0,365	0,099	0,198	**-0,559**
			Uncompensated		
Cereals	**-0,687**	-0,118	-0,068	-0,034	-0,212
MF	-0,052	**-1,012**	0,034	-0,081	-0,040
Dairy	-0,088	0,269	**-0,973**	0,100	-0,028
FV	-0,057	-0,417	0,005	**-1,071**	-0,022
Other	-0,120	0,191	-0,007	0,115	**-0,664**
	Budget	Mean shares			
Cereals	**1,050**	0,197			
MF	**1,158**	0,299			
Dairy	**0,663**	0,183			
FV	**1,585**	0,141			
Other	**0,583**	0,182			

Food demand elasticities of high-income households

	Cereals	MF	Dairy	FV	Other
			Compensated		
Cereals	**-0,513**	0,246	0,076	0,110	0,082
MF	0,179	**-0,707**	0,252	0,112	0,164
Dairy	0,070	0,392	**-0,763**	0,152	0,148
FV	0,258	0,092	0,286	**-0,803**	0,163
Other	0,005	0,424	0,078	0,139	**-0,643**
			Uncompensated		
Cereals	**-0,689**	-0,017	-0,091	-0,009	-0,074
MF	-0,040	**-1,035**	0,048	-0,034	-0,031
Dairy	-0,120	0,112	**-0,941**	0,022	-0,018
FV	-0,064	-0,387	-0,015	**-1,023**	-0,121
Other	-0,104	0,261	-0,026	0,062	**-0,740**
	Budget	Mean shares			
Cereals	**0,880**	0,200			
MF	**1,094**	0,298			
Dairy	**0,943**	0,188			
FV	**1,608**	0,136			
Other	**0,549**	0,177			