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ANALYSIS OF INEQUALITY IN THE CONSUMPTION OF FOODSTUFFS AND BEVERAGES – THE EXAMPLE OF THE CZECH REPUBLIC

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Abstract

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The report focuses on the assessment of the rate of inequality in the consumption of foodstuffs and beverages by households in the Czech Republic. It analyzes the said inequality on the basis of data from the Family Account Statistics for the period of 2001–2009. The main methodical tools for the performed analysis are the quantification of the Gini coefficient of natural consumption and the consumption expenditures for foodstuffs and beverages of Czech households, the construction, quantification and verification of consumption functions. The obtained results evidence a greater balance in the consumption of foodstuffs and beverages than which is shown by the allocation of the overall expenditures or income of Czech households. At the same time, the said inequality in the consumption of foodstuffs and beverages is characterized by a slightly declining tendency in time. With regard to individual categories of foodstuffs and beverages, the greatest inequality can be defined in the case of dispensable commodities, which are consumed by quantitatively wealthier strata of the population, who are simultaneously willing to pay a higher price for them. Thus, for a number of commodities, we can note the greater quality of foodstuffs and beverages consumed by higher income groups. These commodities may primarily be characterized as having a greater price elasticity. On the other hand, there are foodstuffs in the case of which consumers react more flexibly to changes in income, but whose consumption is relatively stable. Therefore, inequality of consumption is not unequivocally associated with income elasticity, but rather with price elasticity.

inequality, expenditures, consumption, consumption functions, Gini coefficient, foodstuffs, beverages

Equality in the allocation of consumption of foodstuffs and beverages in society significantly determines economic prosperity in society. Some economists actually even consider the allocation of consumption expenditures to be a more significant indicator of the level of prosperity in society than the allocation of income. An analysis of inequality in the consumption of foodstuffs can thus provide a basis for the creation of policies aiming at achieving greater equality in society and thereby also the greater prosperity of its members.

The objective of the article is therefore to assess the level of inequality in the consumption of foodstuffs and beverages of households in the Czech Republic in the years 2001–2009. This main objective is broken down into the following partial objectives:

a) Identification of the basic development tendencies in the consumption of selected categories of foodstuffs and beverages within the analyzed period.
b) Identification of inequalities in monetary expenditures for foodstuffs and beverages.

c) A definition of the differences in the natural consumption of individual income groups.
d) Determination of price elasticity and income elasticity for selected commodities and identification of their link to inequality.

The submitted article first provides information on theoretical approaches to inequality in the distribution of consumption expenditures with a focus on foodstuffs and beverages and the existing situation with regard to the matters being studied. Subsequently, there is a methodical section that also includes a definition of the utilized data sources. Chapter No. 3 includes an analysis of the consumption of selected foodstuffs and beverages as regards the trends and significance within consumption expenditures for foodstuffs. Subsequently, there is a construction of the rate of inequality in the distribution of consumption expenditures for foodstuffs and beverages and natural consumption. The said chapter also includes the results of quantified consumption functions for the selected goods, from which price elasticity and income elasticity are defined. Within the discussion, the obtained results are confronted with previously conducted studies. The last chapter summarizes the conclusions of the conducted study.

1 Overview of the results of previous studies

Expenditures for foodstuffs and beverages constitute a significant part of monetary expenditures of households. The distribution of total expenditures for foodstuffs and beverages between individual income groups is considered by a whole range of authors to be an appropriate indicator of economic prosperity (Lazaridis, 2000; Haq, Arshad, 2010). Authors Blaylock and Blisard (1989), who analyzed income inequality and inequality in the distribution of expenditures for foodstuffs in the USA in the period from 1980 to 1985, actually even consider inequality of monetary expenditures for foodstuffs to be a significant barometer of the prosperity of households in the USA.

Measuring inequalities in distribution of expenditures for foodstuffs between individual income groups gains significance primarily in the construction of various political decisions and measures or subsequently when determining their effectiveness.

The consumption of foodstuffs and beverages embodies assorted components with various shares in the total monetary expenditures for foodstuffs and beverages. With this regard, it is important to also monitor inequality in the consumption of individual foodstuffs and beverages. For example, Garner (1993) states that understanding the effect of individual components on expenditure inequality is significant primarily with regard to the construction of various taxes and subsidies that have an effect on the consumer. These are primarily value added tax, excise taxes or various subsidies for foodstuffs or agricultural commodities. Of foreign authors, those focusing on inequality in monetary expenditures for foodstuffs and beverages primarily include authors Blaylock and Blisard (1989), McDowell *et al.* (1997) and Lazaridis (2000), who quantified the Gini coefficient of monetary expenditures and conducted its decomposition for the purpose of defining the effect of expenditures for foodstuffs on overall inequality. On the other hand, Aguiar and Bils (2009) examined expenditure inequality of 20 commodities, including foodstuffs and alcoholic beverages, on the basis of a demand model, which was to define the relationship between expenditure inequality and income inequality with the help of income elasticity. The conclusions of their study show a low income elasticity of foodstuffs (around 0.5% on average) and a weak link between income inequality and expenditure inequality in the case foodstuffs.

In the Czech Republic, inequality in the consumption of foodstuffs within the individual income groups of households was the focus of author Štiková *et al.* (2009), who compared the consumption of foodstuffs and beverages expressed at constant prices of the individual income groups with an average consumption, specifically in the years 2000, 2003, 2005. The results of their study show that *in households included in the 1st decile, there is a relatively high consumption of basic raw materials and, on the other hand, a very low consumption of so-called dispensable foodstuffs (primarily alcoholic beverages).* In their study, the said basic foodstuffs are as follows: milk, pasta, regular baked goods, bread. According to their study, dispensable foodstuffs can also be considered to include fruit juices and mineral waters, beef, fish, fruit and vegetables. Their results further show that households with the highest income purchase foodstuffs for a higher price and thus also generally higher quality foodstuffs and with a higher added value. According to the above, we may assume a difference between natural and expenditure inequality in the consumption of foodstuffs by households in the Czech Republic.

2 Methodical approaches and data sources

From the objectives of the work and previous research, the following working hypotheses may be defined:

H_1: Consumption inequality (expenditure inequality as well as natural inequality) is greater for dispensable categories of foodstuffs and beverages.
H_2: Inequality quantified from natural consumption is more stable in time than expenditure inequality.
H_3: The consumption of basic foodstuffs and non-alcoholic beverages is inflexible in terms of income as well as price.
H_4: Lesser inequality is found in the case of foodstuffs and beverages with a low consumption in terms of income.

In order to fulfill the above objectives and verify the said hypotheses, one of the basic measures of inequality was quantified – the Gini coefficient, which is commonly calculated in order to measure inequality in the allocation of income, according to the following formula 2.1 (see FAO, 2006):

$$G = \frac{2}{\bar{Y}} Cov(Y, F(Y)), \tag{2.1}$$

where:
Cov represents a covariance between the income level $Y = (y_1,\ldots..y_n)$ and the cumulative distribution of income $F(y) = (f(y_1),\ldots,f(y_n))$, $f(y_i)$ is equal to the order y_i divided by the number of observations n, represents the average income.

According to Lazaridis (2000), the above formula 2.1 can also be used for the quantification of inequality in the distribution of monetary expenditures for foodstuffs and beverages. Thus, in the submitted article, Gini coefficients are quantified according to relationship 2.1 for monetary expenditures for individual categories of foodstuffs and beverages, as well as Gini coefficients for natural consumption of such categories of foodstuffs and beverages.

The quantification of Gini coefficients is further supplemented with the construction and quantification of consumption functions with dummy variables of individual income groups. The purpose of the quantification of the consumption model is a definition of the rate of price and income influences on consumption behavior, based on the quantification of price elasticity and income elasticity, and finding the relationship between the said elasticities and inequality. The inclusion of dummy variables in the specification of consumption functions additionally enables the definition of differences in basic consumption of selected commodities between various income groups. Generally, the applied model of consumption power function can be expressed in linearized form by way of the following relationship No. 2.2:

$$\ln C_{it} = \ln \alpha + \beta_P \ln P_{it} + \beta_{CPP} \ln CPP_{kt} + \beta_2 I_2 + \beta_3 I_3 + \\ + \beta_4 I_4 + \beta_5 I_5 + \beta_6 I_6 + \beta_7 I_7 + \beta_8 I_8 + \beta_9 I_9 + \beta_{10} I_{10} + u_t, \tag{2.2}$$

where:
C_{it} is the annual consumption of *i-th* goods in time t in natural units (kg/person, l/person, pieces/person), P_{it} is the price of *i*-th goods in time t (CZK/kg, or CZK/l, or CZK /piece), CPP_{kt} is the average annual disposable income of a consumer in the *k-th* income group in time period t (thousands of CZK/year), I_k for $k = 2, \ldots, 10$ are dummy variables of individual income groups, u_t is a random element with a presumed normal distribution of $u_{kt} \sim N(0,\sigma^2)$, $k = 1, 2, \ldots, K$, $t = 1, 2, \ldots T$ and α is the constant of the model, expressing the consumption of the lowest income group, β are the parameters of the said function.

This is thus a fixed effects model, the parameters of which were quantified by way of the generalized least squares method on the base of panel data. The quality of the obtained estimates was verified by way of standard statistical methods. The statistical significance of estimated parameters was tested by way of the t-test. The concordance of the estimated model with the empirical data was quantified by way of a multiple determination coefficient, in adjusted from, and verified by way of the F-test. The accuracy of the specification of the model was tested by way of the following methods:

a) the construction of a model taking into consideration individual specifics, i.e. a fixed effects model as opposed to a model with an identical constant, was tested by way of the Baltagi-Li Lagrange Multiplier test (Greene, 2008);
b) the inclusion of individual specifics in the random element, i.e. a random effects model as opposed to a fixed effects model, was tested by way of the Hausman test (Wooldridge, 2002);
c) the significance and legitimacy of all explanatory variables was tested by way of the Wald (Greene, 2008).

The presumptions regarding the qualities of the random element were verified by way of the AR random element autocorrelation test and the Wald heteroscedasticity test (see Greene, 2008). The proven heteroscedasticity or autocorrelation of residues was subsequently eliminated by way of the transformation of variables of a balanced panel (for more see Greene, 2008). The estimates of parameters and relevant tests were conducted through econometric programs PcGive 12 and Gretl 1.8.7.

2.1 Data basis

For the purposes of performing the analysis of the inequality of the consumption of foodstuffs and beverages in Czech households, panel data from the Family Account Statistics (hereinafter the "FAS") for the time period of 2001–2009 were utilized, specifically broken down according to deciles, for which the Czech Statistics Office uses the indicator of net monetary income per person. The said examination monitors the economic activity of private households and provides information on the amount of their expenditures and the structure of market consumption, including in a natural expression. The said investigation also enables us to obtain information on net monetary income as well as on average prices.

For the classification of consumption expenditures within the FAS, the CZ-COICOP classification ("Classification of individual consumption according to purpose") has been utilized since 1999. Expenditures according to CZ-COICOP are sorted into 12 sections, whereby for the purposes of this article, section 01 – "Foodstuffs

and nonalcoholic beverages" and section 02 – "Alcoholic beverages, tobacco" have been utilized. Within the said sections, the natural consumption of 41 foodstuffs and beverages is monitored, of which 31 enter into the analysis in the submitted article. This pertains only to the direct consumption of foodstuffs in households. In this case, the FAS do not include the volume of foodstuffs consumed within the public eating network and off-market consumption, whereby its results differ from comprehensive statistics of consumption and price as shown by the Czech Statistics Office.

3 RESULTS

3.1 Characteristics of development tendencies of consumption of foodstuffs and beverages

Households in the reporting set, regardless of the nature and structure of the household, expended approximately 89% of the resources of their net income in 2009 for consumption. Out of the said expenditures, a 17.4% share was expenditures for foodstuffs and a 9.4% share of expenditures for alcoholic and nonalcoholic beverages. In a more long-term view, expenditures for foodstuffs and beverages may be characterized as having a growing trend tendency. In the course of the analyzed time period of 2001–2009, expenditures for foodstuffs increased by 21.6% and expenditures for beverages increased by 16.8%.

As regards the individual types of foodstuffs, the most significant growth was seen in expenditures for bakery products and cereals (31.4%), and further also for vegetables and potatoes (28.3%), while the most moderate increase occurred in the case of oils and fats (13.4%) and foodstuff products and preparations (13.6%).

In the case of beverages, the most significant growth occurred with regard to wine (26.9%) and with regard to coffee, tea and cocoa (24.5%), while in the case of spirit, there was a decline of 11%.

For a number of products, the said growth in consumption expenditures was not caused by a real increase in consumption, but rather by a growth in the prices of the analyzed commodities. The most significant price increase for the entire analyzed period was seen in the case of bakery products and cereals. The price of rice increased by 65.4%, and the price of regular baked goods increased by 58.7%. Bread prices increased by 57.2%, 40.3% for pasta and 11.9% for long-life baked goods. The said price changes meant a decline in the natural consumption of a number of bakery products. A more significant increase can only be identified in the case of pasta, specifically by 26.6%.

In the case of vegetables and potatoes, the trend was different. Prices of the said commodities were more or less constant, or showed only a slight increase, see the trend in the price of potatoes with a 10% growth for the analyzed period of 2001–2009. However, in the case of the said commodities, there are considerable changes occurring in natural consumption. The consumption of fruit vegetables grew in the course of the analyzed period by 33.9%, and the consumption of potatoes grew by 33%. However, the most significant growth in consumption occurred in the case of fruit, specifically in the case of stone fruits and berries, whose declining price (by 14.2%) as well as the change in consumer habits caused a 69.2% growth in natural consumption.

With regard to growth of natural consumption, we cannot omit the consumption of meat, specifically poultry (an increase of 39.2%), pork (by 40.7%), and especially beef (by 45.6%), this being despite the increasing price of beef (by 14.8%) and the constant price of poultry. Only the consumption of pork reacted to price changes in accordance with economic theory; specifically to a decrease of 10.3%.

The consumption of beverages with the exception of spirit showed an inertial tendency, despite the fact that the price of wine grew by 29.6% and the price of beer grew by 23.5% within the analyzed set. However, there was a significant decline in the consumption of spirit, the consumption of which decreased by 21.3% with a growth in price of 20.2%.

3.2 Inequality in consumption of foodstuffs and beverages

Inequality in the consumption of foodstuffs and beverages can be examined from the viewpoint of expenditure inequality, taking into account price disparity of foodstuffs and beverages purchased by individual income groups of consumers, as well as from the viewpoint of natural consumption. The Gini coefficients for both categories of inequality are set out in Tab. I and II.

From a more general viewpoint, the rate of inequality of consumer expenditures for foodstuffs and beverages exceeds the rate of inequality of natural consumption. The Gini coefficient for expenditure inequality was at an average level of 0.096 within the analyzed time period of 2001–2009, while the inequality of natural consumption reached an average value of 0.083 Gini coefficient points. The said Gini coefficient values are relatively low in view of the values of the total expenditure inequality or income inequality, which, in the Czech Republic in the course of the analyzed time period, reached an average value of 0.190 for total expenditure inequality and 0.213 for the inequality of disposable income. However, in view of the fact that this pertains to the consumption of foodstuffs, even the said inequality is considered to be significant, primarily when taking into consideration the fact that data sources describe the consumption of foodstuffs without public meals, which would significantly deepen the said inequality.

From a time perspective, we can see a positive trend in the decline of both analyzed inequalities in the consumption of foodstuffs and beverages, see the different between years 2001 and 2009 in

I: *Gini coefficients of consumption expenditures*

Commodity	Average	Standard deviation	Year								
			2001	2002	2003	2004	2005	2006	2007	2008	2009
Bread	0.052	0.008	0.041	0.048	0.051	0.044	0.046	0.052	0.066	0.058	0.063
Wheat-flour	0.027	0.004	0.030	0.032	0.027	0.023	0.022	0.029	0.023	0.020	0.033
Biscuits, crisp bakery products	0.050	0.004	0.049	0.054	0.045	0.047	0.049	0.053	0.050	0.043	0.058
Soft pastries, cakes	0.095	0.006	0.095	0.087	0.091	0.095	0.090	0.109	0.097	0.089	0.098
Pasta	0.058	0.004	0.056	0.056	0.055	0.063	0.058	0.056	0.063	0.053	0.066
Rice	0.044	0.009	0.049	0.040	0.036	0.034	0.030	0.053	0.051	0.054	0.052
Pork	0.085	0.012	0.101	0.099	0.085	0.084	0.092	0.073	0.076	0.063	0.089
Beef	0.138	0.005	0.133	0.142	0.138	0.133	0.147	0.143	0.135	0.133	0.140
Sausages	0.097	0.005	0.101	0.100	0.100	0.099	0.099	0.099	0.090	0.087	0.099
Poultry	0.100	0.008	0.110	0.107	0.108	0.099	0.100	0.107	0.092	0.083	0.094
Fish	0.121	0.008	0.120	0.121	0.130	0.126	0.118	0.118	0.119	0.101	0.132
Milk*	0.004	0.006	-0.002	0.003	0.002	-0.004	-0.002	0.010	0.007	0.005	0.017
Cheese	0.114	0.002	0.116	0.112	0.114	0.113	0.114	0.119	0.113	0.113	0.117
Eggs	0.078	0.006	0.085	0.089	0.076	0.070	0.076	0.079	0.075	0.069	0.083
Butter	0.069	0.009	0.070	0.082	0.078	0.071	0.064	0.060	0.077	0.054	0.064
Edible oils	0.073	0.006	0.070	0.073	0.078	0.066	0.076	0.076	0.082	0.063	0.076
Vegetable and other fats	0.042	0.009	0.044	0.045	0.047	0.029	0.042	0.060	0.043	0.030	0.036
Citrus fruits	0.113	0.008	0.108	0.117	0.118	0.125	0.121	0.106	0.116	0.101	0.102
Bananas	0.096	0.006	0.089	0.106	0.102	0.093	0.100	0.087	0.093	0.097	0.092
Apples, pears	0.096	0.012	0.104	0.094	0.111	0.092	0.094	0.088	0.117	0.074	0.088
Stone fruits and berries	0.163	0.014	0.180	0.182	0.177	0.162	0.167	0.150	0.156	0.138	0.152
Tomatoes, peppers, cucumber	0.139	0.008	0.148	0.146	0.150	0.138	0.138	0.131	0.139	0.122	0.140
Pulses	0.060	0.017	0.060	0.061	0.073	0.053	0.059	0.051	0.062	0.095	0.028
Potatoes	0.062	0.010	0.072	0.072	0.074	0.065	0.065	0.056	0.042	0.055	0.059
Sugar	0.012	0.014	0.007	0.017	0.008	0.019	0.000	0.013	0.034	-0.016	0.022
Chocolate products	0.106	0.009	0.103	0.097	0.099	0.104	0.106	0.125	0.116	0.098	0.102
Fruit and vegetables juices	0.163	0.013	0.173	0.144	0.163	0.177	0.170	0.182	0.154	0.156	0.146
Mineral water	0.127	0.011	0.139	0.142	0.135	0.130	0.126	0.128	0.121	0.108	0.113
Spirits	0.191	0.015	0.200	0.187	0.214	0.206	0.208	0.175	0.169	0.179	0.181
Wine	0.247	0.009	0.247	0.238	0.243	0.252	0.260	0.245	0.231	0.245	0.261
Beer	0.159	0.015	0.164	0.173	0.169	0.174	0.176	0.149	0.142	0.150	0.134
Average	0.096	0.003	0.099	0.099	0.100	0.096	0.097	0.096	0.095	0.088	0.095

Source: Own data processing

* Note: The negative value of Gini coefficient is caused by a negative covariance between the cumulative distribution of income and the consumption expenditures level

Tab. I and II. Thus, this is an expression of a positive trend of equalization in the amount of consumed foodstuffs and beverages in the individual income groups; nevertheless, though, lower income groups still prefer less expensive foodstuffs and beverages.

With regard to the individual categories, we see a greater inequality for beverages than for foodstuffs. Out of the analyzed types of beverages, the greatest inequality can be defined in the consumption of wine, where the Gini coefficient reaches an average value of 0.247 in the case of consumption expenditures (see Tab. I) and 0.213 in the case of natural consumption, see Tab. II.

The said inequality is relatively stable in time; the Gini coefficients deviate from it on average within the individual years by 0.009 in monetary terms and by 0.007 in natural units. The mutual comparison of expenditure inequality and natural consumption inequality shows the effect of prices on a deepening of inequality. Not only do consumers from higher income groups consume more wine, specifically up to four times, when comparing the last and first income group, but they are also willing to pay a higher price for it. For example, the last income group, as an average of the analyzed years, purchased wine that was 20.5% more expensive than the first income group.

We can similarly also characterize the consumption of spirit and beer. In this case as well, we can see the willingness of consumers from higher income groups to expend a higher price and to thus consume higher quality alcoholic beverages. For the said categories, price disparity between the highest and lowest income group reaches an average of 13.1% in the case of liquors and 9.3% in the case of beer.

II: *Gini coefficients of natural consumption*

Commodity	Average	Standard deviation	Year								
			2001	2002	2003	2004	2005	2006	2007	2008	2009
Bread	0.037	0.005	0.032	0.036	0.036	0.028	0.034	0.038	0.042	0.039	0.046
Wheat-flour	0.015	0.005	0.022	0.022	0.015	0.010	0.010	0.019	0.010	0.010	0.018
Biscuits, crisp bakery products	0.041	0.004	0.040	0.045	0.036	0.037	0.040	0.044	0.043	0.036	0.049
Soft pastries,	0.078	0.006	0.078	0.069	0.075	0.077	0.075	0.087	0.085	0.075	0.084
Pasta	0.020	0.007	0.022	0.024	0.021	0.019	0.015	0.009	0.024	0.012	0.036
Rice	0.031	0.013	0.047	0.028	0.029	0.018	0.021	0.045	0.008	0.048	0.035
Pork	0.075	0.013	0.092	0.093	0.072	0.072	0.085	0.070	0.071	0.046	0.077
Beef	0.129	0.006	0.120	0.131	0.130	0.120	0.133	0.138	0.124	0.128	0.134
Sausages	0.074	0.006	0.078	0.076	0.076	0.074	0.076	0.078	0.064	0.065	0.081
Poultry	0.083	0.010	0.097	0.092	0.092	0.078	0.082	0.090	0.070	0.064	0.087
Fish	0.115	0.033	0.110	0.109	0.117	0.108	0.099	0.096	0.205	0.081	0.115
Milk*	-0.003	0.006	-0.009	-0.005	-0.005	-0.009	-0.005	0.004	-0.003	-0.003	0.008
Cheese	0.109	0.003	0.110	0.107	0.107	0.108	0.108	0.112	0.116	0.104	0.106
Eggs	0.074	0.007	0.084	0.085	0.070	0.066	0.073	0.076	0.073	0.065	0.080
Butter	0.069	0.010	0.069	0.082	0.075	0.069	0.062	0.061	0.086	0.051	0.062
Edible oils	0.032	0.010	0.046	0.045	0.041	0.029	0.031	0.036	0.020	0.013	0.029
Vegetable and other fats	0.028	0.011	0.031	0.032	0.032	0.011	0.027	0.049	0.027	0.012	0.029
Citrus fruits	0.107	0.006	0.101	0.109	0.111	0.116	0.114	0.103	0.113	0.099	0.099
Bananas	0.093	0.006	0.089	0.104	0.101	0.093	0.097	0.081	0.091	0.093	0.090
Apples, pears	0.083	0.012	0.092	0.077	0.092	0.077	0.080	0.081	0.110	0.065	0.077
Stone fruits and berries	0.146	0.012	0.157	0.165	0.153	0.135	0.147	0.150	0.145	0.120	0.141
Tomatoes, peppers, cucumber	0.129	0.007	0.138	0.134	0.140	0.123	0.124	0.130	0.127	0.115	0.130
Pulses	0.044	0.015	0.040	0.048	0.060	0.040	0.048	0.043	0.008	0.064	0.046
Potatoes	0.065	0.010	0.069	0.066	0.071	0.063	0.060	0.087	0.054	0.060	0.051
Sugar	0.011	0.014	0.006	0.018	0.008	0.020	-0.001	0.013	0.033	-0.020	0.020
Chocolate products	0.084	0.007	0.085	0.081	0.075	0.082	0.085	0.100	0.094	0.078	0.080
Fruit and vegetables juices	0.147	0.017	0.165	0.130	0.146	0.163	0.141	0.174	0.148	0.140	0.117
Mineral water	0.118	0.012	0.130	0.133	0.127	0.124	0.116	0.121	0.111	0.098	0.099
Spirits	0.173	0.012	0.182	0.166	0.192	0.184	0.187	0.163	0.163	0.163	0.160
Wine	0.213	0.007	0.220	0.206	0.210	0.216	0.223	0.214	0.200	0.208	0.218
Beer	0.144	0.012	0.144	0.153	0.155	0.154	0.154	0.149	0.137	0.138	0.116
Average	0.083	0.004	0.087	0.086	0.086	0.081	0.082	0.086	0.084	0.073	0.081

Source: Own data processing
* Note: The negative value of Gini coefficient is caused by a negative covariance between the cumulative distribution of income and the natural consumption level

Above-average inequality can also be defined in the remaining categories of beverages, representing non-alcoholic beverages. According to the presumptions, this inequality is higher in the case of fruit and vegetable juices than in the case of mineral waters. The highest income group has a natural consumption that is 2.4 times more fruit and vegetable juices and 2.3 times more mineral waters than the first income group, with an average price disparity of 8% in the case of juices and 6% in the case of mineral waters.

With regard to foodstuffs, consumption inequality can be identified primarily in the case of fruit, vegetables, meat and cheeses. Tab. I shows that the greatest inequality in consumption expenditures was achieved in the case of stone fruits and berries, and further in the case of fruit vegetables and in the case of beef. The said inequality is once again implied not only by inequality of natural consumption, but also by price disparity. The effect of prices on inequality is most significant in the case of stone fruits and berries. Households with the highest income consume, in natural terms, three times more than households in the lowest income group, whereby they purchase the said fruit for a price that is 13% higher. In the case of fruit vegetables, the disparity of natural consumption in the analyzed years is, on average, at a level of 241% in favor of consumption by the highest income group, which also purchases the said vegetables for a price

that is, on average, 7% higher than the first income group. Beef was consumed by the highest income group 2.5 times more, on average, than the first income group, for a price that was 7% higher. The described categories of beverages and foodstuffs can be considered to be dispensable or more luxury foodstuffs.

On the other hand, regular baked goods, bread, potatoes, rice and pasta are in the category of indispensable foodstuffs. Tab. I and II show that the consumption of the said commodities is very balanced in monetary as well as natural expression. Hypothesis H_1 can thus be considered to have been verified.

In 71% of the analyzed commodities, expenditure inequality shows a greater stability as opposed to inequality of natural consumption. Inequality of natural consumption more stable in time as opposed to consumption expenditures can only be identified in the case of bread, citruses, stone fruits and berries, fruit vegetables, pulses, chocolate products and alcoholic beverages. Hypothesis H_2 is thus rejected.

The relationship between inequality and elasticities was studied by way of the consumption function model specified above. The main results of the estimate of the said function (parameter values, their statistical significance, the determination coefficient and the results of the Wald test) for the selected commodities are, in logarithmic expression, set out in Tab. III. Out of the performed estimates, only those estimates are selected which fulfilled the required statistical and econometric qualities. The Baltagi-Li LM statistics of estimated function reached values in interval $\langle 5.994; 48.051 \rangle$, which confirmed the specification of fixed effect model. Mentioned specification confirmed also Hausman test with H-statistics in interval $\langle 6.076; 56.275 \rangle$.

The quantified consumption functions show that 90% of the analyzed commodities show non-elasticity, both with regard to price changes as well as with regard to income changes. Only the consumption of stone fruits and berries and the consumption of bananas can be considered to be elastic with regard to price, because in the case of the said commodities, price elasticity is higher than 1 (in absolute expression). In view of the fact that the said commodities cannot be sorted under the category of indispensable foodstuffs, hypothesis H_3 can be considered to have been verified. With regard to inequality, the consumption of apples, pears and berries is the most unbalanced, and the consumption of bananas also shows above-average inequality.

With regard to the above viewpoint, the presumption of a mutual correlation between price elasticity of foodstuffs and the inequality of their consumption appears to be realistic.

Further comparisons show that only in the case of 42% of the analyzed commodities do consumers react more flexibly to a change of income than to a change of price. Specifically, these are pork, poultry, eggs, edible oils, apples and pears and sugar. The said enumeration of foodstuffs can be supplemented with chocolate products, where the effect of price changes is almost comparable to the effect of changes in the consumer's income.

The most significant difference in income and price flexibility is quantified in the case of sugar, where price elasticity reaches only 0.094% in the absolute value, while income elasticity is at a rate of 0.596%. The consumption of sugar is thus affected by a change in the income of Czech households, but, nevertheless, a direct link between income elasticity and consumption inequality cannot be defined in this case. That is because the consumption of sugar is very balanced, which is also evidenced by the Gini coefficient, see Tab. II.

Unlike in the case of sugar, the remaining, more income-elastic commodities are characterized as having a greater inequality of natural consumption as compared with the other foodstuffs. The only exception is edible oils. The reason for the said fact is the substitution of the said foodstuffs for more luxury commodities, being reflected in higher income groups, as evidenced by the level of basic consumption in the individual groups, see the parameters of the dummy variables that quantify disparities in basic consumption of the relevant income groups with regard to the first income group, whose basic consumption is expressed by the level of the constant. It is evident from the values of the parameters of dummy variables that the said commodities are not undergoing a constant increase in consumption in the passing into a higher income group. For example, in the case of pork, the basic consumption grows up to the fifth income group, but then subsequently with passing to the higher income groups it falls, see Tab. III. A similar trend is characteristic for apples and pears and poultry. The said commodities can thus be considered to be basic foodstuffs which are substituted by higher income groups of the population with more luxury foodstuffs, e.g. with beef or fish.

The results given above can of course be supplemented with the statement that for 58% of the analyzed commodities, consumers react more flexibly to a change in price than to a change in income. The greatest difference is evident in the case of the said stone fruits, berries and bananas. E.g. in the case of bananas, the consumer reacts to a 1% increase in price with a decline in consumption of 1.135%, but, in the case of a 1% increase in income only with an increase in consumption of 0.171% on average, ceteris paribus. The consumption of bananas is characterized by a very low income elasticity, with significant differences existing between the individual income groups, primarily in basic consumption. The higher the social standing of a household as given by its income, the higher the basic consumption of the said commodity. The said characteristic is also shown in the consumption of citruses. On the other hand, basic consumption of stone fruits and berries, as well as the consumption

III: *Consumption functions in linearized form*

Commodity		CPP	P	const.	I_2	I_3	I_4	I_5	I_6	I_7	I_8	I_9	I_{10}	R^2	Wald
Biscuits, crisp bakery	Parametr	0.094	-0.697	4.438	1.107	1.195	1.003	1.222	1.200	1.284	1.219	1.235	1.261	0.868	36.25
	t-prob.	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.00
Pork	Parametr	0.743	-0.448	1.019	0.969	1.002	1.040	1.038	0.994	0.884	0.862	0.793	0.623	0.901	315.30
	t-prob.	0.000	0.000	0.001	0.085	0.929	0.216	0.315	0.879	0.014	0.013	0.001	0.000		0.00
Sausages	Parametr	0.189	-0.711	5.101	1.133	1.258	1.362	1.381	1.405	1.368	1.418	1.450	1.448	0.962	28.72
	t-prob.	0.000	0.000	0.001	0.085	0.929	0.216	0.315	0.879	0.014	0.013	0.001	0.000		0.00
Poultry	Parametr	0.697	-0.502	1.583	0.994	1.068	1.068	1.062	1.050	0.962	0.950	0.888	0.713	0.930	189.50
	t-prob.	0.000	0.000	0.000	0.685	0.003	0.015	0.053	0.173	0.352	0.295	0.046	0.000		0.00
Fish	Parametr	0.575	-0.747	2.247	1.075	1.143	1.143	1.156	1.156	1.097	1.126	1.158	1.000	0.899	58.77
	t-prob.	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.001	0.065	0.049	0.075	0.997		0.00
Cheese	Parametr	0.584	-0.794	3.280	1.033	1.037	1.055	1.048	1.055	1.077	1.032	1.016	0.943	0.973	434.70
	t-prob.	0.000	0.000	0.000	0.000	0.007	0.001	0.009	0.008	0.001	0.269	0.622	0.162		0.00
Milk	Parametr	0.127	-0.179	3.903	0.981	1.034	1.040	1.018	0.989	0.946	0.915	0.906	0.864	0.609	32.20
	t-prob.	0.001	0.001	0.000	0.071	0.029	0.036	0.396	0.649	0.051	0.009	0.016	0.008		0.00
Eggs	Parametr	0.360	-0.190	3.174	1.043	1.233	1.345	1.326	1.236	1.162	1.201	1.171	1.062	0.937	66.77
	t-prob.	0.000	0.015	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.322		0.00
Butter	Parametr	0.638	-0.468	0.447	1.037	1.166	1.238	1.190	1.129	1.017	0.958	0.852	0.753	0.940	121.80
	t-prob.	0.000	0.000	0.052	0.052	0.000	0.000	0.000	0.006	0.738	0.468	0.028	0.004		0.00
Edible oils	Parametr	0.618	-0.351	0.343	0.942	0.931	0.919	0.918	0.926	0.814	0.774	0.720	0.585	0.806	126.30
	t-prob.	0.000	0.000	0.171	0.000	0.001	0.001	0.003	0.018	0.000	0.000	0.000	0.000		0.00
Citrus fruits	Parametr	0.286	-0.361	1.854	1.146	1.314	1.511	1.492	1.511	1.471	1.467	1.447	1.524	0.945	74.90
	t-prob.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.00
Bananas	Parametr	0.171	-1.135	4.641	1.108	1.163	1.315	1.227	1.303	1.350	1.316	1.432	1.506	0.920	278.40
	t-prob.	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.00
Apples, pears	Parametr	0.772	-0.588	0.461	0.961	0.991	1.012	0.996	0.930	0.889	0.855	0.753	0.663	0.846	235.40
	t-prob.	0.000	0.000	0.060	0.004	0.664	0.618	0.891	0.025	0.002	0.001	0.000	0.000		0.00
Stone fruits and berries	Parametr	0.791	-1.475	3.376	1.131	1.255	1.421	1.268	1.355	1.326	1.241	1.223	1.190	0.944	1430.00
	t-prob.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.037	0.172		0.00
Sugar	Parametr	0.596	-0.094	0.184	0.912	1.006	1.002	0.997	0.884	0.758	0.741	0.627	0.515	0.720	143.10
	t-prob.	0.000	0.071	0.562	0.000	0.781	0.949	0.921	0.001	0.000	0.000	0.000	0.000		0.00
Chocolate products	Parametr	0.653	-0.632	1.204	1.068	1.159	1.183	1.175	1.140	1.073	1.004	0.941	0.875	0.946	235.20
	t-prob.	0.000	0.028	0.417	0.000	0.000	0.000	0.000	0.000	0.060	0.938	0.280	0.077		0.00
Fruit and vegetable juices	Parametr	0.355	-0.961	2.976	1.075	1.045	1.117	1.079	1.182	1.274	1.407	1.504	1.576	0.910	50.26
	t-prob.	0.000	0.000	0.000	0.001	0.178	0.006	0.099	0.001	0.000	0.000	0.000	0.000		0.00
Mineral water	Parametr	0.167	-0.902	5.143	1.233	1.367	1.517	1.511	1.552	1.632	1.707	1.823	1.894	0.944	110.20
	t-prob.	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.00
Wine	Parametr	0.556	-0.919	2.679	1.274	1.295	1.395	1.514	1.597	1.595	1.910	2.037	2.271	0.977	50.91
	t-prob.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.00

Source: Own data processing

of apples and pears, shows a growing diversity among income groups only up to the fifth or sixth income group. In higher income groups, basic consumption declines, specifically almost to the level of the second income group.

The greatest inequality in natural consumption of selected foodstuffs is evident in the case of stone fruits and berries, which also show the highest income elasticity out of the analyzed commodities. The foodstuffs coming closest to its value are apples, pears and pork, whose consumption is also characterized by higher inequality as compared to other foodstuffs. On the other hand, similar Gini coefficient values are also found in the case of smoked meats ($Gini_{2009}$ = 0.081, $Gini_{2001}$ = 0.078), for example, whose income elasticity is low (0.189%). A similar situation applies to milk, the said bananas, as well as citruses. That provides the conclusion that an unequivocal relationship between inequality in consumption and income elasticity cannot be defined.

On the other hand, the highly unequal consumption of beverages can be characterized as having a higher price elasticity. For all analyzed beverages, the price elasticity approaches one. Out of the analyzed beverages, income elasticity is the lowest in the case of mineral waters, for which there is also the lowest difference between the real consumption of the last and first income group. On the other hand, the greatest difference is evident in the case of the consumption of wine, which also has the greatest income elasticity. Basic consumption of all monitored beverages shows an increasing tendency in the transition to higher income groups.

In the case of beverages, the assumption of the mutual relationship between income elasticity or price elasticity and consumption inequality thus appears to be more likely than in the case of foodstuffs. We can then generalize the fact that there is more inequality of consumption in the case of commodities with a higher price elasticity.

Hypothesis H_4 thus cannot be considered verified, but not disproved either.

The values of parameters of dummy variables show a significant inequality in the basic consumption of a range of analyzed commodities between the individual income groups. In this regard, the highest inequality is seen in the consumption of bananas (the Gini coefficient of basic consumption = 0.125), followed by the consumption of citruses (0.110). On the other hand, the lowest inequality of consumption is seen in cooking oils (Gini = 0.005) and butter (0.006). We can thus state that inequality in the consumption of bananas, citruses, as well as smoked meats, for example, originates in other characteristics of individual income groups rather than in the amount of income. These characteristics might include, for example, the number of children in reporting households, the education of their members, localization of households in rural or urban areas.

4 DISCUSSION

Štiková *et al.* (2009) defined a high inequality in the consumption of wine, spirits, fruit and vegetable juices, mineral waters, beef, fish, beer, fruit and vegetables, specifically on the basis of differences in consumption in the 1st and 10th decile as compared to average consumption. The said results are also confirmed by the study presented above, which thus enables the making of a more general conclusion regarding higher inequality in the consumption of dispensable foodstuffs. Lazaridis (2000) proposes the taxation of dispensable commodities in order to achieve a higher equality of taxation of such dispensable commodities, while in the case of basic foodstuffs, whose consumption prevails in lower income groups, he recommends the introduction of subsidies. The said approach contributes to greater equality, but, nevertheless, at the expense of losses of economic effectiveness, which increase along with the increasing elasticity of demand for the given commodities.

The submitted study does show the income inelasticity as well as price inelasticity of most foodstuffs. Income elasticity reaches an average value of 0.47%, which corresponds to the results of Aguiar and Bils (2009) as well as the results of Park *et al.* (1996). Unlike the results of Park *et al.* (1996), consumers react more flexibly to a change in price than to a change in income in the case of most foodstuffs and beverages, and thus the taxation of commodities may be considered a very effective tool in order to achieve equality. Nevertheless, in the case of the most unequally consumed commodity (stone fruits and berries), a flexible reaction to a change in price was identified, which can lead to high losses in dead weight. In a study by Park *et. al* (1996), a similar reaction can only be defined in the case of fish, milk, oils and fats.

The direction of the influence of prices as well as income on the consumption of foodstuffs and beverages in the submitted study, just as in the study by Park *et al.* (1996), corresponds to economic theory. However, an opposing assertion can be found in the work by Štiková *et al.* (2006), according to whom only the consumption of beef, eggs, milk, bread and regular baked goods, flour, sugar, potatoes and oils reacts to price in the stated manner. On the other hand, the consumption of poultry, cheeses, fine baked goods, long-life baked goods, vegetables, temperate zone fruits, chocolate and chocolate candies grows along with an increase in price.

According to their study, the consumer thus reacts to a change in prices primarily in the case of basic products. However, it has been proven in the submitted study that more flexible price reactions also occur in the case of dispensable commodities.

5 CONCLUSIONS

Expenditures for foodstuffs and beverages constitute a significant portion of the consumption expenditures of Czech households. Equality in their distribution among the individual income groups is an important indicator of the equality and prosperity of all of society. In the Czech Republic in the years 2001–2009, an average inequality of natural consumption of foodstuffs at a level of 0.083 Gini coefficient points was quantified. The effect of prices slightly exceeds the said inequality, as expenditure inequality reaches a value of 0.096 Gini coefficient points. Higher income groups thus purchase foodstuffs for a higher price, which likely means the consumption of higher quality foodstuffs in higher income groups and of foodstuffs of a higher added value. The said inequality is stable in time. However, when comparing the years 2009/2001, a slight decrease in inequality can be quantified.

As regards the individual categories, a higher expenditure inequality as well as consumption inequality is evident for beverages than for foodstuffs. Specifically, the greatest inequality can be seen in the consumption of wine. For foodstuffs, the most unequal is the consumption of stone fruits and berries. At the same time, the said fruits are characterized by a high price elasticity as well as income elasticity as compared to other categories of foodstuffs. The price elasticity as well as income elasticity are also high in the case of wine as mentioned above. However, high values of income elasticity can also be found in the case of foodstuffs whose consumption is relatively equally distributed among the individual income groups, e.g. long-life baked goods, edible oils. The relationship between income elasticity and inequality thus

cannot be positively defined and needs to be subjected to further examination. Inequality in consumption is associated with price elasticity. That also corresponds to the conclusion that inequality is more significant in categories of dispensable foodstuffs, which include not only the said wine and fruit, but also beef, fish, or vegetables.

The conclusions of the presented study are applicable in political decision making with regard to taxation, or the subsidizing of foodstuffs and beverages. If the goal is greater equality in society, then the recommendation may be for the taxation of commodities consumed primarily by higher income groups and subsidies for commodities predominating in the consumption of households with low income. Nevertheless, it is necessary to also take into consideration losses in effectiveness that the said taxation brings about and the extent of which grows specifically along with a more flexible reaction on the part of consumers.

SUMMARY

Equality in the distribution of the consumption of foodstuffs and beverages in society significantly determines the economic prosperity of society. The goal of the article is thus to assess the level of inequality in the consumption of foodstuffs and beverages by households in the Czech Republic in the years 2001–2009, including a determination of the relation between inequality in natural consumption as well as consumption expenditures and the price elasticity and income elasticity of consumption.

The methodical tools of the performed analysis are quantification of the Gini coefficient of natural consumption as well as of consumption expenditures for foodstuffs and beverages by Czech households, the construction, quantification and verification of consumption functions, enabling the determination of income and price elasticity and a definition of the relation between the said elasticities and inequality. The data for the said analyses have been obtained from the Family Account Statistics, kept by the Czech Statistics Office.

The obtained results evidence the greater equality of consumption of foodstuffs and beverages than that which is shown in the distribution of overall expenditures or income of Czech households. At the same time, the said inequality in the consumption of foodstuffs and beverages is distinguished with a slightly declining tendency in time.

With regard to the individual categories of foodstuffs and beverages, the greatest inequality can be defined in the case of dispensable commodities, which are consumed by quantitatively wealthier population strata and they are simultaneously willing to pay a higher price for them. In the case of a number of commodities, we can thus see a greater quality of the foodstuffs and beverages consumed by higher income groups. As an example, we could mention wine, fruit and vegetable juices, fruit, beef, fish, or vegetables. These commodities can be mainly characterized as having a higher price elasticity. Commodities with a higher income elasticity, such as sugar, for example, are characterized with a below-average consumption inequality, but, nevertheless, there are also categories here for which Gini coefficient values exceed the average, such as in the case of pork, for example. Inequality of consumption is thus not unequivocally associated with income elasticity, but rather with price elasticity. The conclusions of the presented study are applicable to political decision making with regard to taxation, or subsidies for foodstuffs and beverages.

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