

NUTRITIONALLY RECOMMENDED FOOD PRODUCTS DEMAND

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Abstract

The aim of this paper is to find out how the demand determinants influence the demand of selected food products in Slovak Republic. For demand determinants, in line with economic theory, we considered the own price of food product, the prices of other food products and the net income of the consumer. For the analysis were selected milk and dairy products. The analysis was conducted in period 1998-2016. The regression analysis was applied to estimation of the functions of demand. From them, price and income elasticities of the demand were calculated. In tracking period decreased the milk and dairy products consumption in the Slovak republic very hard. According to the income elasticities of the demand the liquid drinking milk seems to be an inferior good for an average Slovak consumer. An increase in income can more likely lead to an increase in demand for curd, fermented milk products and cheese. According to own price elasticities of demand, demand for milk and milk products didn't react elastically to the change of price. It is necessary to use also other policies, except of government price tools policies, to increase consumption of milk and dairy products.

Keywords: demand, elasticity, food products, nutritional recommendations

JEL classification: D03

1 Introduction

The structure of food consumption in Slovak republic seems to be unbalanced from a long-term perspective. On the one hand, consumers aren't receiving enough nutrition from the food, on the other side, energy intake is increasing.

Especially consumption of fruits, vegetables, milk and milk products is low. Long-term high is the consumption of pork, eggs, carbohydrates, fats, oils and salt. Increasing interest in health and well-being is likely to drive a growth in demand for products that have positive effects on health, *Puhakka et al (2018)*. Many domestic and foreign scientists are oriented to the development of food demand and its determinants. There is renewed interest in robust estimates of food demand elasticities at a disaggregated level not only to analyse the impact of changing food preferences on the agricultural sector, but also to establish the likely impact of pricing incentives on households, *Ulubasoglu et al (2016)*. The conventional view is that inelastic demand makes consumption of staple foods resilient to major price and income shocks. While demand for foodstuffs may remain relatively unchanging in environments characterised by stable food prices and incomes, economic crises and significant price spikes appeared to induce dramatic changes in price and income demand elasticities. *Dimova et al (2014)*.

2 Data and Methods

The aim of this paper is to find out how the demand determinants influence the demand of selected food products in Slovak Republic. For demand determinants, in line with economic theory, we considered the own price of food product, the prices of other food products and the net income of the consumer. For the analysis were selected milk and dairy products. The consumption of them is insufficient and it is continually decreasing.

The analysis was conducted in period 1998-2016. Data source was Slovstat (The Statistical office of the Slovak Republic). The regression analysis is applied to estimation of the functions of demand.

The demand for chosen food product x_i is the function of the price of the food product (p_{xi}), of the price of other food products (p_{yj}), and of net income of consumers (I).

$$q_{dx} = f(p_x, p_y, I) \quad (1)$$

The general linear model

$$y = a + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 \quad (2)$$

The linear model of demand has the following form:

$$q_{dxi} = a + b_1 p_{xi} + b_2 p_{y1} + b_3 p_{y2} + b_4 p_{y3} + b_5 I_5 \quad (3)$$

where: q_{dxi} – demand for the food product xi in the kilograms and habitants per year

a, b_k – estimated constant of location and regression coefficients $k = 1, 5$

p_{xi} – purchase price of the x -th food product ($i=1,4$) in EUR *kg⁻¹
 p_{yj} – purchase price of the y -th food product ($j=1,3$) in EUR *kg⁻¹
 I – average income of habitants in EUR *year⁻¹

The general power model

$$y = a * x_1^{\beta 1} * x_2^{\beta 2} * x_3^{\beta 3} * x_4^{\beta 4} * x_5^{\beta 5} \quad (4)$$

The power model of demand has the following form:

$$q_{dxi} = a * p_{xi}^{b1} * p_{y1}^{b2} * p_{y2}^{b3} * p_{y3}^{b4} * I^{b5} \quad (5)$$

where:

ditto (3)

For the quantification of sensitivity of demand are estimated the own price elasticities, cross price elasticities and income elasticities of demand.

Own price elasticity of demand

$$E_{pdx} = \frac{\% \Delta Qdx}{\% \Delta Px} \quad (6)$$

where:

E_{pdx} – own price elasticity of demand in percents

$\% \Delta Qdx$ -percentual change in quantity of demand of x -th food product

$\% \Delta Px$ -percentual change in price of x -th food product

Income elasticity of demand

$$E_{id} = \frac{\% \Delta Qdx}{\% \Delta I} \quad (7)$$

where:

E_{id} – income elasticity of demand in percents

$\% \Delta Qdx$ -ditto (6)

$\% \Delta I$ -percentual change in income of consumer

Cross price elasticity of demand

$$E_{pcd} = \frac{\% \Delta Qdx}{\% \Delta Py} \quad (8)$$

where: E_{pcd} – cross price elasticity of demand in percents

$\% \Delta Qdx$ -ditto (6)

$\% \Delta Py$ -percentual change in price of y -th food product

3 Results and Discussion

In terms of food consumption in Slovak republic, it is necessary to consider the fall in milk and milk products consumption (except of fermented milk products), especially in point of view of optimal young generation and other inhabitants groups development requirements. Real conditions for an expansion especially of osteoporosis are created. According to WHO is the osteoporosis one of the biggest health threatening risks of this century in developed countries³⁴.

Table 1 **Descriptive statistic**

	N	Minimum	Maximum	Mean	Std. Deviation
Qm	19	45,73	76,63	57,1162	9,7142
Qt	19	1,90	2,60	2,1263	0,2050
Qs	19	5,70	11,30	7,6474	1,4163
Qk	19	9,40	18,10	13,4684	2,0355
Valid N (listwise)	19				

Notes: Qt – quantity of curd, Qs – quantity of cheese, Qk – quantity of sour dairy products, Qm – quantity of milk.

Source: Author's calculations.

In table 1, you can see an overview of basic time series descriptive statistics of milk and milk products of an average Slovak consumer in period 1998-2016.

Consumption of liquid drinking milk is long-term under the recommended consumption determined on 91kg per capita and year. Present day it represents only 50% of recommended consumption. During observed period the annual consumption declined almost by 30kg per capita in average. Liquide drinking milk is important particularly for kids and adolescents. The increase of milk and dairy products with lower fat and salt content (kephir, acidified milk, yoghurt, curd and cheese) consumption is a long-term goal of the Slovak health ministry³⁵. There was a lower VAT established on the basic food in 2016. The real effects of this change in VAT are not yet available.

The recommended annual curds consumption is 3.2 kilograms per capita. Not even this food is consumed in sufficient quantity by an average Slovak consumer. Curd consumption in observed period points to a positive tendency. The same trend occurs in consumption of cheeses and fermented dairy products. According

³⁴ <http://www.mpsr.sk>

³⁵ <http://www.uvzsr.sk>

to a group of nutrition specialists are this one of the healthiest commodities in the group of milk and dairy products.

Table 2 **The demand estimation**

	model	R Square	Intercept	b ₁ (I)	b ₂ (Pt)	b ₃ (Ps)	b ₄ (Pk)	b ₅ (Pm)
(t)	power	0,412	-1,206	0,383	-0,569	-0,061**	-0,134**	0,455
(s)	linear	0,853	-3,717	0,002	0,174**	-0,763	-1,229	2,625
(k)	power	0,848	-1,038*	0,242*	-0,507	1,066	0,168**	-0,190
(m)	power	0,951	7,058*	-0,276*	-0,236	0,056**	-0,587	0,273**

(t) – card cottage, (s) – cheese, (k) fermented dairy products, (m) milk, Pt – price of card cottage, Ps – price of cheese, Pk – price of fermented dairy products, Pm – price of milk, (I) income of consumer *Source:* Author’s calculations, * $\alpha=0,05$; ** $\alpha>0,50$.

Table 3 **Price elasticities**

	curd	cheese	fermented dairy products	milk
Epd(Pt)	-0,57	0,01	-0,51	-0,24
Epd(Ps)	-0,06	-0,58	1,07	0,06
Epd(Pk)	-0,13	-0,55	0,17	-0,59
Epd(Pm)	0,46	0,31	-0,19	0,27

Notes: Epd – price elasticities of demand,

Own price elasticities are bold

Pt – price of card cottage, Ps – price of cheese, Pk – price of fermented dairy products, Pm – price of milk

Source: Author’s calculations.

In the table 3 own and cross price elasticities of estimated demand functions of milk and dairy products are showed. Regarding to the own price elasticity, inelastic behavior of the demand for milk and single dairy products was revealed. This fact confirms the knowledges from the economic theory, which considers the food demand as inelastic. The cheese consumer demand is the most responsive on the price change. It is caused by a relatively high price of cheese in comparison to other analyzed food. If the cheese price increases by 1%, the demanded cheese quantity can decrease by 0.57% in average. Demand price elasticity coefficients by fermented dairy products and milk are calculated using the *b* coefficients, which

were estimated with the reliability less than 50%. Therefore we are not going to interpret this coefficients.

It is possible to see the substitution level of milk and dairy products from the calculated cross price elasticities for an average Slovak consumer. Between the pair milk and cheese, the most significant mutual substitution relationship can be seen. Regarding to the estimated cross price elasticity coefficients the rule, with milk price increases of by 1%, the demand for cheese can increase by 0.06% in average, can be applied. If the cheese price increases by 1% an average Slovak consumer will substitute the decreased quantity of cheese by 0.31% increase of the milk demand. This fact is caused by considerably lower price of milk in comparison to cheese price.

A considerable substitution effect on the curd demand has also the milk price change. If the milk price increases by 1% an average Slovak consumer will substitute the milk consumption, as estimated, by an increase of curd consumption by 0.46%.

Table 4 **Income elasticities**

	curd	cheese	fermented dairy products	milk
Eid	0,38	0,91	0,24	-0,28

Source: Author's calculations.

In table 4 calculated income elasticities of the demand are indicated. As expected, the income change will not cause a considerable change in milk and dairy products demand.

Consumers are reacting to an income change only with small change in food demand. This can be seen mainly on income elasticity coefficients of cheeses and fermented dairy products. If consumer income increases by 1%, this can cause an increase of curd demand by 0.38% in average, c. p. (0.24% increase of the fermented milk products demand, c. p.).

The cheeses demand reacts on income change more markedly. If the consumer income increases by 1%, demand for cheeses increases by 0.91%. Cheeses seems to be the most luxury good from observed food for the average Slovak consumer.

Milk is the only one commodity, which demand will decrease as a reason of income increase. According to higher mentioned analyses, milk isn't very preferred good. Its consumption is long-term decreasing and an average Slovak consumer considers milk as inferior good.

Discussion

The results of *Sall et al* (2015), who estimated demand for meat and dairy products in Sweden, indicated relatively inelastic own price elasticities and high income elasticities for all meat products and slightly lower for dairy products. Demand for food in general tends to be less elastic at higher levels of income and for urban households, *Hoang* (2018). *Wu et al* (2017) estimated the elasticities of demand for different dairy products, such as fresh milk, powdered milk and yoghurt, in China. The major findings showed that fluid milk was the most popular dairy product among urban households in China. Demand for fresh milk was price elastic with the highest value being -1.043, indicating that price-cutting promotion programs could be carried out by dairy enterprises to increase dairy consumption.

4 Conclusion

In contrary liquid milk is the most popular dairy product in some countries. Based on the income elasticity coefficients of the demand, Slovak consumers prefers more cheeses, fermented dairy products and curd, however its consumption is still not sufficient. Regarding to the demand price elasticities, seems the demand for dairy products to be inelastic. The optional support from the government side, for example in form of VAT decrease, should not cause a rapid change in dairy products consumption. It is more effective to influence this consumption by non-price tools, for example by increasing of the awareness.

References

1. DIMOVÁ, R., GANG, IN, GBAKOU MBP, HOFFMAN, D. (2014). The impact of food and economic crises on diet and nutrition. *Journal of development studies*, 50(12), p. 1687-1699. Routledge Journals, England. doi 10.1080/00220388.2014.957274. WOS:0003472811400006, ISSN:00222-0388, eISSN:1743-9140
2. HOANG, HK. (2018). Analysis of food demand in Vietnam and short-term impacts of market shocks on quantity and calorie consumption. *Agricultural Economics*. 49(1), p. 83-95. doi 10.1111/agec.12397, WOS: 000419229500007, ISSN: 0169-5150, eISSN: 1574-0862
3. PUHAKKA, R., VALVE, R., SINKKONEN, A. (2018). Older consumers' perceptions of functional foods and non-edible health-enhancing innovations. *International journal of consumer studies*, 42(1), p. 11-119. Wiley: USA, WOS: 000419368800009, ISSN: 1470-6423, eISSN: 1470-6431

4. SACLI, Y., OZER, OO. (2017). Analysis of factors affecting red meat and chicken meat consumption in Turkey using an ideal demand system model. (2017): *Pakistan journal of agricultural sciences*. 54(4), p. 933-942. Univ. Agriculture: Pakistan, doi 10.21162/PAKJAS/17.5849. WOS: 000419194900026, ISSN: 0552-9034, eISSN: 2076-0906
5. SALL, S., GREN, IM. (2015). Effects of an environmental tax on meat and dairy consumption in Sweden. *Food policy*, 55, p. 41-53, Elsevier: Oxford, doi 10.1016/j.foodpol.2015.05.008. WOS: 000359879200005, ISSN: 0306-9192, eISSN: 1873-5657
6. ULUBASOGLU, M., MALLICK, D., WADUS, M., HONE, P., HASZLER, H. (2016). Food demand elasticities for Australia. *Australian journal of agricultural and resource economics*. 60(2), p. 177-195. Wiley: USA, doi 10.1111/1467-8489.12111. WOS:000373614200006, ISSN: 1364-985X, eISSN: 1467-8489
7. WU, BB., CHEN, YF. (2017). A multistage budgeting approach to the analysis of dairy demand in urban China. *British food journal*. 119(12), p. 2804-2821. Emerald Group Publishing: England, doi 10.1108/BFJ-10-2016-0469. WOS:000416122700020, ISSN: 0007-070X, eISSN: 1758-4108