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Modelling consumer's behaviour of the meat consumption in Slovakia

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Abstract: There exists a plenty extensive theoretical and empirical literature on what determines the consumption *levels* over time and across countries, but less research into the changes in the consumption *patterns* (i.e. the mix of different goods and services that is purchased). To better understand how changing incomes and prices influenced the consumption patterns, the contribution estimates the Almost Ideal Demand System (AIDS) models. The aim of the paper is to find patterns and preference changes in the consumer demand for meat in Slovakia. From the methodological aspect, there were used important items of the demand, and for the consumer behaviour analysis, there were computed elasticity coefficients by using the model AIDS. The coefficients of the price and income demand elasticity were determined. The computed elasticities showed that all meat items had a positive income elasticity of demand which implies that they were normal goods. Beef and pork were expenditure (income) elastic and hence could be considered as a luxury, while poultry and fish were income inelastic meaning that those were of necessity.

Keyword: AIDS model, consumer patterns, meat demand, own and cross price elasticities

One of the primary factors affecting the food consumption patterns is the consumers' ability to purchase food. The last two decades have witnessed major increases in the per capita income levels of households all over the world.

A question that arises in our research is whether economic factors are still the only factors that determine the world consumption, especially in Slovakia.

In this regard, it is important to take note of the studies of Bansback (1995), Huston (1999), Braschler (1983) and Dickinson et al. (2003), who showed that the non-economic factors (i.e. non price/income factors) are becoming more important in the recent period in determining the consumers' purchasing decisions. For example, in a study by Bansback (1995) on the demand for meat in the EU, he showed that, for the period 1955 to 1979, price and income factors accounted for a higher proportion of the explanation of the changes in meat consumption than for the period 1975 to 1994.

Demand, the influence of which on the whole system of production, processing, and distribution of agriproducts is constantly increasing, is a decisive factor determining the amount and quality of agricultural production, as well as the market price conditions and costs. The finalizing chain links, which further their interests in the pre-production phases and input sectors of the food production system, achieve the decisive position. Consumer demand can be considered the primary one. The demand of consumers crucially influences the amount and structure of production and supply, both in time and space.

In order to achieve success in the domestic and foreign market, producers and distributors should be aware of the consumer behaviour, and have a good command of efficient methods of influencing it to gain the benefit. Consumers make daily many decisions about their purchase.

Nagyová et al. (2007) state that the majority of big traders pay their careful attention to receiving the information about their consumers' behaviour – where, when, how, how much, and why they do their shopping. The identification of the key factors influencing the demand on the consumers' level of the product vertical line is a *conditio sine qua non* of the demand analysis. It is based on the theory of

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maximizing the consumer's utility, whose demand gains the dominant position.

As stated by Stávková et al. (2008), consumer decisions are made only on the basis of a few criteria. Instead of comparing more characteristics, a consumer decides according to the price criteria (he/she issues from the presumption that a higher price means also a higher quality).

Moschini and Meilke (1989) found out that the demands for beef and pork are much more elastic than those for chicken and fish. Notably, beef was the only superior good. The cross-price elasticities show more complementary relationships than expected, with ten of the twelve cross-price elasticities having a negative sign.

Fraser and Moosa (2002) determined the meat demand elasticity coefficients for the UK. According to their results, the compensated cross-price elasticity estimates show that all meat types – beef, pork, and poultry are net substitutes with some marked differences between the specifications. There are also differences between the expenditure elasticity estimates that are particularly pronounced for beef and chicken. For beef, the expenditure elasticity estimates fall when moving to the stochastic trend and seasonality models, but for all other meats they increase. Although all the models yield sensible elasticity estimates, the different specifications impact the magnitude of the elasticity estimates.

Besides the income elasticity of demand, this paper will also deal with the intrinsic price and cross elasticities of demand. As stated by Akbay and Jones (2006), price elasticities of demand play an important role in the support of the selected products; however, income elasticities are not less important. The authors used in their research a linearized AIDS model to estimate the demand elasticities.

There is an extensive theoretical and empirical literature on what determines the consumption *levels* over time and across countries, but less research into the changes in consumption *patterns* (i.e. the mix of different goods and services that is purchased). The two are obviously related, in the sense that at any given time, the consumption shares can readily be derived from the levels of consumption of different goods in one's consumption basket. As incomes, prices and the aggregate consumption change over time, the shares of different goods consumed will also tend to shift, even if underlying preferences are stable. In particular, the goods with higher income elasticities tend to rise in the relative importance over time. However, while the recent research has emphasised that the aggregate consumption may exhibit the time non-separability, the implications of this for the consumption patterns have not been emphasised.

International studies of demand systems are more plentiful, although none has specifically looked at the dynamics of consumption patterns in a transition setting. Clements et al. (2006) examined diversity in consumption and homogeneity in preferences for a large sample of countries. Using an entropy measure of diversity, they find that higher income economies tend to have less specialised consumption baskets. In effect, diversity has positive income elasticity. Their results also contradict the notion that tastes are identical across countries. Selvanathan and Selvanathan (1993) compare consumption by the commodity groups across 18 OECD countries using a static demand model. They too reject the hypothesis that tastes are identical across countries, and they find that food, housing and medical expenditures tend to be the necessities while clothing, durables, transport and recreation tend to be the luxuries. Most classes of goods in their models proved to be price-inelastic. These results are also borne out in a later paper (also using a static model), Selvanathan and Selvanathan (2003), in which the authors focus on the consumption patterns in five Asian "tiger" economies: Hong Kong, Japan, Korea, Singapore and Taiwan.

Ogura (2004a, b) look at the structural change in Japanese consumption between 1980 and 2000 for five categories of goods, food, housing, clothing, fuel-electricity and miscellaneous. The author examines the own-price and income elasticities and confirms that the housing, clothing and miscellaneous categories are luxury goods compared to food and fuel-electricity, which are the necessities. Trimidas (2000) examines the pattern of consumer demand in Greece between 1958 and 1994. He focuses on four categories of non-durable consumption expenditures and finds positive own-price elasticities for all categories. The focus of his paper is not, however, on the estimation of elasticities but how well the AIDS fits compared to other models.

To better understand how changing incomes and prices influenced the consumption patterns, Barnett and Apostolos (2008) estimated the Almost Ideal Demand System (AIDS) models. Their first model was focused on Ireland with as much sectoral disaggregation as the data allow: nine categories of commodities between 1976 and 2003. Their main

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objective in this section was to obtain a consistent set of income and own-price elasticities for these classes of expenditures, on both a long-run and short-run basis. Our findings have wider policy relevance. For example, the continued relative increase in transport and recreation expenditures may have implications for the environmental, fiscal and transport policy.

The aim of the paper is to find patterns and preference changes in the consumer demand for meat in Slovakia. From the methodological aspect, we used important items of the demand, and for the consumers behaviour analysis, we computed elasticity coefficients using the model AIDS. We determined the coefficients of the price and income demand elasticity.

MATERIALS AND METHODS

Data sources: The data set is obtained from the Situation and Outlook Reports of Meat (1997–2014) and from the Slovak Statistical Office and it consists of the yearly observations of beef, pork and poultry per capita consumption, the average annual consumer prices of beef, pork and poultry meat and the net income per capita. The Household Budget Survey of the Slovak Statistical Office was used for the period 1999–2014. The use of the household level data offers the potentially richest dataset that may offer an additional insight into the underlying economic relationships.

Theoretical framework: The basic objective of the theory of consumer behaviour is to explain how a rational consumer chooses from varying options when confronted with a different price stratum and/or limited disposable income. The choice of the commodity turns out to be an option between the utility maximising or cost minimising. The optimal solutions to these are the Marshallian and Hicksian demand functions. The Marshallian uncompensated demand functions, defined on prices and outlay, are contrasted the Hicksian compensated demand functions, defined on prices and utility and the central concept of the cost function is introduced. The simplest and most important type of the opportunity set is that it arises when the household has an exogenous budget, an outlay or the total expenditure x, which is to be spent within a given period of time on some or all commodities. These can be bought in the non-negative quantities qi at the given fixed prices p_i. The constraint can then be written as (Deaton and Muellbauer 1980; Gujarati 2004):

$$x \geq \sum_{i=1}^{n} p_i q_i \quad (1)$$

The implications of a linear budget constraint: To understand consumer behaviour, we must recognise that the budget constraint is the obstacle perceived by the decision maker. A great deal of the consumer demand analysis is built on the assumption of a simple linear budget constraint. In equality form it is represented below:

$$x = \sum_{i} p_i q_i \quad (2)$$

where the total expenditure is x and the prices are p_k. The use of the equality, as opposed to the inequality of Equation 1, will be justified if the consumers always attain the upper boundary of the opportunity set. This will happen if the consumer cannot completely satisfy all their wants within the budget and because there will be always some commodities which are more desirable. The use of Equation 2 rules out the non-linearities, indivisibilities, uncertainties and interdependencies of Equation 1. It also assumes that the total amount to be spent x is decided separately from the detail to be made up.

General restriction of demand functions: To maximise the utility function subject to a budget constraint implies a number of general restrictions on the parameters of the Hicksian and Marshallian demand functions. These are the aggregation or adding up restriction, the homogeneity restriction, the Slutsky's symmetry restriction and the negativity restriction. The first restriction is particularly applicable to complete the demand systems.

The aggregation restriction, which also arises from the budget constraint, implies that the total value of both Hicksian and Marshallian demands is equal to the total expenditure, that is

$$\sum p_i q_i(u,p) = \sum p_i q_i(x,p) = x$$

The homogeneity conditions state that the Hicksian demands are homogeneous of degree zero in prices, the Marshallian demands in the total expenditure and prices together, this implies that the consumer does not suffer from the money illusion. This can be shown as:

$$h_i(u,\theta_p) = h_i(u,p) = g_i(\theta_p,\theta_x) = g_i(x,p)$$

The Slutsky's symmetry restriction arises from the cross substitution effects. It states that the effect of a price change on the quantity of a good consumed

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can be decomposed into the income effect and the substitution effect. The cross price derivatives of the Hicksian demands are symmetric, that is, for all $i \neq j$.

$$\frac{\partial h_i(u,p)}{\partial p_i} = \frac{\partial h_j(u,p)}{\partial p_j}$$

Since, $h_i(u, p)$ is $\partial c(u, p)/\partial p_i$, $\partial h_i/\partial p_j$ is $\partial 2c/\partial p_j \partial p_i$. Similarly, $\partial h_j/\partial p_i$ is $\partial 2c/\partial\, p_i \partial p_j$, so that the only difference between the two lies in the order of the double differentiation. The Young's theorem asserts that the continuous derivatives exist, which does not matter and hence the two derivatives are identical.

The negativity restriction requires that the own price substitution effect is negative. The $n \times n$ matrix formed by the elements $\partial h_i/\partial p_j$ is negative semi-definite, that is, for any n vector ξ, the quadratic form is:

$$\sum_i \sum_j \xi_i \xi_j \, \partial h_i / \, \partial p_i \leq 0$$

If ξ is proportional to p, the inequality becomes an equality and the quadratic form is zero. This result also follows from the derivative property; $(\partial h_i/\partial p_j)$ is the matrix of second derivatives of a concave function and so is negative semi-definite. The fact that $\Sigma j_{pj} \times \partial h_i/\partial j$ is zero follows from the homogeneity.

For a normal good, the total effect of a price change is negative. This is the basic law of demand which says that the demanded quantity of a good varies inversely with its price level. It is only a Giffen good that has a positively sloping demand curve (Deaton and Muellbauer 1980; Talukder 1990a, b).

The empirical model: The linear approximate almost ideal demand system (LA/AIDS) was chosen to estimate the parameters of the potato demand in Bangladesh. Each equation in the AIDS is given as:

$$w_i = \alpha_i + \sum_i \gamma_{ij} \ln P_i + \beta_i \ln(\frac{X}{P}) + \mu_i \qquad (3)$$

where w_i is the share of the i^{th} good (i.e., $w_i = P_i Q_i/X$), P_j is the price of the j^{th} good, X is the total expenditure on all goods in the system, P is a price index, μ_t is the residuals and is assumed to have zero mean and constant variance, α_i, β_i and γ_{ij} are the parameters.

The price index (P) is a translog index:

$$\ln P = \alpha_0 + \sum_i \alpha_1 \ln P_1 + \frac{1}{2} \sum_i \sum_j \gamma_{ij} \ln P_i \ln P_j \qquad (4)$$

The price index from Equation 4 makes Equation 3 a non-linear estimation, raising estimation difficulties. To avoid the non-linear estimation, many empirical studies used Stone (1953) price index (P^*) instead of P, as suggested by Deaton and Muellbauer (1980):

$$\ln p^* = \sum_i w_i \ln P_i$$

The model that uses the Stone geometric price index is called the Linear Approximate AIDS (LA/AIDS). It can be shown that if prices are highly collinear, then the LA/AIDS model can be used to estimate the parameters of the AIDS model because the factor of proportionally of P to P^* is incorporated in the intercept term (Green and Alston 1990; Hsiao 1986).

The use of the Stone price index has been shown to be inappropriate as it makes the estimated parameters inconsistent (Moschini 1995). Moschini attributes this problem to the fact that the Stone price index does not satisfy what Diewert (1987) calls the commensurability property and suggests that the problem may be solved by using a price index that satisfies this property. Moschini (1995) suggests several other price indices that satisfy this property which may be used to keep the specification of the almost ideal demand system linear. He also shows that these indices perform like the translog index in a Monte Carlo experiment. To keep the specification of the demand system linear, the price index that Moschini calls the corrected Stone index has been used which may be written as:

$$\ln P = \sum_i w_i \ln \frac{P_1}{P_0} \qquad (5)$$

The AIDS model automatically satisfies the adding-up condition and is capable of satisfying the three other restrictions, but it does not necessarily do so. In terms of the parameters in Equation 3 the adding-up condition implies:

$$\sum_i \alpha_i = 1, \sum_i \beta_i = 0, \sum_{ij} \gamma_{ij} = 0 \qquad (6)$$

Homogeneity is satisfied if:

$$\sum_{ij} \gamma_{ij} = 0 \qquad (7)$$

while symmetry is satisfied provided.

$$\gamma_{ij} = \gamma_{ji} \qquad (8)$$

The negativity conditions have no obvious parametric representation in the AIDS model. Except for the adding-up condition, the AIDS does not have the restrictive implications. Thus, the AIDS offers the opportunity of testing the homogeneity and symmetry restrictions.

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The adding up restriction is given by Equation 6. Equation 7 implies that the demands are homogenous of degree zero in prices and income and Equation 8 shows the Slutsky Symmetry. The derivations of elasticity formulas for the AIDS model are found in the papers of Green and Alston (1990) and Buse and Chan (2000).

Economists are often interested in price and income elasticities. Price elasticity is defined as the percentage change in the quantity demanded of some good with respect to a one percent change in the price of the good (own price elasticity) or of another good (cross price elasticity). The expenditure elasticity η_i and the uncompensated (Marshallian) own and cross price elasticity ε_{ij} can take the following form:

$$\mu_i = 1 + \beta_i / w_i$$

$$\varepsilon_i = -\delta_{ij} + \left(\gamma_{ij} - \beta_i w_i\right)/w_i \quad (10)$$

where δ_{ij} is the Kronecker delta, which takes the value of one for the own price elasticity and zero for the cross price elasticity, w_i is the share of the i^{th} good and w_j is the share of the j^{th} good. Once the expenditure and uncompensated price elasticities are estimated, the compensated (Hicksian) own and cross price elasticities can be computed using the Slutsky equation in elasticity form:

$$\varepsilon_{ij} = \varepsilon_{ij}^H - w_{ij}\mu_{ij} \quad (11)$$

or

$$\varepsilon_{ij}^H = -\delta_{ij} + \left(\frac{\gamma_{ij}}{w_i}\right) + w_j$$

where ε^H_{ij} is the compensated (Hicksian) price elasticity (Deaton and Muellbauer 1980; Moschini 1995; Asche et al. 1998).

Price elasticities can either be derived from the Marshallian demand equation or the Hicksian demand equation. The Marshallian demand equation is obtained from maximizing utility subject to the budget constraint, while the Hicksian demand equation is derived from solving the dual problem of the expenditure minimization at a certain utility level. Elasticities derived from the Marshallian demand are called the Marshallian or uncompensated elasticities, and the elasticities derived from the Hicksian demand are called the Hicksian or compensated elasticities.

More detailed discussions on the Marshallian and the Hicksian demand relations and the Slutsky equation can be found in many standard economics textbooks (see Nicholson 1992; Gravelle and Rees 1992 and SAS Institute Inc. 1999).

We provide an analysis and quantification of factors influencing consumer behaviour of meat consumption.

RESULT AND DISCUSSION

Perhaps none of the food except meat expresses plastically the welfare prosperity or, on the contrary, fluctuations in living standards, but also the changing views on the human consumption.

A distinct line of the rational consumption of meat became in 1990. After this year, the state stopped generously subsidizing not only the production of meat, but also its consumption. Only several economists remember that the presently so expensive beef was at that time available, because the sate applied the negative sales tax on it.

From the moment this unusual measure was stopped, the consumption went down sharply. But at the same time a variety of new knowledge emerged and the importance and status of meat in the human diet has been reconsidered.

The question is why the poultry consumption in the recent years has gone up sharply, especially at the expense of beef but also pork. There is pointed out the two- to five times' higher difference between the price of chicken, pork and beef.

Poultry meat is, from the price development viewpoint, for poor people and beef for rich. In Slovakia, the annual consumption of beef per capita incredibly fell from 28 kg in 1990 to only 4.3 kilograms in 2010. In the same period, the poultry consumption increased from 13.6 to 19 kg. Over the past decade, the total consumption of meat on the bone per capita stopped at the level of 55.8 kilograms. We have recommended the range meat consumption, but the pattern of consumption of each type of meat is bad. Critically low is the consumption of beef and veal. The average citizen eats barely one quarter of the recommended dose of 17.4 kg per year. On the other hand, Slovakia is, with the annual 30 kg per capita consumption of pork, by 38 per cent over the recommended healthy consumption.

The meat quality priority reflects the content of the net muscle protein against the fat or water content. The consumer, however, does not seek only the protein and other nutrients in the meat dishes, but also the expected pleasure, which is mirrored in the sensory characteristics of food. If you have a positive

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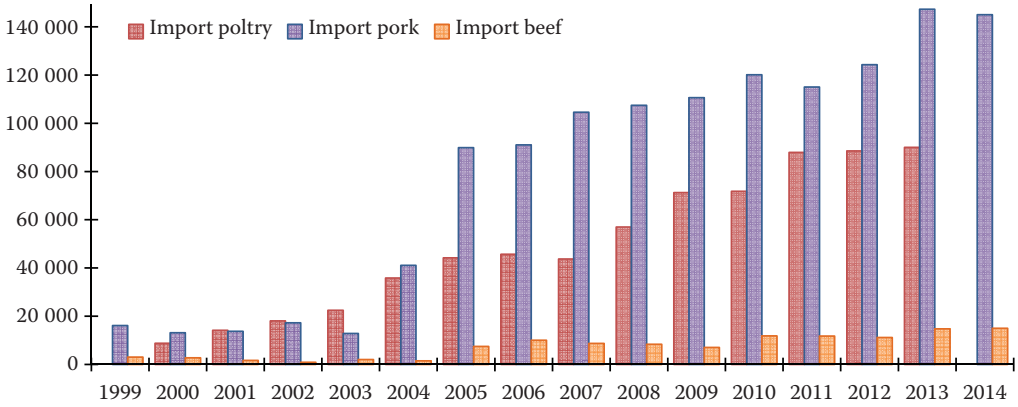

Figure 1. Import of meat in tones in Slovakia

Source: Statistical Office of the SR, www.statistics.sk

experience with meat, you seek it again and again. The most important is still the price; it reflects not only the quality of the provided benefit and enjoyment at the same time, but also the availability of meat. The consumer thus perceives meat through it.

From the viewpoint of the dietetics, the rabbit meat is valuable, but the consumption of it is only 0.6 to 0.8 kilograms, which we can consider as marginal. It is more often eaten by people in rural areas where rabbits are kept, but the urban population largely regards it as a luxury.

Just occasionally the Slovaks eat the wild-boar and similar meats. The explanation is simple, the price of EUR 15 per 1 kg far exceeds the already expensive beef.

The end of the winter season used to be historically, throughout the twentieth century, typical by its pig-killing feasts. Today, these are becoming increasingly scarce. In the rural areas, people have ceased to breed pigs and so some mayors organize abattoir feasts, so that the traditional tastes of sausages, haggis, black pudding, boiled jowl and smoked bacon with garlic are not forgotten. Their consumption, as they come on the market and to butcher shops, increases.

For a better understanding of the current situation, it is necessary to look into the history of the production and consumption of meat. From the macroeconomic perspective, it is important to monitor the import of the commodity into the country. Figure 1, we can see that the import of pork extremely increased in the period 1999 to 2014. One of the main reasons for such high import pork is the decline in the domestic production. That was caused not only by animal diseases but also by the legislation, which liquidated many farmers. Consequently, they find it inconvenient to produce pork. Beet import has stabilized at a certain amount, notably the import for further processing. The domestic production covers a majority of the beef consumption.

Poultry has experienced a consumer boom in Slovakia, but that has fallen down and there started a more rational consumption of the poultry meat. The domestic production is currently unable to meet the Slovak consumption.

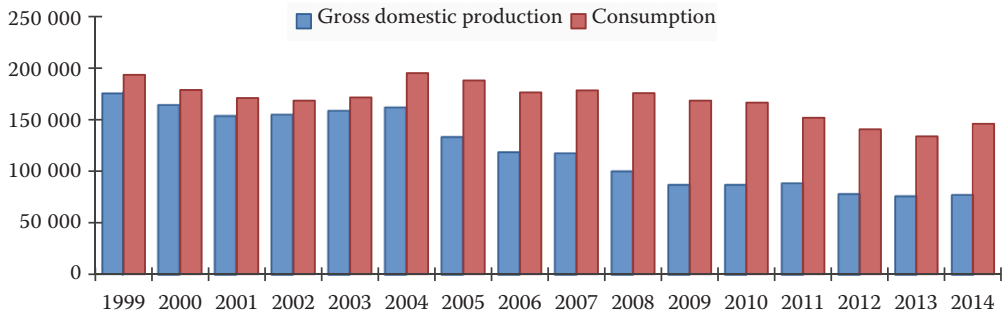

Figure 2. Comparison production and consumption of pork in tones in Slovakia

Source: Situation and outlook reports of the meat (1997–2014). Available at http://www.vuepp.sk/en/publikacie_en.htm

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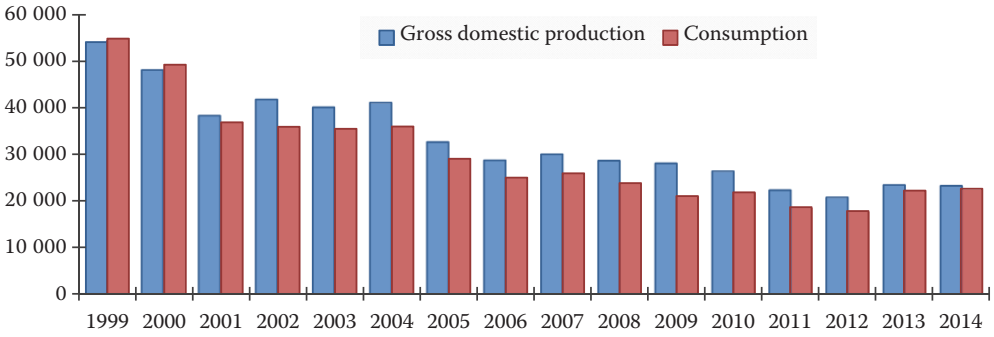

Figure 3. Comparison production and consumption in tones of beef in Slovakia

Source: Situation and outlook reports of the meat (1997–2014). Available at http://www.vuepp.sk/en/publikacie_en.htm

The decline in the consumption of pork is most notable since 2008, when it stood at 32.3 kg and steadily declined until 2012, although the pork consumption still exceeds the consumption of other types of meat (Figure 2).

The significant decline in the pork consumption may be associated with the rising consumer prices, unemployment and the associated lower purchasing power of the population. Currently, the domestic production of pork covers only less than 43% of the total supply of meat in Slovakia.

The stocks of cattle in Slovakia are decreasing rapidly and the beef consumption is declining. While in 1990 the beef consumption per capita reached 22.1 kg and was comparable to the Western countries, in 1998 this indicator reached 11.8 kg and at present only 6.2 kg per capita. The situation of the cattle stocks and the beef consumption is alarming. Eating beef is not customary in Slovakia. Up to one-fifth of the Slovak territory consists of the meadows, grassland and pasture, which should be effectively utilised. Regarding the situation of beef farmers, they operate in the conditions that do not contribute to the rural development. The system of the cattle rearing support system used to operate well and efficiently in the past in Slovakia, however, it presents currently a big problem for the farmers (Figure 3).

The current self-sufficiency in meat is at about 54%, the state reserve short term capacities are estimated up to 65 or 70%. The poultry farms in Slovakia are able to ensure, if necessary, 80-% self-sufficiency in the production of poultry in Slovakia (Figure 4).

The increased production of poultry meat to 80% can be currently provided, according to the three existing processing plants in Slovakia, which now do not use their production capacity to the full 100%. However, there have to be conditions for increasing the capacity utilization, meaning the marketing of poultry into the retail chains in Slovakia and a sufficiency of the live poultry for slaughter. The primary production of live poultry in Slovakia is currently provided by six producers of the farmer's broiler chickens. For the above mentioned reasons, our aim was to find out the patterns how the Slovaks behave regarding the meat consumption, because it is important not only from the economic but also the nutrition viewpoint. For the identification of the consumer

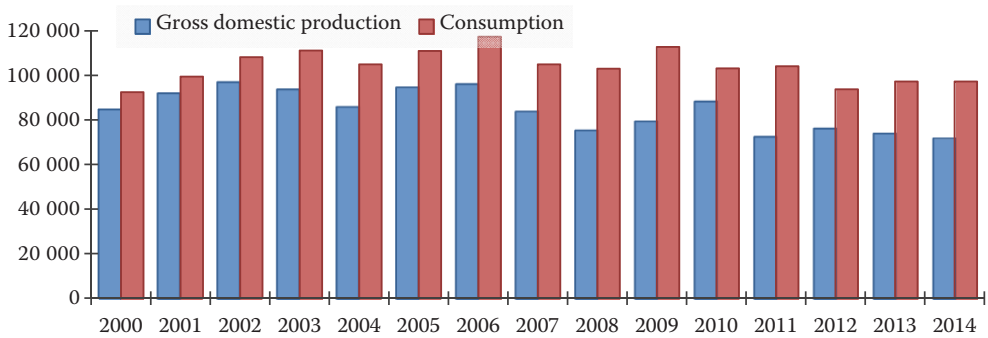

Figure 4. Comparison production and consumption of poultry in tones in Slovakia

Source: Situation and outlook reports of the meat (1997–2014). Available at http://www.vuepp.sk/en/publikacie_en.htm

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Table 1. Coefficients of LA/AIDS model

	Beef	Pork	Chicken	Fish
α	–0.80931	0.523995	1.167753	0.117567
Pr > |t|	0.1947	0.1556	0.1142	0.0373
Beef	–0.0687	0.112134	–0.20517	–0.0002
Pr > |t|	0.7760	0.1114	0.4651	0.0736
Pork	–0.14111	0.040099	–0.01671	
Pr > |t|	0.0081	0.5810	0.1908	
Chicken	0.181779	–0.01113		
Pr > |t|	0.4567	0.1411		
Fish	0.1411			
Pr > |t|	–0.04			
R^2	0.8598	0.9272	0.8879	

Source: Own computations

behaviour, we calculated the elasticities using the AIDS model.

The almost ideal demand system was estimated by eliminating fish. Without a proper dynamic specification of the estimated equations, the homogeneity and symmetry restrictions implied by the economic theory cannot be rejected. These restrictions are tested with the help of the Likelihood Ratio test where the estimated value of the Chi-squared was highly significant at 5% level. As no evidence against the homogeneity and symmetry restrictions implied by the consumer theory was found, it implies that the estimated results were consistent.

The estimated coefficients of the LA/AIDS model are presented in Table 1 where 11 coefficients out of 14 were statistically significant.

The results show that all own price elasticities are negative, and all of the elasticities are less than 1 in the absolute value, meaning that all goods are inelastic. The uncompensated own-price elasticities of demand for all meat groups are negative and consistent with the a priori expectation. The absolute amounts of these elasticities for all commodity groups are lower than unity. The demand reacts inelastically to the own price changes.

The own price elasticity of a product is expected to have a negative sign, according to the economic theory, indicating the negative slope of the demand curve. The uncompensated elasticity of demand refers to the changes in the demand quantity of the major household food items as a result of the changes in prices in the absence of any compensation in terms of either the price change or the income change. Or, in other words, this represents the general prices elasticity of demand. On the other hand, the compensated elasticity of demand for the major household food items refers to that portion of the total change in the quantity of the household food items demanded which is compensated by the price changes. Once the allowance for price compensated to the total change in the quantity demanded (of the uncompensated elasticity) is made, the remaining is the income effect. That is, the price effect plus the income effects equals the total effect.

The compensated and uncompensated own price elasticity indicated that all food items (except edible oil and spices) were price inelastic.

The largest absolute value of the uncompensated own-price elasticity is calculated for the chicken meat (–0.92).

This implies that the demand reacts inelastically to the changes in prices of these products. The elasticities are the lowest for beef meat (–0.43) and pork (–0.84), where the demand reacts the least to the price changes.

The expenditure (income) elasticity measures the responsiveness of demand to a change in the consumer income and it is affected by the time period over which they are measured (the shorter the time period the lower the income elasticity of demand) and the degree of necessity of the good (the more necessary the good, the lower the income elasticity of demand) (Hug and Arshad 2010). The expenditure (income) elasticity of demand may be interpreted as the percentages change in the quantity demanded

Table 2. Uncompensated own-price elasticities

	Marshallian elasticity matrix			
	BEEF	PORK	CHICKEN	FISH
BEEF	**–0.427978**	–1.529313	–0.245573	0.0413323
PORK	–0.193065	**–0.842875**	0.0288189	–0.020276
CHICKEN	0.129002	0.8030288	**–0.915826**	0.026537
FISH	0.8760695	–0.066822	0.3938175	**–0.857985**

Source: Own computations

Table 3. Expenditure elasticities

	Income elasticity
BEEF	2.1615314
PORK	1.0273972
CHICKEN	0.042742
FISH	–0.34508

Source: Own computations

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when the expenditure (income) changes (roughly) by 1%, while other factors are constant. Since the elasticity of demand is independent of the units in which the demand is measured, the elasticity is a more meaningful measure of the responsiveness of demand to the change in income or prices. For example, estimated at the mean level of beef expenditures for the entire sample, the income elasticity of demand for beef was 2.16, suggesting that a 10% increase in the household income would increase the demand for beef by 21.6%. All estimates of income elasticity for different food items were statistically significant.

In average, almost all meat items had a positive income elasticity of demand which implies that they were normal goods. Beef and pork were expenditure (income) elastic and hence could be considered as a luxury, while poultry and fish were income inelastic meaning that those were of the necessity.

It can be seen from the above Table 2 and 3 that the expenditure and own-price elasticities are of the expected sign. The income (expenditure) elasticities for all food groups are positive and less than one ($0 < \boldsymbol{\varepsilon}_i < 1$) except for the pork meat, indicating that the food group represents normal and necessary goods, and there are no inferior products. For beef, the income elasticity amounts to 0.668, and for chicken to 0.124, respectively. The food groups such as pork meat have the expenditure elasticity's larger than unity ($\boldsymbol{\varepsilon}_i > 1$), which identifies them as luxuries. It is expected that these food group will experience an increase in demand when the consumers' income increases in tandem with the overall economic growth of the country.

The own price Hicksian elasticities are also negative for all goods as we expected. The values of the cross-price elasticities are smaller – in the absolute terms – than those of the expenditure or own-price elasticities. This holds true for the uncompensated and compensated cross-price elasticities.

The cross-price elasticities characterise the pairs of goods as substitutes or complements. On the level of all selected food commodity groups, there are only substitution relationships and no complementary ones.

Table 4. Compensated cross-price elasticity's

Hicksian elasticity matrix				
	BEEF	PORK	CHICKEN	FISH
BEEF	**–0.084526**	–0.122169	0.135651	0.0710435
PORK	–0.029819	**–0.174046**	0.2100183	–0.006154
CHICKEN	0.1222106	0.7752042	**–0.923364**	0.0259495
FISH	0.8212388	–0.291467	0.3329566	**–0.862729**

Source: Own computations

The Marshalian elasticity provides the entire uncompensated price elasticity matrix. The uncompensated cross-price elasticity provides the gross cross effects that include both the substitution effect and the income effect. The Hicksian elasticty provide the compensated price elasticity matrix. The compensated cross-price elasticity represent the pure price effects (that is, only the substitution effect) or the net effects of price change on demand.

Some cross-price elasticity changed the + or – signs between their uncompensated and compensated forms. The negative uncompensated cross-price elasticity is indicating that the products were gross complements. However, the positive compensated cross-price elasticity is indicating that the products were net substitutes. The cross price effects had no clear direction and a relatively low degree of complementarities and substitutability existed among the food items considered in the model.

The uncompensated cross price elasticity was more ambiguous. However, the strong expenditure effects clearly play a role. The compensated cross price elasticity is the most appropriate when one wants the information about the substitution possibilities.

CONCLUSION

The main impact factors affecting food consumption are the consumers' income and food prices. The food patterns development in Slovakia during the past two decades has undergone rapid structural changes. Changes in tastes, preferences, lifestyles and economic transformation have also strongly influenced food demand, concluded Hupkova et al. (2009). Slovakia ranks among the states with the predominant pork and poultry meat consumption.

The modern consumer theory is valuable in indicating a plausible assumption for estimating the demand parameters in a statistically tractable framework. In particular, the theory offers conditions under which the own-and cross-price and income elasticity of demand can be estimated with an economy of parameter and with systematic behavioural interrelations.

The computed elasticities showed that all meat items had a positive income elasticity of demand which implies that they were normal goods. Beef and pork were expenditure (income) elastic and hence could be considered as a luxury, while poultry and

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fish were income inelastic meaning that those were of necessity.

The Slovaks have good eating habits, but there are still significant reserves. Regarding the consumption of all types of meat, we arrive at the recommended dose, but constantly we eat more pork and poultry meat to the detriment of beef and veal. The Slovaks also had hard time understanding the necessity of the increased consumption of fish.

The main criterion when choosing the food we eat should not be the price, but the health concerns. The present trend, unfortunately, shows and the statistics confirm that Slovakia still has a long-term low meat consumption.

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