

Demand for Food Away from Home in Slovakia*

Andrej CUPÁK—National Bank of Slovakia (andrej.cupak@nbs.sk), *corresponding author*

Ján POKRIVČÁK—Slovak University of Agriculture, Nitra (jan.pokrivcak@uniag.sk)

Marian RIZOV—Lincoln Business School, Lincoln, UK (mrizov@lincoln.ac.uk)

Abstract

We analyze demand for food away from home (FAFH) in Slovakia by means of a double-hurdle model using recent Slovak Household Budget Survey data covering the period 2006–2012. The estimated unconditional income elasticity of FAFH demand (1.37) demonstrates that away-from-home eating is still perceived as a luxury by Slovak households. An important feature of our applied theoretical framework is measurement of the effect of a wife's opportunity cost of time. Results indicate that households where the wife is employed have significantly higher expenditure on FAFH compared to households where the wife is unemployed or a housewife. Further FAFH market growth can be expected in Slovakia in the future, driven by rising GDP, increasing participation of women in the job market, demographic changes towards an increase in the proportion of single-person households, and adoption of more individualistic lifestyles.

1. Introduction

In recent years, household expenditures on food away from home (FAFH) have been increasing globally and it is expected that they will continue to rise in the future. According to the United States Department of Agriculture (2014) the share of expenditure on FAFH in the total food expenditure in the US more than doubled from around 20% in 1970 to almost 45% in 2012. A similar trend is evident in Europe; for example, the FAFH share of total household spending on food in Spain has increased from 10% to 25% in the last 30 years (Angulo *et al.*, 2002) and in Ireland from 13% to 23% over the last two decades (Keelan *et al.*, 2009). Furthermore, the share of households that engage in FAFH consumption has also been rising. These trends have relevant impacts on resource utilization and healthy diets, as well as the functioning of agricultural and food markets.

There are multiple reasons behind the rise in FAFH consumption. Rising incomes and the changing size, composition and lifestyles of households and participation of women in the labor market have been identified as main factors stimulating FAFH demand (e.g., Nayga and Capps, 1992; Liu *et al.*, 2015). Increased availability and variety of restaurant outlets including significant growth of fast-food establishments has positively affected the supply side of the FAFH market.

The demand for FAFH has been studied in the US for a number of years (e.g., Prochaska and Schrimper, 1973; Byrne *et al.*, 1996; Stewart *et al.*, 2004) and more

* The authors acknowledge the financial support from the European Commission FP7 FOODSECURE Research Project (Grant No. 290693) and the Slovak Grant Agency (VEGA-1/0930/15 and VEGA-1/0586/14). We thank the Slovak Statistical Office for granting access to the Household Budget Survey data. The authors are solely responsible for the content of the paper. The views and results presented in this paper are those of the authors and do not necessarily represent the official opinions of the National Bank of Slovakia.

recently in China (e.g., Bai *et al.*, 2010; Liu *et al.*, 2015), Spain (e.g., Mutlu and Gracia, 2006; Angulo *et al.*, 2007), Greece (e.g., Mihalopoulos and Demoussis, 2001), and Ireland (e.g., Newman *et al.*, 2003). There are also several studies analyzing some aspects of food demand in the CEE countries such as the Czech Republic, Slovenia, and Slovakia (e.g., Janda *et al.*, 2010; Dybczak *et al.*, 2014; Verbič *et al.*, 2014; Cupák *et al.*, 2015). However, there is a rather limited number of relevant studies analyzing FAFH demand patterns; two exceptions are studies by Janský (2014) for the Czech Republic and by Staudigel and Schröck (2015) for Russia. These authors incorporate the FAFH bundle into a Quadratic/Almost Ideal Demand System. They find FAFH to be a luxury good for both Czech and Russian households. The lack of studies focusing on the out-of-home eating habits of households in CEE represents a significant gap in the literature, as the CEE countries differ substantially from those of Western Europe and North America in many aspects including income, prices of restaurant and catering services, lifestyles of individuals, and the quantity and quality of available restaurants and fast-food outlets.

Besides the factors determining FAFH consumption, the aforementioned authors also studied the link between FAFH and the health (nutritional) status of individuals and found a significant correlation between excessive weight/obesity and FAFH consumption. Such evidence has been obtained worldwide (e.g., Thompson *et al.*, 2004; Bezerra and Sichieri, 2009). Studies have also found that rising obesity is often linked to the higher calorie count resulting from oversized portions served in restaurants, especially fast-food establishments (Todd *et al.*, 2010). Monotonous diets comprising food that is of poor nutritional quality served by fast-food establishments is correlated with household income. Low-income households tend to consume lower-quality FAFH and as there is a much higher share of low-income households in CEE than in richer countries, studying demand for FAFH in the CEE countries is very relevant also from the perspective of health and food and nutrition security policies.¹

Our empirical analysis of the demand for FAFH is based on the household production theory developed by Becker (1965), Lancaster (1971), and Michael and Becker (1973). An important feature of Becker's model is that households are assumed to be both producing and consuming units and they maximize their utility not only with respect to their budget constraints but also with respect to their time constraints. Households demand not only food products and services outside of their homes, but also convenience to save their time. Therefore, the association between FAFH demand and the value of time has received considerable attention in the empirical literature in recent years.

Due to the presence of censoring in microeconomic data, estimation techniques such as OLS would lead to biased estimates. Therefore, the censored nature of the data has to be addressed. To estimate the income elasticity of FAFH and its determinants, we apply Cragg's (1971) double-hurdle model, in which consumers are assumed to overcome two hurdles: the participation hurdle and the expenditure

¹ An OECD (2014) study shows that excessive weight and obesity might be a threat in the CEE with rates ranging from around 17% of adults in Slovakia and 21% in the Czech Republic to nearly 28.5% in Hungary. For comparison, the average obesity rate in the OECD (34) countries is around 18%, while it is 35.3% in the US.

hurdle. Empirical analysis is carried out using seven annual sets of Slovak Household Budget Survey (HBS) data from the period 2006–2012.

The results indicate that around 62% of Slovak households participated in the FAFH market between 2006 and 2012 and they spent on average about EUR 49 per month on FAFH. However, there is a significant heterogeneity across households. The highest FAFH expenditures are observed among highly educated, high-income households. The estimated unconditional income elasticity of demand for FAFH (1.37) suggests that eating out is perceived as a luxury good in Slovakia. Moreover, the income elasticity of FAFH demand in Slovakia differs across different household types. Our results also confirm the hypothesis about women’s opportunity cost of time as households with employed wives have significantly higher participation in FAFH as well as spending on FAFH.

This paper is organized as follows: Section 2 describes the theoretical framework that is used to study FAFH spending patterns. Econometric estimation techniques are discussed in Section 3. Data and variables are described in Section 4 along with the summary statistics. Estimation results are presented in Section 5 and the concluding remarks and possible policy implications are discussed in Section 6.

2. Theoretical Framework

Our theoretical framework is based on the household production theory developed by Becker (1965), Lancaster (1971) and Michael and Becker (1973). The fundamental feature of the model is that households use market goods and services x_i and their non-market time to produce commodities z_i , which increase household utility. FAFH is considered as a separate commodity, which differs from food consumed at home. Hence, households are viewed to be both producing and consuming units. The household utility function takes the following form:

$$U = U(z_i) \equiv U[f(x_i, T_i, D_k)] \quad (1)$$

where T_i represents the time needed to produce z_i ($i = 1, \dots, n$) commodities by the household and D_k stands for a set of k variables reflecting the demographic and socio-economic characteristics of the household. The time constraint is defined as follows:

$$T = \sum_{i=1}^n T_i + T_w \quad (2)$$

where T denotes total time and T_w is the time devoted to labor-market participation. Therefore, the full income constraint is defined as

$$T_w W + V = \sum_{i=1}^n x_i p_i \quad (3)$$

with W denoting wage, V representing a non-wage income and p_i representing the market prices of goods x_i used to produce consumed goods z_i . Maximizing the utility function subjected to the time and income constraints and solving

the utility model with respect to x_i and T_i , the demand function for x_i can be written as

$$x_i = f(p_i, W, V, D_k) \quad (4)$$

In order to obtain expenditure function for market-purchased good i Yen (1993) and Nayga (1996) suggest multiplying the demand function, equation (4) by p_i :

$$p_i x_i = f(W, V, D_k) \quad (5)$$

Assuming all prices constant across households the reduced form specification of FAFH expenditure can be written as:

$$E_i = f(Y, L, D_k) \quad (6)$$

where E_i represents spending on FAFH, Y is household income, L represents the opportunity cost of women's time and D_k is a set of demographic and socio-economic household characteristics.

Demand for food away from home is estimated by a standard single-equation model. Alternatively, FAFH demand can be estimated with a system of demand equations (e.g., Linear Expenditure System, Almost Ideal Demand System, or Quadratic/Almost Ideal Demand System) as well. In the literature, there is no exact guidance with respect to which approach is appropriate to apply. The strengths and weaknesses of demand models are comprehensively reviewed in Okrent and Alston (2011). On the one hand, single-equation demand models fit the data better than other functional forms and are easy to estimate and interpret. On the other hand, such models are not consistent with the restrictions of demand theory such as adding-up, homogeneity, and symmetry conditions. Moreover, one cannot study the possible substitution effects between bundles in a single-equation demand model framework. Nevertheless, we argue that a single-equation model is suitable for estimating FAFH demand elasticities and analyzing the effects of wives' opportunity cost of time and other variables on FAFH demand because FAFH is a distinct from the food production at home. Furthermore, this approach has been used in other similar studies (e.g., Mutlu and Gracia, 2006; Liu *et al.*, 2015).

3. Estimation Methodology: Double-Hurdle Model

When working with microeconomic data, researchers often face a problem of censoring. We face a similar issue since a significant number of households report zero spending on FAFH during the monitored time period (see *Appendix*). Households' zero FAFH spending may arise due to various reasons such as the short recording period (a month in our case), never eating outside of home in any circumstance, or willingness of households to demand FAFH, but not at the given incomes and prices which represents a typical corner solution.

If the problem of censoring in microeconomic data is not addressed, standard estimation techniques such as OLS would lead to biased and inconsistent estimates (Amemiya, 1984). To overcome this issue, several econometric techniques dealing with limited dependent variables have been introduced in the econometric literature

including, for example, Tobit models, sample selection models, infrequency of purchase models and hurdle models, which are excellently surveyed in Humphreys (2013).

To analyze FAFH demand in Slovakia, we employ Cragg's (1971) double-hurdle model, which has been commonly applied in the empirical literature to analyze the determinants of FAFH demand. Generally, it is appropriate to apply hurdle models when non-consumption is a genuine zero and when consumers make decisions about participation and consumption in stages. The double-hurdle model further postulates that consumers are assumed to overcome hurdles (decisions): participation decision and consumption (expenditure) decision. Furthermore, unobservable factors influencing the participation stage are assumed to be uncorrelated with unobservable factors affecting the consumption (expenditure) stage. The participation stage is estimated using a Probit model, while spending in the second stage is estimated with a truncated Tobit model adjusted by the inverse of the Mills ratio.

The participation stage of the double-hurdle model is described by the equations

$$d_i^* = z_i \gamma + u_i \quad u_i \sim N(0,1) \quad (7a)$$

and

$$d_i = \begin{cases} 1 & \text{if } d_i^* > 0 \\ 0 & \text{if } d_i^* \leq 0 \end{cases} \quad (7b)$$

In the above equations, d_i^* stands for the unobserved latent variable representing the participation hurdle and d_i is the observed binary variable ($d_i = 1$ means that the household participates in the FAFH market while $d_i = 0$ indicates no participation). The level of spending on FAFH in the second expenditure stage is then given by

$$y_i^* = x_i \beta + v_i \quad v_i \sim N(0, \sigma^2) \quad (8a)$$

and

$$y_i = \begin{cases} y_i^* & \text{if } d_i = 1 \text{ and } y_i^* > 0 \\ 0 & \text{else} \end{cases} \quad (8b)$$

where y_i^* stands for the unobserved latent variable and y_i is the actual FAFH expenditure when both hurdles are overcome, i.e. the observed FAFH expenditure given by y_i is equal to y_i^* only if the latent variable y_i^* takes positive values and the first participation stage is fulfilled.

In the double-hurdle model, the participation and expenditure stages can be determined by separate sets of explanatory variables z_i and x_i with the corresponding vectors of parameters γ and β to be estimated. Latent variables are specified as linear functions of the explanatory variables. The explanatory variables are also assumed to be uncorrelated with the error terms u_i and v_i . The coefficients of the double-hurdle model are estimated by maximizing the following log-likelihood function:²

² Note that if $\gamma = \beta/\sigma$, then the double-hurdle model reduces to the standard Tobit model.

$$l_i(\theta) = 1[y_i = 0] \log[1 - \Phi(z_i \gamma)] + 1[y_i > 0] \log[\Phi(z_i \gamma)] + \\ + 1[y_i > 0] \left\{ -\log \left[\Phi \left(\frac{x_i \beta}{\sigma} \right) \right] + \log \left\{ \phi \left[\frac{(y_i - x_i \beta)}{\sigma} \right] \right\} - \log(\sigma) \right\} \quad (9)$$

The probability that the FAFH expenditure will be positive for the particular household is given by

$$P(y_i > 0 | z_i) = \Phi(z_i \gamma) \quad (10)$$

while the probability that the FAFH expenditure will be zero is

$$P(y_i = 0 | z_i) = 1 - \Phi(z_i \gamma) \quad (11)$$

where Φ is the standard normal cumulative distribution function. Then the expected value of the FAFH expenditure, conditional on positive FAFH participation decision is given by

$$E(y_i | y_i > 0, x_i) = x_i \beta + \sigma \lambda(x_i \beta / \sigma) \quad (12)$$

with $\lambda(c)$ being the Inverse Mill's Ratio defined as

$$\lambda(c) = \frac{\phi(c)}{\Phi(c)}$$

where ϕ represents the standard normal probability distribution function. The unconditional expected value of the FAFH expenditure can be written as

$$E(y_i | z_i, x_i) = \Phi(z_i \gamma) \{x_i \beta + \sigma \lambda(x_i \beta / \sigma)\} \quad (13)$$

Derivation of the partial effects (elasticities) of independent variables in Cragg's double-hurdle model is straightforward (see Burke, 2009). The elasticity of participation measures the impact of variable z_{ij} on the probability of taking part in the FAFH market which can be derived as follows:

$$\frac{\partial P(y > 0 | z_i)}{\partial z_{ij}} = \gamma_j \phi(z_i \gamma) \quad (14)$$

Once the decision to participate in the FAFH market has been made, the marginal effect of variable x_{ij} on the conditional level of FAFH expenditure can be derived as

$$\frac{\partial E(y_i | y_i > 0, x_i)}{\partial x_{ij}} = \beta_j \left[1 - \lambda(x_i \beta / \sigma) \{x_i \beta / \sigma + \lambda(x_i \beta / \sigma)\} \right] \quad (15)$$

Finally, the total elasticity is given by the partial effect of explanatory variable x_{ij} on the unconditional level of FAFH expenditure. It can be derived as follows:

$$\frac{\partial E(y_i | z_i, x_i)}{\partial x_{ij}} = \gamma_j \phi(z_i \gamma) \{x_i \beta + \sigma \lambda(x_i \beta / \sigma)\} + \\ + \Phi(z_i \gamma) \beta_j \left[1 - \lambda(x_i \beta / \sigma) \{x_i \beta / \sigma + \lambda(x_i \beta / \sigma)\} \right] \quad (16)$$

Table 1 Definition of Variables Entering the Model

Variable	Definition
<i>FAFH_exp</i>	Monthly expenditure on food away from home (EUR)
<i>FAFH_part</i>	Dummy variable; 1 if household participates in the FAFH and 0 otherwise
<i>Income</i>	Net monthly household disposable income (EUR)
<i>Employed_wife</i>	Dummy variable; 1 if wife is employed and 0 otherwise (opportunity cost)
<i>Educ_wife</i>	Wife's education: this variable contains 3 categories of education (no or primary education, secondary education, and tertiary education)
<i>Gender_HH</i>	Dummy variable; 1 if household head is female and 0 otherwise
<i>Age_wife</i>	Wife's age
<i>HH_size</i>	Household size
<i>N_children</i>	Number of children (below age 16)
<i>Urban</i>	Dummy variable; 1 if household resides in urban area and 0 otherwise
Q1, Q2, Q3, Q4	Seasonal d respectively
<i>Trend</i>	Time trend

Sources: Household Budget Survey, Statistical Office of the Slovak Republic; authors' calculations.

4. Data

Demand for FAFH is estimated based on Household Budget Survey (HBS) data collected by the Statistical Office of the Slovak Republic consisting of seven annual rounds, from 2006 to 2012.³ The advantage of this time span is that it covers both the economic boom period in Slovakia before 2009 as well as the economic slowdown caused by the global financial crisis after 2009. The HBS provides detailed information on household incomes and expenditures on food and non-food goods and services.⁴ The data also contains detailed information on household characteristics such as geographical location, size and composition, as well as individual household member characteristics such as age, education, occupation and marital status. Each of the annual samples contains between 4,500 and 6,000 households. However, the samples do not form a genuine panel, as surveyed households are randomly selected from the population in each round and do not necessarily remain in the sample for two consecutive periods.

In our econometric specifications, the dependent variables entering the double-hurdle model are dummy variable indicating whether a household participates in the FAFH market and the household's monthly spending on food consumed away from home (meals eaten at restaurants, cantinas and fast-food establishments, also including spending on non-alcoholic beverages). We consider a set of covariates, identified in our theoretical model and, which have been commonly used in other empirical studies on FAFH as the explanatory variables (e.g., Liu *et al.*, 2015; Mutlu and Gracia, 2006). The codes of variables along with their definitions are listed in *Table 1*.

³ To the best of our knowledge, the latest available Slovak HBS dataset is for 2012. Although the survey was also conducted in 2015, the data will not be available until late 2016.

⁴ Incomes and expenditures are monitored on a monthly basis.

Table 2 Summary Statistics (pooled sample: 2006–2012)

Variable	Full sample		Sample with positive FAFH	
	Mean	Std. Dev.	Mean	Std. Dev.
<i>FAFH_exp</i>	30.41	42.50	48.71	44.74
<i>Income</i>	755.10	520.15	889.29	556.76
<i>HH_size</i>	2.82	1.43	3.22	1.38
<i>N_children</i>	0.59	0.91	0.79	0.98
<i>HH_gender</i>	0.32	0.47	0.25	0.43
<i>Employed_wife</i>	0.56	0.50	0.67	0.47
<i>Age_wife</i>	45.01	15.18	41.84	13.47
<i>Educ_wife</i>	1.83	0.60	1.97	0.57
<i>Urban</i>	0.58	0.49	0.61	0.49
Q1	0.25	0.43	0.24	0.43
Q2	0.25	0.43	0.26	0.44
Q3	0.25	0.43	0.24	0.43
Q4	0.25	0.43	0.26	0.44
<i>Trend</i>	2009.00	2.00	2008.99	1.99

Notes: All monetary values for the years 2006–2008 have been converted to euros using the corresponding exchange rates and deflated by CPIs. There are eight regions in Slovakia—Bratislava, Trnava, Trenčín, Nitra, Žilina, Banská Bystrica, Prešov and Košice—which are approximately equally represented in the survey. Descriptive statistics were computed using the survey weights.

Sources: Household Budget Survey, Statistical Office of the Slovak Republic; authors' calculations.

The descriptive statistics of regression variables both for the whole sample and for the restricted sample conditional on the positive FAFH expenditure are presented in *Table 2*. A typical Slovak household spent on average around EUR 30 per month on away-from-home food consumption based on the full sample data and EUR 49 conditional on positive FAFH expenditure. The mean disposable monthly household income varied between EUR 755 for the full sample and EUR 890 for the sample recording positive FAFH expenditure. Considering the household demographic characteristics, around 56% of the wives declared “employed” working status. Another important factor affecting the participation in the FAFH market is wives’ educational level. Since the methodology of measuring the educational level changed several times between 2006 and 2012, we decided to create a simple categorical variable with three levels of education (1—no formal or only primary education, 2—secondary education, and 3—tertiary education). Among all the household wives, the approximate average education level was 2. The average wife’s age was approximately 45 and 42 years for the full and restricted samples respectively. A typical Slovak household consisted of around 2.8 household members between 2006 and 2012. Like in a number of other CEE countries, the recent trend of having a small number of children is present in Slovakia; the average Slovak family had only 0.59 children. Around 58% of all households reported residence in an urban area.

Table 3 Food Away from Home Expenditure Patterns Based on Regional and Demographic Characteristics (pooled sample: 2006–2012)

	Participation rate	FAFH share in total food expenditure	FAFH expenditure (EUR)
<i>Slovakia</i>	0.62	0.21	48.71
<i>Region</i>			
Bratislava	0.67	0.26	50.65
Trenčín	0.60	0.19	47.00
Trnava	0.62	0.19	43.70
Nitra	0.53	0.16	42.75
Žilina	0.68	0.25	56.23
Banská Bystrica	0.58	0.21	48.01
Prešov	0.72	0.28	55.75
Košice	0.60	0.18	42.54
<i>Income quantile</i>			
1 st	0.26	0.09	19.82
2 nd	0.47	0.16	28.88
3 rd	0.64	0.20	38.09
4 th	0.80	0.27	51.28
5 th	0.88	0.33	69.01
<i>Education of RP</i>			
Elementary	0.27	0.08	37.57
High school	0.64	0.21	47.95
University	0.80	0.32	54.93
<i>Working status of RP</i>			
Employed	0.80	0.29	52.70
Unemployed	0.48	0.13	37.89
Inactive/other	0.29	0.07	28.74
<i>Household type</i>			
Single person	0.66	0.37	35.59
Single with children	0.72	0.23	39.23
Couple	0.71	0.24	56.39
Couple with 1 child	0.76	0.26	49.88
Couple with 2 children	0.84	0.29	57.64
Multiple adults without children	0.61	0.18	39.54
Multiple children	0.77	0.21	54.90
Retired couple	0.21	0.03	15.99
Single retired person	0.18	0.05	14.88

Notes: Mean values of FAFH expenditure are conditional on FAFH participation. RP is reference person.

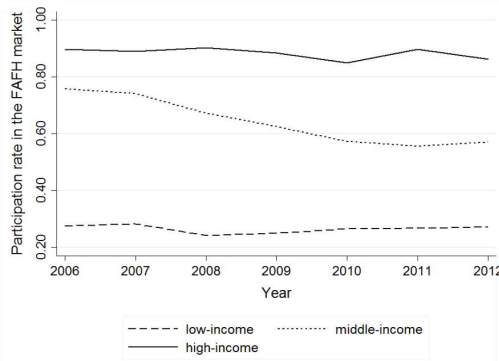
Sources: Household Budget Survey, Statistical Office of the Slovak Republic; authors' calculations.

5. Results and Discussion

5.1 Food Away from Home Expenditure Patterns in Slovakia

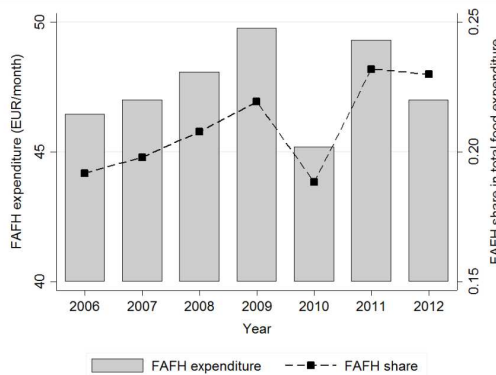
Table 3 provides more detailed information on FAFH expenditure patterns by region, income group, and type of household, as well as the employment and education status of the heads of households. In the period between 2006 and 2012 about 62% of households in Slovakia participated in the FAFH market and they spent

Figure 1 Evolution of Participation in the FAFH Market by Different Income Groups



Sources: Household Budget Survey, Slovak Statistical Office; authors' calculations.

Figure 2 Evolution of FAFH Expenditure and Its Share in Total Food Expenditure



Sources: Household Budget Survey, Slovak Statistical Office; authors' calculations

on average about EUR 49 per month on FAFH consumption. The share of FAFH expenditures constituted around 21% of total monthly food spending. *Figure 1* describes the rising trend in FAFH expenditures and FAFH market participation of households in the given period. The economic crisis temporarily reduced the number of households that ate away from home and caused stagnation of FAFH expenditures. *Figure 2* depicts the evolution of FAFH household participation by income group. It is noticeable that the participation of middle-income households in FAFH consumption exhibits a declining trend in recent years. On the other hand, participation of low- and high-income households in the FAFH market has been stable over time, without any noticeable trend.

There are substantial differences in FAFH expenditure patterns by income, education, and the employment status of household heads. FAFH participation and expenditure are positively correlated with household income. High-income households had the highest FAFH market participation (88%) and monthly expenditures (EUR 69) while only 26% of low-income households participated in the FAFH market, with average spending of EUR 20 per month. Similarly, there exists a posi-

**Table 4 Double-Hurdle and Tobit Maximum Likelihood Estimates
(pooled sample: 2006–2012)**

Variable	Tobit model		Double-hurdle model			
			Participation stage		Consumption stage	
	Coef.	Std. err.	Coef.	Std. err.	Coef.	Std. err.
<i>Income (ln)</i>	1.981***	0.047	0.999***	0.033	0.743***	0.023
<i>N_children</i>	-0.002	0.025	0.074***	0.020	-0.029**	0.012
<i>HH_size</i>	0.207***	0.021	0.050***	0.015	0.086***	0.010
<i>Employed_wife</i>	0.891***	0.036	0.381***	0.024	0.398***	0.017
<i>Age_wife</i>	-0.043***	0.002	-0.022***	0.001	-0.007***	0.001
<i>Educ_wife</i>	0.435***	0.035	0.287***	0.024	0.041**	0.017
<i>Urban</i>	0.211***	0.032	0.132***	0.021	0.021	0.015
Q1	0.034	0.043	0.022	0.029	0.086***	0.022
Q2	0.058	0.043	0.033	0.030	0.094***	0.022
Q3	-0.154***	0.043	-0.069**	0.030	0.088***	0.021
<i>Trend</i>	-0.111***	0.009	-0.095***	0.006	0.025***	0.004
<i>Constatnt</i>	212.489***	17.541	184.100***	12.282	-52.173***	8.512
<i>Sigma</i>	2.028	0.015			0.860***	0.006
<i>N</i>	19,722		19,722			
<i>Log pseudolikelihood</i>	-33,529.441		-26,312.347			
<i>AIC</i>	67,084.880		52,674.690			
<i>BIC</i>	67,187.450		52,871.930			

Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. In both models FAFH expenditure is log-transformed. Extreme values in household income and FAFH expenditure were trimmed. *HH_gender* and *Q4* are omitted due to the collinearity issue.

Sources: Household Budget Survey, Slovak Statistical Office; authors' calculations.

tive relationship between FAFH participation/expenditure and the education level of household heads. Whereas only 27% of households with a head of household having elementary education participated in the FAFH market, nearly 80% of households with highly educated household heads reported positive spending on eating away from home. There are also considerable differences with respect to FAFH participation and expenditure among different types of households. For example, 84% of households consisting of adult couples with children participated in the FAFH market, while at the other end of the spectrum there were households consisting of a single retired person with a participation rate of only 18%.

5.2 Estimation and Results

Tobit and double-hurdle models were estimated using a pooled sample of cross-sectional data covering the period from 2006 to 2012. Estimations were carried out in Stata software using a set of commands developed by Burke (2009). *Table 4* presents the maximum likelihood estimates. The vast majority of the estimated coefficients are statistically significant at conventional levels for both models. Based

Table 5 Estimated Marginal Effects (Elasticities) of Selected Variables of the Double-Hurdle Model at Sample Means

Variable	Probability	Conditional	Unconditional
<i>Income</i>	0.269	0.740	1.373
<i>N_children</i>	0.020	-0.029	0.045
<i>HH_size</i>	0.014	0.086	0.102
<i>Employed_wife</i>	0.102	0.396	0.601
<i>Age_wife</i>	-0.006	-0.007	-0.024
<i>Educ_wife</i>	0.077	0.041	0.278
<i>Urban</i>	0.036	0.021	0.130

Notes: Probability means "Effect on probability of participation", Conditional—"Effect on conditional level of expenditure", Unconditional—"Effect on unconditional level of expenditure".

Sources: Household Budget Survey, Slovak Statistical Office; authors' calculations.

on Bayesian and Akaike's information criteria, the double-hurdle model is preferred to the Tobit model. Estimated results reveal a statistically significant positive relationship between income and participation in the FAFH market as well as the level of FAFH consumption. This is in line with the applied theoretical framework and other empirical studies investigating the link between income and FAFH spending (e.g. Byrne *et al.*, 1996; Angulo *et al.*, 2007).

There are a considerable number of households in Slovakia where women are unemployed or stay at home and take care of housekeeping (including cooking). These households spend significantly less on FAFH. The dummy variable indicating a wife's formal employment status is used to measure the opportunity cost of her time. Our results show that households with employed wives in Slovakia have significantly higher probability of entering the FAFH market and they spend more on FAFH. Furthermore, the wife's education level positively affects both the participation and the level of spending on FAFH. On the other hand, the impact of the wife's age is significantly negatively related to both participation and FAFH spending. This is in line with the results in the literature which show that younger families spend more on FAFH than older ones (e.g., Fabiosa, 2008). Household size negatively affects the participation decision. The effect of household size on the FAFH expenditure level is, however, significantly positive, as bigger families spend more on FAFH if they eat out. Furthermore, households with more children are more likely to participate while the second, expenditure decision is negatively correlated with the number of children. Households residing in urban areas are significantly more likely to enter the FAFH market arguably due to the better supply of restaurant outlets in cities relative to rural areas, while the expenditure decision is unaffected. The impact of seasonal dummies and the trend variable on FAFH demand is ambiguous.

Because of the nonlinear nature of the double-hurdle model, we cannot interpret the estimated coefficient as marginal effects (elasticities). The computed elasticities of the selected explanatory variables of the double-hurdle model are presented in Table 5. The elasticity of FAFH demand with respect to income indicates that a 1% increase in household income will lead to a 0.27% increase in the probability of participation in FAFH market, while conditional consumption

will increase by 0.74% and unconditional consumption by 1.37%.⁵ Therefore, FAFH can be viewed as a luxury good (elasticity larger than 1) in Slovakia. Our estimates are in line with other studies analyzing food demand patterns in the CEE region. For example, Janský (2014) and Staudigel and Schröck (2015) determined FAFH to be a luxury good in the Czech Republic and Russia with budget elasticities of 1.10 and 1.05, respectively. Results from the post-communist countries substantially differ from the FAFH demand patterns in the US, where FAFH consumption is a normal good with income/expenditure elasticity of 0.2 (e.g., Byrne *et al.*, 1996). Demand for FAFH is also a normal good in urban China, with income elasticity equal to 0.60 (see Liu *et al.*, 2015), and for Irish households, where the income elasticity of FAFH is about 0.38 (see Newman *et al.*, 2003). On the other hand, away-from-home eating has been found to be a luxury in Spain, with income elasticity of 1.83 (see Mutlu and Gracia, 2006).

6. Conclusion

In this study we analyzed demand for food away from home in Slovakia using recent Household Budget Survey data covering the period from 2006 to 2012. Our analysis builds on Becker's (1965) household production theory. The FAFH demand functions were estimated by means of a double-hurdle model. The majority of estimated coefficients are statistically significant at the conventional levels and have expected signs.

Results show that around 62% of Slovak households participated in the FAFH market between 2006 and 2012. The participation rate in the FAFH market and spending on FAFH rose gradually during the period. The share of FAFH spending in total food expenditures ranged from 15% to 22%. FAFH spending and the participation rate were lower for the rural subsample compared to the urban one. The estimated unconditional income elasticity of FAFH in Slovakia is relatively high (1.37) and varies across different household types which is in line with estimates from other CEE countries. FAFH expenditure patterns in Slovakia differ substantially between regions and seasonally.

Our results also show that households with an employed wife have significantly higher spending on FAFH compared to households with a housewife, which is in line with the applied theoretical framework accounting not only for the budget but also for time constraints in the household decision-making process. Households with a working wife have more valuable time and therefore use fewer time-intensive and more service-intensive ways of achieving a given level of utility. Those households rely more on food served by restaurant establishments. From the perspective of public policymaking, it is therefore necessary to monitor not only the quality of food sold in supermarkets, but also the quality of food provided in restaurant establishments given the rising importance of FAFH consumption. In Slovakia there is an ongoing discussion on the quality (including diversity) of food in school cafeterias as well as the quality of other services provided for working mothers (daycare, after-school care, etc.).

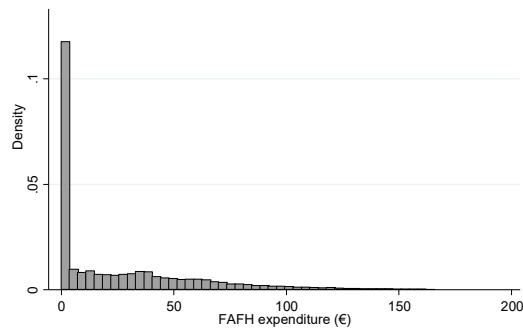
In spite of the fact that the share of consumers who eat out increased in Slovakia between 2006 and 2012, that share is still significantly lower than

⁵ We could similarly interpret the elasticities with respect to other variables as well.

in the richer countries of Western Europe and North America. The same applies to FAFH expenditures. It is expected that the FAFH market will continue to grow in the future, fueled by rising GDP in Slovakia, increasing participation of women in the labor market, the demographic shift towards more single-person households and adoption of more individualistic lifestyles. Besides the optimistic outlook for the supply side of the FAFH market, given the alarming finding associated with FAFH of some health and nutrition studies on the US and Western Europe, it is likely that the Slovak population's exposure to the health and nutrition hazard associated with FAFH will increase. This calls for policymakers to design appropriate policies addressing both the supply and demand sides of the FAFH market and promoting a healthy diet.

APPENDIX

Figure A1 Distribution of the Food Away from Home Expenditure, 2006–2012



REFERENCES

- Amemiya T (1984): Tobit models: a survey. *Journal of Econometrics*, 24(1-2):3–61.
- Angulo AM, Gil JM, Mur J (2002): Spanish Demand for Food Away From Home: A Panel Data Approach. European Association of Agricultural Economists, International Congress, August 28–31, 2002, Zaragoza. Available at: <http://ageconsearch.umn.edu/bitstream/24977/1/cp02fa31.pdf>.
- Angulo AM, Gil JM, Mur J (2007): Spanish Demand for Food Away from Home: Analysis of Panel Data. *Journal of Agricultural Economics*, 58(2):289–307.
- Bai J, Wahl T, Lohmar B, Huang J (2010): Food away from home in Beijing: effects of wealth, time and “free” meals. *China Economic Review*, 21(3):432–441.
- Becker GS (1965): A Theory of allocation of time. *Economic Journal*, 75(299):493–517.
- Bezerra IN, Sichieri R (2009): Eating out of home and obesity: a Brazilian nationwide survey. *Public Health Nutrition*, 12(11):2037–2043.
- Burke WJ (2009): Fitting and interpreting Crag’s tobit alternative using Stata. *Stata Journal*, 9(4):584–592.
- Byrne PJ, Capps O, Saha A (1996): Analysis of Food-Away-from-Home Expenditure Patterns for U.S. Households, 1982–89. *American Journal of Agricultural Economics*, 78(3):614–627.
- Cragg J (1971): Some statistical models for limited dependent variables with application to the demand for durable goods. *Econometrica*, 39(5):829–844.
- Cupák A, Pokrivčák J, Rizov M (2015): Food Demand and Consumption Patterns in the New EU Member States: The Case of Slovakia. *Ekonomický časopis* (Journal of Economics), 63(4):339–358.
- Dybczak K, Tóth P, Voňka D (2014): Effects of Price Shocks on Consumer Demand: Estimating the QUAIDS Demand System on Czech Household Budget Survey Data. *Finance a úvěr-Czech Journal of Economics and Finance*, 64(6):476–500.
- Fabiosa JF (2008): The Food-Away-from-Home Consumption Expenditure Pattern in Egypt. *Center for Agricultural and Rural Development, Working Papers*, no. 474.
- Humphreys BR (2013): Dealing with Zeros in Economic Data. University of Alberta, Department of Economics, April 4, 2013. Available at: https://www.ualberta.ca/~bhumphre/class/zeros_v1.pdf.
- Janda K, Mikolášek J, Netuka M (2010): Complete Almost Ideal Demand System Approach to Czech Alcohol Demand. *Zemědělská ekonomika* (Agricultural Economics), 56(9):421–434.
- Janský P (2014): Consumer Demand System Estimation and Value Added Tax Reforms in the Czech Republic. *Finance a úvěr-Czech Journal of Economics and Finance*, 64(3):246–273.
- Jensen HH, Yen ST (2005): Food Expenditures Away from Home by Type of Meal. *Canadian Journal of Agricultural Economics*, 44(1):67–80.
- Keelan D, Henschion MM, Newman CF (2009): A Double-Hurdle Model of Irish Households’ Foodservice Expenditure Patterns. *Journal of International Food and Agribusiness Marketing*, 21(4):269–285.
- Lancaster K (1971): *Consumer Demand*. Columbia University Press, New York.
- Liu H, Wahl TI, Seale JL, Bai J (2015): Household composition, income, and food-away-from-home expenditure in urban China. *Food policy*, 51:97–103.
- Michael RT, Becker GS (1973): On the new theory of consumer behavior. *Swedish Journal of Economics*, 75(4):378–396.
- Mihalopoulos V, Demoussis M (2001): Greek household consumption of food away from home: a microeconomic approach. *European Review of Agricultural Economics*, 28(4):421–432.
- Mutlu S, Gracia A (2006): Spanish food expenditure away from home (FAFH): by type of meal. *Applied Economics*, 38(9):1037–1047.
- Nayga RM Jr (1996): Wife’s Labor Force Participation and Family Expenditures for Prepared Food, Food Prepared at Home, and Food Away from Home. *Agricultural and Resource Economics Review*, 25(2):179–186.

- Nayga RM Jr, Capps O Jr (1992): Determinants of Food Away from Home Consumption: An Update. *Agribusiness*, 8(6):493–506.
- Newman C, Henschion M, Matthews A (2003): A double-hurdle model of Irish household expenditure on prepared meals. *Applied Economics*, 35(9):1053–1061.
- OECD (2014): *Obesity Update*. OECD Directorate for Employment, Labour and Social Affairs, June 2014.
- Okrent AM, Alston JM (2011): Demand for Food in the United States: A Review of Literature, Evaluation of Previous Estimates, and Presentation of New Estimates of Demand. *Robert Mondavi Institute Center for Wine Economics, Working Papers*, no. 162515.
- Prochaska FJ, Schrimper RA (1973): Opportunity cost of time and other socioeconomic effects on away-from-home food consumption. *American Journal of Agricultural Economics*, 55(4): 595–603.
- Staudigel M, Schröck R (2015): Food Demand in Russia: Heterogeneous Consumer Segments over Time. *Journal of Agricultural Economics*, 66(3):615–639.
- Stewart H, Blisard N, Bhuyan S, Nayga RM (2004): The demand for food away from home. Full-service or fast food? *United States Department of Agriculture. Agricultural Economic Report*, no. 829.
- Thompson OM, Ballew C, Resnicow K, Must A, Bandini LG, Cyr H, Dietz WH (2004): Food purchased away from home as a predictor of change in BMI z-score among girls. *International Journal of Obesity*, 28(2):282–289.
- Tobin J (1958): Estimation of relationships for limited dependent variables. *Econometrica*, 26(1): 24–36.
- Todd J, Mancino L, Lin BH (2010): The Impact of Food Away from Home on Adult Diet Quality. *United States Department of Agriculture, Economic Research Report*, no. ERR-90. Available at: http://www.ers.usda.gov/media/136609/err90_1_.pdf.
- United States Department of Agriculture (2014): *Food-Away-from-Home*. Available at: http://www.ers.usda.gov/topics/food-choices-health/food-consumption-demand/food_away-from-home.aspx.
- Verbič M, Čok M, Božič A (2014): Demand for food during economic transition: An AIDS econometric model for Slovenia, 1988–2008. *Post-Communist Economies*, 26(2):277–295
- Yen ST (1993): Working wives and food away from home: the Box-Cox double hurdle model. *American Journal of Agricultural Economics*, 75(4):884–895.