

# Comparison of the income development and the food demand elasticities of the private households in Slovakia

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**Abstract:** The paper deals with assessing the development of monetary incomes and expenditures of the Slovak households for food using the classification of households by income quartiles and by consumer spending. The analysis confirms the significant differences and unbalanced income distribution. Households in the fourth income quartile dispose of 2.8 times higher incomes than the families in the first quartile. There have been analyzed the food groups that in terms of expenditures represent the part in the food basket higher than 6%. The results confirm that income differentiation of households is also reflected in their different behavior in the food market. The demand changes most sensitive to income changes are those of the households with the lowest incomes. Demand for vegetables, potatoes and tuberous plants shows the highest value of the income elasticity, and in the households with the lowest incomes, the demand for potatoes and vegetables is elastic ( $E_I = 1.165$ ).

**Key words:** incomes and expenditures of the households by income quartiles, elasticity of demand for bakery and dairy products, meat and meat products, vegetables and fruits

The assessment of the standard of living of the population and its development is affected by several indicators. The key indicators that allow assessment of the standard of living and its development are the monetary income, consumption and expenditures for food, housing, culture, education and healthcare.

Data on the household incomes and the household expenditures for the stated needs point at the standard of living of the population as well as various social groups. Important is also the reciprocal comparison of the differences in expenditures for the basic living needs of the household. During the transformation process, the variability types and groups of households expanded. A downtrend is spotted in the average size of the households and the growing pluralism of the various forms of coexistence.

## METHODOLOGICAL APPROACH

The paper aims to identify the changes and development in consumer behavior of the population in the food market. Measuring the market size, identifying the trends and the ability to predict the future development (Lesáková et al. 2006) are the critical factors in identifying the opportunities and risks of the market including food. On majority markets, there is an un-

stable total demand or demand for individual foods and it shows fluctuations, so a reliable prediction of the future demand and consumption is a key factor affecting the knowledge. It is helpful in formulating the tasks of providing nutrition policy and food needs of the population in the socio-economic conditions.

The paper put accent on the analysis and determinants qualifying the consumer demand for food with the accent on the analysis and determinants of monetary income. The amount of income, its resources and structure are determined by the social position of the population, especially in the labor market. The transformation process and expression of the financial crisis led to creating of relatively stable household groups and the official statistics provide an overview of income and expenditures by the net income quartiles of households.

The first income group (25% of the households) is on the lowest level of income, the pensions and social funds are the overwhelming source of revenue. Their expenditure structure is typical for poor households, which must reduce their consumption. Statistical Office of the Slovak Republic provides the input empirical data on net incomes and expenditures of the households for food and non-alcoholic beverages in quartil segmentation by net money income per capita for the years 1998–2008.

There had been used the methods of descriptive statistics and trends of development using the base and chain indexes and the average growth factor. The analysis of food expenditure and household consumption, which resulted from their inclusion in the income quartile, was made by using the regression and correlation analysis. We have emanated from the regression model, and the following premise:

$$RV_{kj} = f(RPK) + ekj \quad (1)$$

where:

$RV_{kj}$  = real expenditures of households in the  $k$ -income quartile ( $k = 1, 2, 3, 4$ ) for the  $j$ -food commodity, model is determined by the relation:

$$RV_{kj} = Qkj \times Pkj$$

$RPK$  = real money incomes of households in the  $k$ -income quartile

$Pkj$  = real price of the  $j$ -food commodity in the  $k$ -income quartile

$Qkj$  = purchased quantity of  $j$ -food commodity in the  $k$ -income-quartile

$ekj$  = random variable

In addressing the relation (1), we used the log-hyperbolic function

$$RV_{kj} = \exp(a + b \times \frac{1}{RP_k}) \quad a > 0, b < 0$$

that appropriately described the process according to the real food expenditures and their dependence on the real income, which has the asymptotic form characterized the saturation of demand and describes the trends in spending, or consumption, and the large fluctuations in the revenues (Sznajder and Adamczyk 2003). In addressing the demand function (1) after its transformation to a linear form, we used the method of the least squares.

The suitability of different models depends on the course description of food expenditures, food con-

sumption and the real income had been considered by using the coefficient of determination  $R^2$  and parameters of regression equations using the Student's  $t$ -distribution.

## RESULTS AND DISCUSSION

### Development of the monetary income and consumption expenditures

The available funds and resources of the households are sensitive factors to the ongoing processes in the social and economic spheres of the society. The amount of the monetary income of the households, their sources and structure are primarily determined by their position in the labour market.

The transformation process in Slovakia has contributed to the creation of relatively stable household groups. The empirical analysis (Pacáková et al. 2005) shows that the net annual monetary income of the Slovak households reported a non-symmetrical distribution with a characteristic prolonged right end. Predominant are the households with low-income. Gradually there was increasing the differentiation, and even if the nominal earnings rose in all households, part of the households (families with more children, pensioners) are still at the level of low income and even destitution. The first quarter of the household incomes located between the bottom quartile and the median value disposed with an average annual real income of 47 457.3 SKK per 1 household member (Table 1).

Household income in the third quartile was in the real value 84 724.5 SKK and 1.8 times higher than the household income in the first quartile. In the fourth quartile, it was as much as 2.8 times higher than the mentioned household income in the first quartile.

Table 1. Monetary incomes and expenditures of private households in quartile segmentation by net the money income per person in 1998–2008

Coefficient		1 <sup>st</sup> quartile	2 <sup>nd</sup> quartile	3 <sup>rd</sup> quartile	4 <sup>th</sup> quartile
Real monetary incomes	average in SKK	47 457.3	67 949.2	84 724.5	131 319.0
	index 2008/1998	2.165	2.244	2.287	2.528
	growth coefficient	1.080	1.084	1.086	1.097
Real consumer expenditures	average in SKK	48 980.5	67 217.5	83 214.1	122 400.8
	index 2008/1998	2.062	2.150	2.128	2.256
	growth coefficient	1.075	1.080	1.078	1.085
Real expenditures on food and soft drinks	average in SKK	14 572.3	18 774.6	21 540.0	24 550.5
	index 2008/1998	1.832	1.627	1.487	1.558
	growth coefficient	1.062	1.050	1.040	1.043

Consumer price index (previous year = 100)

Source: SO SR, own calculations

The growth coefficient ( $k'$ ) of the real income since 1998 has had an increasing trend and it has ranged in the diameter from 8.0% in the first income quartile ( $k' = 1.080$ ) up to 9.7% in the fourth – the highest income quartile. The uneven distribution of incomes has been deepened since 1989. A greater differentiation and acceleration of growth of the real incomes can be observed since 2003.

In 2003, the top income quartile of real household incomes increased in average by 11.7% ( $k' = 1.1169$ ) and the first income quartile only by 10.5%. Adaptation mechanisms and the ongoing development showed the non-standard features and on the scale of incomes, part of households was situated in the low-income zones with a sharp drop to the average values and a slower growth of the households (Figure 1).

The average annual equivalent of the disposable income (EU SILC 2008) of the households in Slovakia was 174 883 SKK (5 178 EUR). In the interval of the disposable income per person and month from 5 001 SKK to 9000 SKK, there were found 47.1% four-person households. The Gini coefficient that measures the inequality of income distribution (EU SILC 2008) was 24. The threshold for determining the real poverty of the EU Member States is the income level of one equivalent household member amounting to 60% of the median equivalent income (Labudová 2009). The results of the harmonized EU SILC survey showed that the risk of poverty rate after social transfers in the families with two children in 2008 in Slovakia was 10%, and in the families with three or more dependent children, it was 33%.

An uneven development of pensions was reflected in the consumption expenditures of the population. The total consumption expenditures by households

in the fourth income quartile increased in average by 8.5% ( $k' = 1.085$ ) per year, and the first quartile of consumption expenditures growth was 7.5%. Incomes of the households in the first quartile were insufficient to cover the necessary consumption expenditures, so that a part of the expenditures could be covered only through savings, loans and also undocumented (black) income. The real food expenditures were, on the other hand, counterfactual with a downward trend. It was in difference to the total consumption expenditures of the households with the lowest incomes, which increased in average by 6.2% per year ( $k' = 1.062$ ), while in the households located in the higher income quartiles of the median food expenditures increased in average by 4.3% ( $k' = 1.043$ ).

In absolute terms, household consumption expenditures in the fourth income quartile were only two and a half times higher than the actual expenditures in the first income quartile. Expenditures for food and soft drinks were only 1.68 times higher than in the lowest income households. This confirms the knowledge of Ch.L.E. Engel, that the costs and the quantitative demand for food grow more slowly than the population incomes.

Food expenditures in the pattern of consumption expenditures were reduced in all income groups of households. The highest food expenditures for beverages and food (32.1%) were reported by the households in the first income quartile.

The most significant decline in food expenditures (Table 2) was in the highest income quartile of the households, by 7.2 percentile points, in the third income quartile by 7.7 percentile points, where the food expenditures occupied 29.59% share in the structure of consumption expenditures. After 2001,

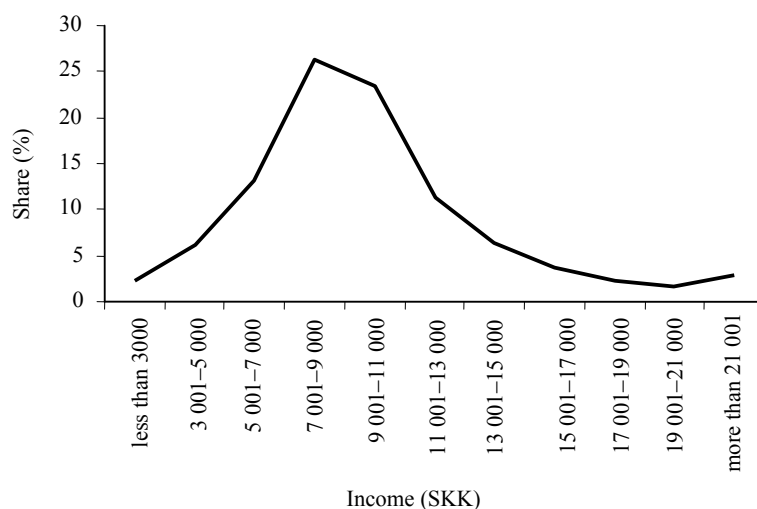


Figure 1. Monthly disposable income per person in SKK in Slovakia

Source: EU SILC 2008; own calculations

the development has been marked by projecting the administrative arrangements within the administered prices, and the households have been forced to redistribute their consumption expenditures in relation to the disposable income.

As a result of the fall of interest rates, there have declined also the revenues from income and property. Accelerated has been the convergence of payment structures to the structures of the EU Member States, especially in housing, transportation, food services, although when compared to the EU-15 countries, food expenditures of Slovak households are still high. Changes in food consumption and non-food goods have been made on the basis of the changes in the assortment of goods through the large shopping centers and a large proportion of the products of the foreign provenance.

In the structure of consumption expenditures, it was possible to observe the consequences of different dynamics of the nominal income growth and the costs of living. Significantly, there have increased the spendings on services and other expenses in the third and especially fourth income quartile. The expenditures on clothing and footwear in 2008 were three times higher than in households with the lowest incomes. In the fourth income quartile, the households spent four to five times more funds for transport, culture, recreation, furniture and home furnishings than in the first quartile.

The overall increase in spending on services (Table 2) was attributable to the growth levels of rents and municipal services. In 2008 compared with 2000, the expenditures of this kind increased in all households. The highest increase was in the expen-

ditures for services by 5.0 percentile points and in the expenditures for services and other expenses by 3.4 percentile points. These expenditures could be afforded in particular by the household income in the fourth quartile as an indication of the possibility of higher claims and to ensure their living standards compared with the families falling into the first or second income quartile.

### **Income elasticity of food expenditures and its expression in the particular household income groups**

The size of consumer spending is affected by many factors such as tradition, family age structure, socio-economic situation of the individual households and their economic environment. The results confirm that the poorer the household was, the higher were its expenditures to meet the basic living needs such as nutrition, housing, health and the lower the discretionary spendings for culture, recreation and education (Kubicova 2007; Cross 2009).

Changes in the level of income create a different space for maneuvering in the individual households. The problem is still in a high proportion of expenditures on food, beverages and catering (Table 2). This causes the pension restrictions and the sensitive consumer behavior responding to the changes in the prices of goods and services. A significant part of the households, especially in the first and in the second income quartile with notable changes in prices, reduced their consumption and expenditures on the individual foods and in the physical units. Changes

Table 2. Structure of the consumption expenditures of the households in Slovakia per person per year in%

Households	Consumption expenditures (= 100)	2000	2008
1 <sup>st</sup> quartile	food, beverages and catering	39.66	35.11
	non-food goods	31.76	31.02
	services	24.16	26.67
	other net expenditures	4.42	7.19
2 <sup>nd</sup> quartile	food, beverages and catering	38.68	31.83
	non-food goods	29.31	31.02
	services	26.43	26.87
	other net expenditures	5.58	10.27
3 <sup>rd</sup> quartile	food, beverages and catering	37.34	29.59
	non-food goods	29.65	30.74
	services	25.69	28.09
	other net expenditures	7.31	11.57
4 <sup>th</sup> quartile	food, beverages and catering	31.81	24.61
	non-food goods	29.97	28.75
	services	29.08	34.13
	other net expenditures	9.13	12.50

Source: SO SR, own calculations

Table 3. The share of monetary expenditures for the aggregated food groups of the total expenditure for food and soft drinks per person per year in%

Food groups	1998	2000	2008
Cereals and bakery products	15.7	16.5	19.8
Meat and meat products	26.4	25.8	24.1
Milk, cheese and eggs	16.2	17.2	16.6
Vegetables, potatoes and chervil plants	5.7	5.7	6.7
Fruits	6.6	6.1	5.9

Source: SO SR, own calculations

in food consumption and the food expenditure pattern have been analyzed from the perspective of the individual aggregate food groups and the disposable monetary income of the individual households. We have focused primarily on the food groups, which are indispensable and irreplaceable in ensuring the basic nutrition needs of the household members.

In the Table 3, there can be observed that during the eleven seasons, there were changes in the structure of the household consumption as follows:

- the growth in expenditures for cereals and bakery products,
- the decline in expenditures for meat and meat products and fruits,
- the growth in expenditures for vegetables, including potatoes and other tuberous plants,
- the fluctuations in expenditures in the direction of growth and decline of the expenditures for milk, cheese and eggs.

The money spent for each aggregated food group and the income elasticity of expenditures beyond saturation across the household income groups have been examined by using the regression analysis. From

the number of the possible regression functions used in the investigation of economic phenomena, we have chosen as the appropriate the log-hyperbolic function allowing to analyze the income elasticity of demand and to estimate the limit of saturation of demand.

On the basis of the analysis, it could be found that the demand for cereals and bakery products is income-inelastic, bread and bakery products belong to the group of the basic goods. The indicators of income elasticity within each income quartile are relatively balanced (Table 4). The highest value of income elasticity of the household expenditures was reported in the second income quartile ( $E_I = 0.604$ ). To an increase of the monetary income by 1%, the households responded by increasing of expenditures for bread and bakery products in average by 0.6% in the second quartile.

The preferences and demand for bakery products that shift to a higher household income groups were only slightly reduced. The consumption of bread and bakery products due to the household income reported a low variability. Cereals and bakery products are the basic food of Slovak households. In 2008, consumption of bread and bakery products ranged from 91.0 kg in the first income quartile to 106.1 kg in the fourth income quartile. The maximal saturation of consumption and the expenditures for bread and bakery products are derived from the earnings growth from 5250 SKK per person per year in the first income quartile to 6555 SKK per person per year in the wealthy families. Since 1998, the expenditures for the bread and bakery products have gradually increased in average by 4.1 percentile points on the level of 19.8% in the pattern of the consumption expenditures.

Expenditures for meat and meat products occupy the largest share of spending in the food basket of

Table 4. The course of dependence, saturation, and income elasticity of expenditure for bread and bakery products from the real income of households by income

Income groups	Parameters of functions	Income elasticity $E_I$	Saturation limit	$R^2$
1 <sup>st</sup> quartile	$\ln RV_1 = 8.566 - 27\,008.8 \frac{1}{RP_1}$	0.569	5 250	0.943**
2 <sup>nd</sup> quartile	$\ln RV_2 = 8.750 - 41\,067.3 \frac{1}{RP_2}$	0.604	6 311	0.969**
3 <sup>rd</sup> quartile	$\ln RV_3 = 8.749 - 45\,106.2 \frac{1}{RP_3}$	0.532	6 304	0.949**
4 <sup>th</sup> quartile	$\ln RV_4 = 8.788 - 65\,698.4 \frac{1}{RP_4}$	0.500	6 555	0.964**

\*\*Statistically proven parameter, significance level  $\alpha = 0.01$

Source: own calculations



Table 5. The course of dependence, saturation, and income elasticity of expenditures for meat and meat products from the real income of households by income quartiles

Income groups	Parameters of functions	Income elasticity $E_I$	Saturation limit	$R^2$
1 <sup>st</sup> quartile	$\ln RV_1 = 8.923 - 34\,390$	0.725	7 503	0.913**
2 <sup>nd</sup> quartile	$\ln RV_2 = 9.143 - 43\,375.3$	0.638	9 349	0.947**
3 <sup>rd</sup> quartile	$\ln RV_3 = 9.577 - 58\,505.4$	0.691	14 429	0.627*
4 <sup>th</sup> quartile	$\ln RV_4 = 9.146 - 48\,852$	0.372	9 377	0.938**

\*Statistically proven parameter, significance level  $\alpha = 0.05$ ; \*\*Statistically proven parameter, significance level  $\alpha = 0.01$

Source: own calculations

the Slovak households. Their share in the pattern of food expenditures has been reduced, and in 2008 it presented 24.1% share of the total food expenditures. The lowest consumption of meat and meat products was reported in the lowest income quartile (44.37 kg per capita in 2008). In the higher income groups, the consumption gradually increased and in the fourth income quartile in 2008, it was 64.1 kg per person. Consumer demand for meat products was marked by a considerable variability of material consumption as well as cash expenditures across the income groups. Households with the lowest incomes had the highest expenditure elasticity ( $E_I = 0.725$ ).

Comparable and consistent results are indicated in (Syravátka 2008; Bielík and Šajbidorová 2009) and in the conditions of the Polish households (Gulbick and Kwasek 2006). The households have not met their nutritional needs due to their low purchasing power.

The increase of the monetary income by 1% may be reflected in average by 0.725% increase in expenditures for meat and meat products. By shifting into higher household income quartiles, the preferences and demand for meat and meat products and their income elasticity have been reduced (Table 5).

The households with the highest incomes had better saturated dietary needs and 1% increase in money income could be reflected in average by 0.372% growth

in expenditures for meat and meat products (Table 5), while in the households with the lower-income only with 0.638% up to 0.691% growth. Our results correspond with the published findings (Thiele 2008; Zentková and Hoskova 2009). The relatively elastic spending consistently responded to the domestic demand for dairy products, cheese and eggs, and showed that these food commodities represented the constant level of 16.6% spending of the Slovak households.

In the households with the lowest income, 1% increase of income was reflected in average by 0.595% increase in expenditures for milk, cheese and eggs. The households in the second and the third income quartile responded to the demand for dairy products with a consistent elasticity, while the more wealthy households showed a lower ( $E_I = 0.427\%$ ) expenditure elasticity. The 1% increase in the average income responded by 0.427% increase in spending and the level of saturation could be expected to reach the spending limit 6458 SKK for milk, cheese and eggs per person per year (Table 6).

Consumer demand for vegetables is characterized by a relatively high flexibility, which was reflected in all income groups of households. Thus the households with the lowest income elastically responded to demand for vegetables, potatoes and tuberous plants flexibly. This income group of households responded

Table 6. The course of dependence, saturation, and income elasticity of expenditures for milk, milk products, cheese and eggs from the real income of households by income quartiles

Income groups	Parameters of functions	Income elasticity $E_I$	Saturation limit	$R^2$
1 <sup>st</sup> quartile	$\ln RV_1 = 8.468 - 28\,234.9$	0.595	4 760	0.975**
2 <sup>nd</sup> quartile	$\ln RV_2 = 8.714 - 40\,661.6$	0.598	6 088	0.967**
3 <sup>rd</sup> quartile	$\ln RV_3 = 8.735 - 42854.7$	0.506	6 217	0.965**
4 <sup>th</sup> quartile	$\ln RV_4 = 8.773 - 56021.7$	0.427	6 458	0.967**

\*\*Statistically proven parameter, significance level  $\alpha = 0.01$

Source: own calculations

Table 7. The course of dependence, saturation, and income elasticity of expenditures for vegetables, potatoes and chervil plants from the real income of households by income

Income groups	Parameters of functions	Income elasticity $E_I$	Saturation limit	$R^2$
1 <sup>st</sup> quartile	$\ln RV_1 = 7.906 - 55\ 290.2$	1.165	2 714	0.914**
2 <sup>nd</sup> quartile	$\ln RV_2 = 7.992 - 63\ 616.4$	0.936	2 957	0.943**
3 <sup>rd</sup> quartile	$\ln RV_3 = 7.980 - 78\ 335.4$	0.925	2 922	0.939**
4 <sup>th</sup> quartile	$\ln RV_4 = 8.089 - 83\ 539.9$	0.636	3 258	0.960**

\*\*Statistically proven parameter, significance level  $\alpha = 0.01$

Source: own calculations

to 1% income increase by increasing of the demand by 1.165% and their demand for vegetables is seen as income elastic. The limit of elasticity is close to the demand for this food group in the households in the second and the third income quartile. The demand for vegetables in the households with the highest incomes was inelastic and 1% increase of income caused an average 0.636% increase in expenditures for this food group (Table 7). The limit of saturation of the demand for vegetables was then reached on the level of spending 3258 SKK per person per year.

Income elasticity of the demand for fruits showed a similar course (Table 8) depending on the elasticity of the demand and consumer expenditures which was reflected in the household demand for milk and dairy products. From the results, we can conclude that the demand for fruits showed the lowest level of tightness, depending on the real disposable incomes compared to other food commodities analyzed in this work.

The level of satisfaction of the nutritional needs is increasing with the growth of income, which was also reflected in the declining levels of income elasticity of demand with the highest household real incomes. The preferences for food decrease in proportion to the degree of transition from the households with a lower income to the higher income groups, because these families have better opportunities to satisfy their nutritional needs.

## CONCLUSION

In the advanced economies, the human needs had been shifted to a higher level of needs within the Maslow's Needs Triangle, where the basic level are the physiological needs. Consumers expect food to be wholesome to contribute to the protection of their health and also they demonstrate by this way their image and life attitude. Pension elasticity of these attributes is changed simultaneously with the income growth. The consumer demand shifts toward more valuable, better processed and prepared foods and the intermediate products. During the transformation period in Slovakia, there have developed differences in income and wealth, which was reflected in the total consumption and expenditures for food. The real and nominal income of the households was in the fourth quartile 2.8 times higher than the household income in the first quartile. The high proportion of the household food expenditures limits the households in deciding about the amount and structure of the consumed food. Different income levels and price developments are strongly reflected in the changes in the structure of consumption expenditures. In the evolution of the consumer demand and structure of expenditures over the eleven year period, there could be observed the following trends:

- declining but still high share of expenses for food, beverages and catering, but these were reduced in

Table 8. The course of dependence, saturation, and income elasticity of expenditures for fruit from the real income of households by income quartiles

Income groups	Parameters of functions	Income elasticity $E_I$	Saturation limit	$R^2$
1 <sup>st</sup> quartile	$\ln RV_1 = 7.1837 - 27\ 402.9$	0.577	1 318	0.879**
2 <sup>nd</sup> quartile	$\ln RV_2 = 7.5561 - 39\ 237.5$	0.578	1 912	0.872**
3 <sup>rd</sup> quartile	$\ln RV_3 = 7.5646 - 33\ 294.6$	0.393	1 929	0.799**
4 <sup>th</sup> quartile	$\ln RV_4 = 7.8433 - 55\ 379.6$	0.422	2 549	0.892**

\*\*Statistically proven parameter, significance level  $\alpha = 0.01$

Source: own calculations

average by 4–5 percentile points by transiting to the higher income quartiles

- significantly were increased the costs for services and other net expenses especially in the households of the income groups located on the right side of the median income distribution
- increasing expenditures for bread and bakery products, vegetables including potatoes and tuberous plants
- decreasing expenditures for meat, meat products and fruits, and in the direction of growth and decline the expenditures for milk and milk products varied
- small differences in the income elasticity of demand for cereals, bakery products, for milk and milk products had been demonstrated among different income groups of households
- the high income elasticity was reflected in the households with the lowest income, particularly in the demand for vegetables, potatoes and other tuberous plants. By transiting to the higher income quartiles, the income elasticity of demand fell in all food groups and it was the lowest in the households in the fourth, the highest income quartile
- there was seen a negative impact of the high prices of the consumer goods and services in comparison with the level and growth of incomes in the meaningful part of the Slovak households. The limit for the level of poverty in the households with two children has risen since 2005 from 142 720 SKK (3564 EUR) to 203 932 SKK (6037 EUR) in 2008 (EU SILC 2008). After social transfers, there were below the poverty line 10% of households with two children and 33% of households with three or more dependent children.

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