Regionálne disparity v spotrebných výdavkoch domácností na Slovensku

Regional Disparities in Household Consumption Expenditure in Slovakia

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Abstrakt
Porozumenie regionálnym rozdielom vo výdavkoch domácností je nevyhnutné pre efektívne formovanie sociálnej a regionálnej politiky. Cieľom tohto článku je analyzovať regionálne rozdiely vo výdavkoch slovenských domácností na základe dát zo zisťovania Rodinné účty. Analýza sa zameriava na 12 kategórií výdavkov podľa klasifikácie COICOP a porovnáva ich medzi ôsmimi krajmi Slovenska s využitím viacrozmerných štatistických metód – viacrozmerná analýza rozptylu a permutačná viacrozmerná analýza rozptylu. Výsledky ukazujú, že hoci Bratislavský kraj vykazuje najvyššie celkové výdavky, štruktúra výdavkov v relatívnom vyjadrení je medzi krajmi pomerne podobná, s dominanciou základných potrieb (bývanie a potraviny). Výsledky boli doplnené Bonferroniho post-hoc testom, ktorý identifikoval štatisticky významné rozdiely medzi jednotlivými krajmi. Bratislavský kraj vykazuje signifikantne vyššie výdavky oproti všetkým ostatným krajom v kategóriách bývanie; reštaurácie a hotely; pošty a telekomunikácie; odevy a obuv.

Kľúčové slová
rodinné účty, domácnosti, výdavky, spotreba, viacrozmerná analýza rozptylu, permutačná viacrozmerná analýza rozptylu

Abstract
Understanding regional differences in household expenditure is essential for the effective formulation of social and regional policy. The aim of this paper is to analyse regional differences in the expenditure of Slovak households based on data from the Household Budget Survey. The analysis focuses on 12 categories of expenditures according to the COICOP classification and compares them across the eight regions of Slovakia using multivariate statistical methods – Multivariate Analysis of Variance and Permutational Multivariate Analysis of Variance. The results show that although the Bratislava region reports the highest total expenditures, the relative structure of expenditures is similar across regions, dominated by basic needs (housing and food). The results were supplemented by the Bonferroni post-hoc test, which identified statistically significant differences between individual regions. The Bratislava region shows significantly higher expenditures compared to all other regions in the categories of housing; restaurants and hotels; postal services and telecommunications; and clothing and footwear.

Key words
household budget survey, households, expenditure, consumption, Multivariate Analysis of Variance, Permutational Multivariate Analysis of Variance

JEL classification
R29, C19

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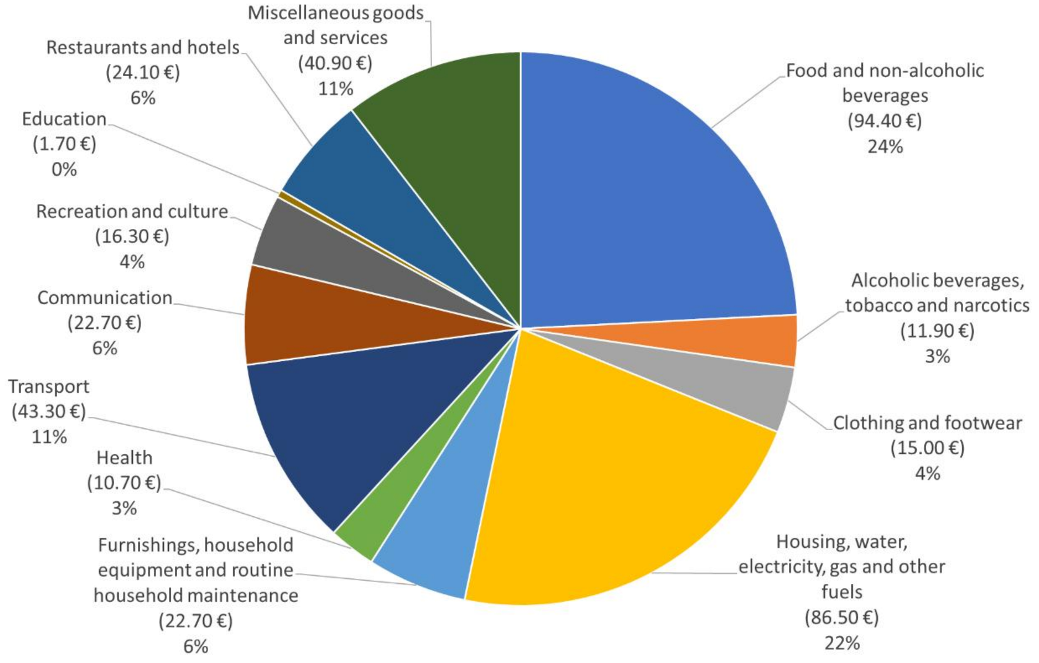
1 Introduction

Analysis of regional disparities in household consumption expenditure is an important part of examining socio-economic disparities in Europe. Piekut and Knapkova (2025) focus on differences in consumption expenditure between households in Western and Eastern Europe from 2000 to 2021. Using cluster analysis and regression analysis, they identify two distinct consumption patterns: while households in Eastern Europe allocate a higher share of their expenditures to basic needs (e.g., food and non-alcoholic beverages), households in Western Europe invest more in recreation, culture, and housing. The results suggest partial convergence in the consumption of certain categories, such as food and miscellaneous goods and services, indicating an improvement in the standard of living in Eastern Europe. However, significant differences persist in areas such as education, telecommunications, and clothing.

These findings are also relevant in the context of regional differences in consumption expenditure in Slovakia, where economic and historical factors similarly influence household spending patterns. This paper analyses these differences using data from the Household Budget Survey and applies the one-way Multivariate Analysis of Variance (MANOVA) method to identify statistically significant differences in consumption expenditure across Slovak regions in 2022. The aim is to identify structural differences between regions and assess their statistical significance, thus contributing to the broader discussion on socio-economic inequalities at the regional level.

According to Eurostat (2025), the Household Budget Survey (HBS) is a national statistical survey conducted in EU countries and coordinated by Eurostat, which collects data on household consumption expenditure on goods and services. These data are supplemented by information on household size and composition, income, and the characteristics of individuals living in private households. Household Budget Survey began to be implemented in most EU Member States in the early 1960s, and since 1988, Eurostat has collected and published data from this survey every five years. The survey focuses on consumption expenditure, i.e., what people spend on goods and services to satisfy their needs. Data from the survey also serve as an important input—especially at the national level—for determining weights in the consumer basket used to calculate the Consumer Price Index (CPI).

Figure 1 Structure of average household consumption expenditures in Slovakia in 2022



Source: Database of the Statistical Office of the Slovak Republic

To classify consumption expenditure, the international Classification of Individual Consumption According to Purpose (COICOP) is used, as recommended by Eurostat for Household Budget Statistics. According to this classification, consumption expenditure is divided into 12 main divisions, as outlined in the publication Classification of Individual Consumption According to Purpose 2018 (United Nations, 2023): Food and non-alcoholic beverages; Alcoholic beverages, tobacco and narcotics; Clothing and footwear; Housing, water, electricity, gas and other fuels; Furnishings, household equipment and routine household maintenance; Health; Transport; Communication; Recreation and culture; Education; Restaurants and hotels; Miscellaneous goods and services.

To begin with, we present the overall structure of the average consumption expenditure of Slovak households in 2022 (Figure 1). The data are based on the database of the Statistical Office of the Slovak Republic (SOSR) and include 12 categories of expenditure according to the COICOP classification. Figure 1 clearly shows that almost half of total household expenditures are allocated to basic necessities such as food and non-alcoholic beverages and housing, including energy. In 2022, the highest monthly per capita expenditure in Slovakia was on food and non-alcoholic beverages, amounting to 94.40€, which represented approximately 24% of total household consumption expenditures. The second highest category was housing, water, electricity, gas, and other fuels, with an average monthly cost of 86.50€, which represented approximately 22% of total household consumption expenditures (Figure 1). A significant portion of the household budget is also allocated to transport; restaurants and hotels; and miscellaneous goods and services. However, the share of each category can vary significantly depending on the socio-economic status of the household and the region in which its members live.

2 Literature review

Household expenditure reflects the economic behaviour and living standards of households, making them the subject of numerous academic studies. The following section provides an overview of relevant research focused on the regional analysis of household consumption expenditures.

Piekut and Piekut (2022) analysed the expenditure patterns of European households between 2004 and 2020 and identified groups of countries with similar consumption structures using cluster analysis. They found that household expenditure increased in most countries, with key categories being food, housing, and services. The COVID-19 pandemic caused a temporary decrease in consumption across all areas except food and non-alcoholic beverages. The results showed that similarities in countries' consumption patterns change over time, although some countries maintained stable positions within the created clusters. This study provides a valuable methodological framework for examining regional differences in household expenditures and their evolution over time.

Lazíková (2017) analysed the development of household income and expenditure in Slovakia between 2000 and 2015, with an emphasis on regional differences. She pointed out that despite the increase in net income and expenditure of households in recent years, significant disparities between regions persist—particularly between the Bratislava and Prešov regions. She identified key factors influencing this development, such as Slovakia's accession to the EU, the adoption of the euro, and the economic crisis, emphasizing that these events did not contribute to reducing regional disparities.

Hupková et al. (2018) focused on economic and social disparities in Slovak regions during 2005–2015, examining household expenditure and the factors influencing them. The results of regression and correlation analyses confirmed a strong dependence of expenditures on nominal gross monthly wages and the at-risk-of-poverty rate in all Slovak regions. The strongest dependency was observed in the Trnava and Košice regions. In Nitra and Košice, a negative correlation was identified between the risk of poverty and household expenditure.

In the context of analysing regional differences in household financial situations, the study by Kozak et al. (2022) is also relevant. It focused on evaluating the financial situation of Polish households and its regional differentiation in 2018. The authors used both one-dimensional comparisons of indicators and multidimensional assessment using the TOPSIS method. The results showed significant regional differences. The main factors behind the differences included economic and demographic characteristics such as employment rates, the education level of the household head, and the ability to repay debts.

Regional differences in the expenditures and incomes of Polish households over a longer period (2000–2019) were analysed in the study by Kasprzyk and Leszczyńska (2021). Based on data from the Household Budget Survey, the research identified increasing household income and expenditure over time. The study also confirmed the existence of regional disparities in household spending and income. Despite a decreasing trend in regional inequality over time, eastern regions remained economically the weakest, with their financial situation mainly influenced by socio-economic and demographic factors.

3 Methodology

To analyse regional differences in household expenditure, we used the MANOVA and Permutational Multivariate Analysis of Variance (PERMANOVA) methods. The assumptions for applying MANOVA— multivariate normality and homogeneity of covariance matrices across groups—were not met; therefore, we decided to supplement the analysis with PERMANOVA. Unlike MANOVA, PERMANOVA does not require strict fulfilment of the assumptions, and thus represents a suitable alternative for verifying regional differences in expenditure structure. For a more detailed comparison between individual regions, the Bonferroni post-hoc test was subsequently applied.

Multivariate Analysis of Variance is a statistical method that extends the univariate analysis of variance (ANOVA) to the case when there is more than one dependent variable. While ANOVA tests for differences in the means of a single dependent variable across multiple groups, MANOVA allows us to examine differences in the mean vectors of multiple dependent variables between groups. Typical applications of MANOVA include, for example, investigating differences in sets of psychological test scores, where each person completes multiple tests and we want to determine whether the result vectors differ among various groups (Hebák, Hustopecký, 1987).

MANOVA focuses on testing whether the mean vectors of the dependent variables are the same across different groups. It is used to test the null hypothesis

$$H_0\colon \boldsymbol{\mu_1} = \boldsymbol{\mu_2} = \cdots = \boldsymbol{\mu_p}$$

which states that the mean vectors of the dependent variables are equal across all groups. The vector $\boldsymbol{\mu_i}$ denotes the mean vector of the variables for group i. The alternative hypothesis states that at least one of the mean vectors is different:

$$H_1\colon \boldsymbol{\mu_i} \neq \boldsymbol{\mu_j} \text{ for at least one } i \neq j.$$

If the null hypothesis is rejected, it means that there is a statistically significant difference between the groups in some (or all) of the dependent variables.

PERMANOVA is a non-parametric statistical permutation test used to compare groups across multiple dependent variables. This test is especially useful when analysing data that are not normally distributed or when the assumption of homoscedasticity (equal variances) is not met. PERMANOVA uses a permutation-based approach, which involves randomly permuting the data to obtain empirical distributions of test statistics. In PERMANOVA, various distance metrics can be selected (e.g., Euclidean distance, Manhattan distance), increasing the flexibility of the analysis (Anderson, 2017).

3.1 Fundamental Concepts of MANOVA

The main idea of analysis of variance is the decomposition of the total variability (T) into a between-group component (B) and a within-group component (W). Individual multivariate observations are denoted as $\boldsymbol{x_{hi}}$, where the index $h = 1,2, \cdots k$ indicates the group, and the index $i = 1,2, \cdots n_h$ identifies the object. The sample size for group $h = 1,2, \dots k$ is n_h and the total number of observations is $n = \sum_{h=1}^{k} n_h$. To decompose the variability, we first compute the following statistics within each group: the vector of group means $\overline{\boldsymbol{x_h}}$ (1) and the group covariance matrices $\mathbf{S_h}$ (2) (Hebák, Hustopecký, 1987):

$$\overline{\boldsymbol{x_h}} = \frac{1}{n_h} \sum_{i=1}^{n_h} \overline{\boldsymbol{x_{h_i}}} \tag{1}$$

$$\mathbf{S_h} = \frac{1}{n_h - 1} \sum_{i=1}^{n_h} (\boldsymbol{x_{hi}} - \overline{\boldsymbol{x}}_{\boldsymbol{h}})(\boldsymbol{x_{hi}} - \overline{\boldsymbol{x}}_{\boldsymbol{h}})^T \tag{2}$$

Additionally, we compute the overall mean vector $\overline{\boldsymbol{x}}$ (3) and the pooled estimate of the covariance matrix $\overline{\mathbf{S}}$ (4).

$$\overline{\boldsymbol{x}} = \frac{1}{n} \sum_{h=1}^{k} \overline{\boldsymbol{x}}_{\boldsymbol{h}} n_h \tag{3}$$

$$\overline{\mathbf{S}} = \frac{\sum_{h=1}^{k} \boldsymbol{S_h}(n_h - 1)}{n - k} \tag{4}$$

The calculations of MANOVA test statistics are based on matrices of between-group and within-group variability.

- Between-group variability matrix (B):

$$\mathbf{B} = \sum_{h=1}^{k} n_h (\overline{\boldsymbol{x_h}} - \overline{\boldsymbol{x}})(\overline{\boldsymbol{x_h}} - \overline{\boldsymbol{x}})^T \tag{5}$$

- Within-group variability matrix (W):

$$\mathbf{W} = \sum_{h=1}^{k} (n_h - 1)\mathbf{S_h} \tag{6}$$

- Total variability matrix (T):

$$\mathbf{T} = \mathbf{B} + \mathbf{W} \tag{7}$$

3.2 Assumptions of the MANOVA Model

For MANOVA to yield reliable results, the following assumptions must be met:

- randomness of the sample,
- independence between the defined groups (absence of multicollinearity),
- existence of multivariate normal distribution within groups,
- equality of covariance matrices between groups,
- homogeneity of variances between groups (homoscedasticity).

To test the equality of covariance matrices, Box's M test is used (Hebák, Hustopecký, 1987). The null hypothesis of equal covariance matrices, $H_0\colon \boldsymbol{\Sigma_1} = \boldsymbol{\Sigma_2} = \cdots = \boldsymbol{\Sigma_k}$, is rejected if the value of the test statistic

$$K = \frac{1}{C_p} (n - k)\, ln|\overline{\mathbf{S}}| - \sum_{h=1}^{k} (n_h - 1)\, ln|\mathbf{S_h}| \tag{8}$$

exceeds the critical value of the chi-square distribution $\chi^2_{1-\alpha}[(k-1)p(p+1) \,/\, 2]$. In this formula, C_p is a constant that improves the approximation:

$$C_p = 1 + \frac{2p^2 + 3p - 1}{6(k-1)(p+1)} \left(\sum_{h=1}^{k} \frac{1}{n_h - 1} - \frac{1}{n - k} \right), \tag{9}$$

where p is the number of dependent variables (i. e., the number of expenditure categories analysed simultaneously).

To verify the assumption of multivariate normality, several tests can be applied, such as Mardia's test (based on multivariate skewness and kurtosis), Royston's test (a multivariate version of the Shapiro-Wilk test), or the Henze-Zirkler test, which is based on a non-negative functional distance that measures the deviation between two distribution functions. Details of these computations can be found in Korkmaz et al. (2014). The null hypothesis tested is that the empirical and theoretical (normal) probability distributions do not significantly differ, versus the alternative hypothesis that they do differ.

To diagnose multicollinearity, several approaches may be used, including sample pairwise correlation coefficients, the determinant of the correlation matrix, the smallest eigenvalue of the correlation matrix, the condition index, the Variance Inflation Factor (VIF), the M statistic, or the Farrar-Glauber test for variable independence, which is discussed in more detail by Šoltés (2019).

To assess homoscedasticity, several tests can be used. These test the null hypothesis that the random component has constant variance (homoscedastic), against the alternative hypothesis that the variance is not constant (heteroscedastic). Bartlett's test for homoscedasticity is a universal test suitable for both balanced and unbalanced samples (a balanced sample has equal numbers of observations in each group, while an unbalanced sample has varying numbers). Cochran's test and Hartley's test are suitable for balanced samples. In our case, we applied Levene's test, which can be used even when the assumption of normality is violated in one or more subgroups. Details of these tests can be found in Pacáková et al. (2012).

3.3 Test Statistics for MANOVA

In MANOVA, several test statistics are used to decide whether to reject or accept the null hypothesis. The values of these statistics are calculated based on the between-group variability matrix **B** and the within-group variability matrix **W** or based on the eigenvalues λ_g of the matrix $\boldsymbol{BW^{-1}}$, where $g = 1,2, \dots, s$, where s is the number of nonzero eigenvalues of the matrix $\boldsymbol{BW^{-1}}$, and it holds that $s = min(p, k-1)$, with p being the number of dependent variables and k being the number of groups (Carey, 1998).

Wilk's Lambda – ratio of within-group variability to total variability

$$\lambda = \frac{|\boldsymbol{W}|}{|\boldsymbol{T}|} = \frac{|\boldsymbol{W}|}{|\boldsymbol{W}+\boldsymbol{B}|} = \prod_{g=1}^{s} \frac{1}{1+\lambda_g} \tag{10}$$

Hotelling-Lawley's Trace

$$T^2 = st(\boldsymbol{BW^{-1}}) \equiv \sum_{g=1}^{s} \lambda_g \tag{11}$$

Roy's Largest Root

$$V = \max \lambda_g \tag{12}$$

Pillai's Trace – considered the most powerful and robust of the mentioned statistics

$$Pillai's\ trace = st[\boldsymbol{B}(\boldsymbol{B}+\boldsymbol{W})^{-1}] = \sum_{g=1}^{s} \frac{\lambda_g}{1+\lambda_g} \tag{13}$$

Each of these test statistics can be approximated by the *F*-distribution, which allows us to draw conclusions about the hypotheses.

If the calculated F-statistic is greater than the critical value of F (based on the chosen significance level and degrees of freedom), we reject the null hypothesis and conclude that statistically significant differences exist between the studied groups.

3.4 Multiple Comparison Methods

If the null hypothesis is rejected in favour of the alternative hypothesis about the inequality of group means, we obtain only a vague statement indicating that there exists at least one pair (or more) of means that differ. In such cases, the analysis is extended with multiple comparison methods, which help identify specific pairs of group means that differ significantly (Pacáková et al., 2012). The null hypothesis for each of these methods takes the form:

$$H_0: \mu_i = \mu_{i'} (i, i' = 1,2, \cdots k; i \neq i')$$

Various multiple comparison methods can be applied, such as Scheffé's method, Tukey's method, Bonferroni method, Duncan's method, or Kramer's method. In our case, we applied the Bonferroni method, which is suitable for unbalanced samples. Formulas for calculating the critical values of selected multiple comparison methods are presented in Pacáková et al. (2012).

The analysis is based on anonymized microdata from the Household Budget Survey for 2022, provided by the Statistical Office of the Slovak Republic for scientific purposes. All analyses (MANOVA, PERMANOVA, Bonferroni post-hoc tests) were conducted using the Python programming language in the Jupyter Lab environment.

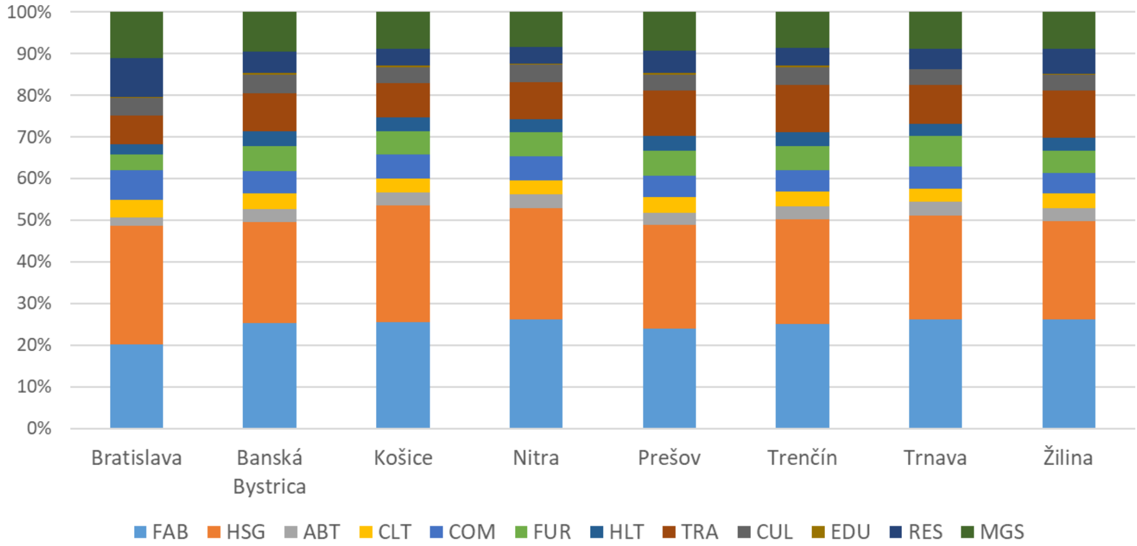
4 Results and Discussion

We began by looking at the average consumption expenditures of Slovak households and the average net income of households across different Slovak regions.

Piekut and Knapkova (2025) reveal two distinct consumer patterns among European households. According to their study, households in Eastern European countries tend to prioritize basic needs, such as food and non-alcoholic beverages, while households in Western Europe allocate more spending to other needs and services, including recreation, culture, and housing. Slovakia, which is usually classified as an Eastern European country based on household consumer behaviour, shows a trend towards the Western European consumption model, according to the findings of Piekut and Knapkova (2025). Figure 2 shows that across Slovak regions, the share of spending on basic needs (housing and food) remains high—around 50%. Although households do spend on recreation, culture, and other goods and services, the share of these categories is not significant enough to confirm a clear shift toward the Western consumption pattern. However, this shift may not be most visible at the regional level, but rather in the structure of household expenditures by household type. It is likely that differences in consumer behaviour are more pronounced between households with varying income levels, sizes, or compositions, rather than between regions. A more detailed analysis by household type could therefore better reveal any tendencies of convergence toward the Western European model.

Spending category abbreviations used in the graphs and tables are based on the classification presented in the introduction: FAB – Food and non-alcoholic beverages, ABT – Alcoholic beverages, tobacco and narcotics, CLT – Clothing and footwear, HSG – Housing, water, electricity, gas, and other fuels, FUR – Furnishings, household equipment, and routine household maintenance, HLT – Health, TRA – Transport, COM – Communication, CUL – Recreation and culture, EDU – Education, RES – Restaurants and hotels, MGS – Miscellaneous goods and services.

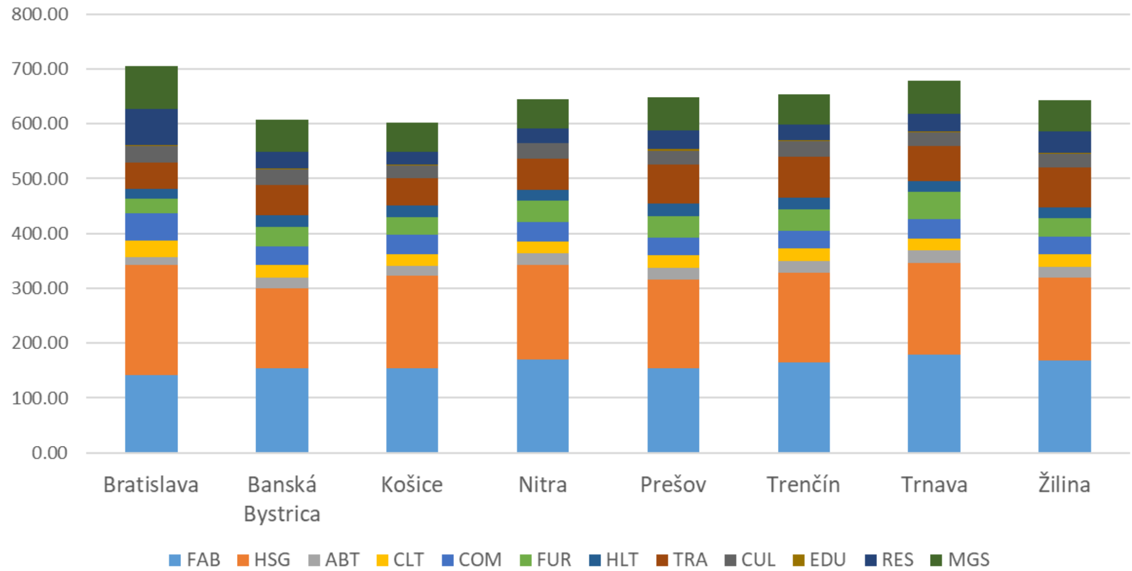
Figure 2 Share of individual expenditure categories in the total household expenditures in the given region



Source: Own processing based on data from the Household Budget Survey (SOSR).

According to Figure 3, households in the Bratislava region have the highest total expenditures, while those in the Košice region show the lowest. The difference between these two regions amounts to approximately €100 per person per month, highlighting significant regional disparities in consumption expenditures. Despite these differences in absolute spending levels, the structure of consumption across regions is very similar.

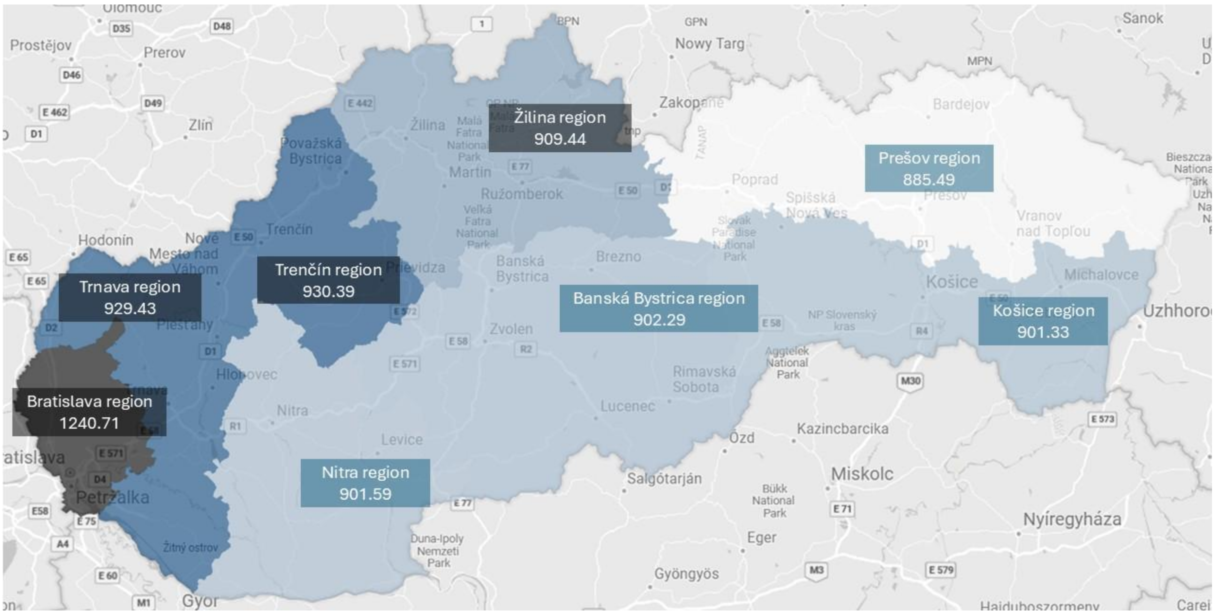
Figure 3 Average monthly household expenditures in Slovak regions according to 12 COICOP categories (in €/month/person)



Source: Own processing based on data from the Household Budget Survey (SOSR).

In our analysis, the average net household incomes were aggregated at the regional level. The results show substantial regional differences in average net income (Figure 4), with the Bratislava region reaching the highest average income (1240.71€/person/month), while the lowest values were recorded in the Prešov region (885.49€/person/month).

Figure 4 Average net income in Slovak regions (in €/month/person)



Source: Own processing based on data from the Household Budget Survey (SOSR) in PowerBI.

In Figure 4, these income differences are illustrated on a map using a colour scale from white (lowest income) to black (highest income). The contrast between the Bratislava region and the other regions is clearly visible, which may be related to the concentration of economic opportunities and higher wage levels in this area. The remaining regions range between approximately 885€ and 930€/person/month, showing relatively minor differences between them.

Similarly to the findings of Lazíková (2017), who revealed significant income and expenditure differences among Slovak regions for the period 2005–2015, our 2022 analysis also shows that the Bratislava region records the highest average net income per person. Lazíková noted that the Bratislava region had the highest income levels and the lowest share of spending on basic needs, in line with Engel’s law. However, in our analysis, we observe that the relative structure of household expenditures in the Bratislava region is similar to other regions—around 50% of spending goes to basic needs (housing and food). Nevertheless, in absolute terms, the Bratislava region spends significantly more on less essential categories, such as miscellaneous goods and services or restaurants and hotels. This difference is therefore more visible in absolute expenditure amounts rather than in their relative structure.

Before proceeding with the multivariate analysis, we tested the assumptions necessary for the valid application of MANOVA. Multivariate normality was assessed using the Henze-Zirkler’s test, where the p-value was <0.001, leading to the rejection of the null hypothesis that the data originate from a multivariate normal distribution. Homogeneity of covariance matrices was tested using Box’s M test, which also resulted in the p-value <0.001, thus rejecting the null hypothesis of equality of covariance matrices across groups. Homoskedasticity was evaluated by Levene’s test for each of the 12 consumption categories separately; for all variables, the p-value was <0.001, indicating heteroskedasticity.

Since none of the assumptions for MANOVA were satisfied, caution is necessary when interpreting its results. Nevertheless, MANOVA was performed, and the results showed a statistically significant difference in household expenditures across Slovak regions for all four test statistics (Wilk’s lambda, Pillai’s trace, Hotelling-Lawley trace, Roy’s largest root) at the 0.05 significance level (Figure 5).

Figure 5 Results of the MANOVA test

```
                 Multivariate linear model
================================================================

----------------------------------------------------------------
       Intercept        Value   Num DF   Den DF  F Value  Pr > F
----------------------------------------------------------------
          Wilks' lambda 0.3249 12.0000 4972.0000 860.9382 0.0000
         Pillai's trace 0.6751 12.0000 4972.0000 860.9382 0.0000
 Hotelling-Lawley trace 2.0779 12.0000 4972.0000 860.9382 0.0000
    Roy's greatest root 2.0779 12.0000 4972.0000 860.9382 0.0000
----------------------------------------------------------------

----------------------------------------------------------------
          Kraj          Value   Num DF   Den DF   F Value Pr > F
----------------------------------------------------------------
          Wilks' lambda 0.7943 84.0000 30459.4727 13.8981 0.0000
         Pillai's trace 0.2153 84.0000 34846.0000 13.1642 0.0000
 Hotelling-Lawley trace 0.2472 84.0000 21352.2280 14.6285 0.0000
    Roy's greatest root 0.1918 12.0000  4978.0000 79.5839 0.0000
```

Source: Own processing in Jupyter Lab (Python).

Due to the violation of key assumptions, permutational multivariate analysis of variance (PERMANOVA) was subsequently applied as a robust alternative, and it confirmed the existence of statistically significant regional differences in the expenditure structure of Slovak households.

Figure 6 Results of the PERMANOVA test

```
method name                  PERMANOVA
test statistic name           pseudo-F
sample size                       4991
number of groups                     8
test statistic               11.069869
p-value                          0.001
number of permutations             999
Name: PERMANOVA results, dtype: object
```

Source: Own processing in Jupyter Lab (Python).

The results of the PERMANOVA test (Figure 6) confirm statistically significant differences in household expenditures across Slovak regions (pseudo-F = 11.07, p-value = 0.001). The analysis included 4991 households divided into eight groups based on their region. 999 permutations were used, ensuring robustness of the results.

After confirming statistically significant regional differences, we conducted additional pairwise comparisons between regions for each expenditure category individually. Table 1 presents the results of the Bonferroni post-hoc test for all pairs of Slovak regions. The test examines whether there are statistically significant differences in average expenditures between regions within each COICOP category. For each regional pair, the p-value and the difference in average expenditures are shown. Statistically significant values at the $\alpha = 0.05$ significance level are highlighted in blue.

The results show that average spending on food and non-alcoholic beverages in the Bratislava region is significantly lower (at the 0.05 level) compared to all other Slovak regions. This trend may be linked to differences in income levels, availability of stores, and dietary habits. Residents of the Bratislava region generally have higher incomes, allowing them to eat out more often, which in turn is reflected in higher average spending on restaurants and hotels compared to other regions. The largest difference in average spending on restaurants and hotels is between the Bratislava and Košice regions, amounting to 41.48€.

Table 1 Results of the Bonferroni post-hoc test for regional differences in household expenditures

Region 1	Region 2		FAB	ABT	CLT	HSG	FUR	HLT	TRA	COM	CUL	EDU	RES	MGS
BA	TT	diff	-36.56	-8.24	8.61	33.08	-22.98	-1.93	-14.87	13.43	4.65	0.01	33.44	17.53
		p-value	0.000	0.000	0.000	0.000	0.000	0.213	0.106	0.000	0.077	0.978	0.000	0.000
BA	TN	diff	-22.42	-5.88	6.07	36.99	-10.53	-5.13	-25.59	16.28	2.25	-0.98	37.07	22.14
		p-value	0.000	0.000	0.001	0.000	0.000	0.002	0.006	0.000	0.352	0.107	0.000	0.000
BA	NR	diff	-27.86	-6.82	8.08	28.70	-11.14	-1.77	-9.56	13.19	2.45	-0.26	40.19	23.83
		p-value	0.000	0.000	0.000	0.000	0.000	0.216	0.150	0.000	0.310	0.428	0.000	0.000
BA	ZA	diff	-25.82	-4.49	5.83	48.91	-6.07	-3.13	-23.82	17.58	5.09	-0.20	26.66	21.80
		p-value	0.000	0.001	0.001	0.000	0.004	0.032	0.002	0.000	0.030	0.553	0.000	0.000
BA	BB	diff	-12.08	-4.61	5.90	54.19	-8.19	-4.66	-7.13	17.26	3.19	-1.56	34.77	19.83
		p-value	0.002	0.001	0.001	0.000	0.001	0.011	0.321	0.000	0.207	0.014	0.000	0.000
BA	PO	diff	-12.98	-4.98	5.20	39.23	-11.91	-5.39	-22.44	17.02	5.13	-2.19	31.83	17.38
		p-value	0.001	0.000	0.004	0.000	0.000	0.001	0.008	0.000	0.033	0.002	0.000	0.000
BA	KE	diff	-12.31	-3.40	8.17	31.92	-5.70	-3.81	-0.98	15.19	7.26	-0.86	41.48	24.59
		p-value	0.001	0.014	0.000	0.000	0.023	0.010	0.902	0.000	0.002	0.094	0.000	0.000
TT	TN	diff	14.14	2.36	-2.54	3.90	12.45	-3.20	-10.72	2.85	-2.40	-1.00	3.63	4.60
		p-value	0.001	0.197	0.093	0.332	0.035	0.041	0.374	0.011	0.284	0.151	0.218	0.144
TT	NR	diff	8.70	1.42	-0.54	-4.39	11.84	0.16	5.31	-0.23	-2.20	-0.28	6.74	6.30
		p-value	0.045	0.434	0.754	0.342	0.041	0.899	0.563	0.848	0.340	0.442	0.014	0.031
TT	ZA	diff	10.75	3.75	-2.79	15.83	16.91	-1.20	-8.95	4.16	0.44	-0.21	-6.78	4.27
		p-value	0.015	0.024	0.053	0.000	0.003	0.362	0.392	0.000	0.839	0.560	0.037	0.151
TT	BB	diff	24.48	3.63	-2.71	21.10	14.79	-2.73	7.74	3.83	-1.46	-1.57	1.33	2.30
		p-value	0.000	0.029	0.048	0.000	0.011	0.133	0.433	0.001	0.542	0.030	0.657	0.495
TT	PO	diff	23.58	3.27	-3.41	6.15	11.07	-3.46	-7.57	3.60	0.47	-2.20	-1.61	-0.15
		p-value	0.000	0.056	0.019	0.126	0.055	0.028	0.496	0.001	0.833	0.006	0.571	0.962
TT	KE	diff	24.26	4.84	-0.44	-1.16	17.28	-1.88	13.89	1.76	2.61	-0.88	8.04	7.06
		p-value	0.000	0.003	0.760	0.750	0.002	0.168	0.186	0.107	0.230	0.131	0.002	0.034
TN	NR	diff	-5.44	-0.93	2.00	-8.29	-0.61	3.36	16.03	-3.08	0.20	0.72	3.12	1.69
		p-value	0.177	0.603	0.240	0.074	0.857	0.020	0.089	0.009	0.922	0.236	0.222	0.551
TN	ZA	diff	-3.39	1.39	-0.25	11.93	4.46	2.00	1.77	1.31	2.84	0.78	-10.41	-0.34
		p-value	0.406	0.397	0.866	0.002	0.113	0.174	0.867	0.200	0.136	0.214	0.001	0.907
TN	BB	diff	10.34	1.27	-0.18	17.20	2.34	0.47	18.46	0.98	0.94	-0.58	-2.30	-2.30
		p-value	0.011	0.443	0.901	0.000	0.444	0.805	0.068	0.357	0.663	0.509	0.409	0.481
TN	PO	diff	9.44	0.91	-0.87	2.25	-1.38	-0.27	3.15	0.75	2.88	-1.20	-5.24	-4.76
		p-value	0.015	0.592	0.554	0.584	0.655	0.875	0.779	0.477	0.150	0.198	0.048	0.129
TN	KE	diff	10.12	2.49	2.10	-5.06	4.84	1.32	24.61	-1.08	5.01	0.12	4.41	2.45
		p-value	0.008	0.130	0.150	0.178	0.129	0.381	0.021	0.307	0.010	0.874	0.069	0.446
NR	ZA	diff	2.05	2.33	-2.25	20.22	5.07	-1.36	-14.26	4.39	2.64	0.06	-13.52	-2.03
		p-value	0.613	0.157	0.170	0.000	0.088	0.265	0.064	0.000	0.185	0.833	0.000	0.448
NR	BB	diff	15.78	2.20	-2.18	25.49	2.95	-2.89	2.43	4.06	0.74	-1.30	-5.42	-4.00
		p-value	0.000	0.183	0.175	0.000	0.355	0.084	0.727	0.000	0.739	0.042	0.037	0.189
NR	PO	diff	14.88	1.84	-2.88	10.53	-0.77	-3.63	-12.88	3.83	2.67	-1.92	-8.36	-6.45
		p-value	0.000	0.276	0.082	0.023	0.810	0.013	0.127	0.001	0.197	0.007	0.001	0.027
NR	KE	diff	15.56	3.42	0.10	3.23	5.44	-2.04	8.58	2.00	4.81	-0.60	1.29	0.76
		p-value	0.000	0.037	0.953	0.452	0.096	0.106	0.275	0.080	0.017	0.231	0.565	0.800
ZA	BB	diff	13.73	-0.12	0.07	5.27	-2.12	-1.53	16.69	-0.32	-1.90	-1.36	8.11	-1.97
		p-value	0.001	0.933	0.957	0.155	0.413	0.372	0.045	0.746	0.357	0.039	0.009	0.526
ZA	PO	diff	12.84	-0.48	-0.63	-9.68	-5.84	-2.27	1.38	-0.56	0.04	-1.98	5.17	-4.42
		p-value	0.001	0.751	0.656	0.013	0.026	0.127	0.887	0.568	0.985	0.007	0.081	0.136
ZA	KE	diff	13.51	1.09	2.35	-16.99	0.37	-0.68	22.84	-2.39	2.17	-0.66	14.82	2.79
		p-value	0.000	0.459	0.092	0.000	0.892	0.595	0.012	0.016	0.240	0.202	0.000	0.363
BB	PO	diff	-0.90	-0.36	-0.70	-14.95	-3.72	-0.74	-15.31	-0.24	1.94	-0.63	-2.94	-2.46
		p-value	0.818	0.814	0.604	0.000	0.195	0.699	0.092	0.818	0.368	0.513	0.275	0.462
BB	KE	diff	-0.22	1.22	2.27	-22.26	2.49	0.85	6.15	-2.07	4.07	0.70	6.71	4.76
		p-value	0.954	0.411	0.089	0.000	0.405	0.625	0.467	0.047	0.051	0.370	0.007	0.163
PO	KE	diff	0.68	1.58	2.97	-7.31	6.21	1.59	21.46	-1.83	2.13	1.32	9.65	7.21
		p-value	0.853	0.302	0.034	0.051	0.039	0.296	0.027	0.074	0.270	0.116	0.000	0.028

Source: Own processing in Jupyter Lab (Python).

Average spending on housing, water, electricity, gas, and other fuels is significantly higher in the Bratislava region compared to all other Slovak regions, which is an expected result given the high property and rental prices in the capital. Specifically, households in Bratislava spend on average 54.19€ more than those in the Banská Bystrica region, 48.91€ more than in the Žilina region, and 39.23€ more than in the Prešov region.

The Bratislava region also shows statistically significantly higher average expenditures than other regions in the following categories: clothing and footwear; communication; miscellaneous goods and services (e.g., hairdressing, jewellery, insurance, consultancy, financial services, funeral services, etc.) This may be attributed to the higher standard of living in Bratislava, a wider selection of shopping opportunities, or a specific urban lifestyle. On the other hand, average spending on alcoholic beverages, tobacco, and narcotics, as well as furniture and household equipment, is significantly lower in the Bratislava region compared to other regions.

At the 0.05 significance level, significantly higher average expenditures on housing, water, electricity, gas, and other fuels were also observed in the Trenčín, Trnava, Nitra, Prešov, and Košice regions, compared to the Žilina and Banská Bystrica regions.

Average spending on food and non-alcoholic beverages was significantly higher in the Trnava region compared to all other regions at the 0.05 level. This spending was also significantly higher in the Trenčín, Žilina, and Nitra regions compared to Banská Bystrica, Prešov, and Košice.

Beyond the Bratislava region, average expenditures on restaurants and hotels were also significantly higher (at the 0.05 level) in the Prešov, Banská Bystrica, Žilina, and Trnava regions compared to the Nitra and Košice regions. On the contrary, significantly lower expenditures on restaurants and hotels were recorded in Trnava, Trenčín, and Banská Bystrica compared to the Žilina region.

In the Trnava region, significantly higher expenditures (at the 0.05 level) were observed on furniture, household equipment, and routine household maintenance compared to Trenčín, Bratislava, Nitra, Žilina, Banská Bystrica, and Košice. Likewise, higher average expenditures on communication were recorded in Trnava compared to Trenčín, Žilina, Banská Bystrica, and Prešov.

Significant differences at the 0.05 level also emerged in the transport category. Significantly higher average transport expenditures were found in the Trenčín, Žilina, and Prešov regions compared to Bratislava and Košice. This may be linked to high commuting rates to the capital city for work.

Overall, these results confirm the existence of regional differences in household consumption behaviour, influenced by a combination of factors such as income level, cost of living, availability of services, and cultural habits of the population.

Piekut and Knapkova (2025) used cluster analysis to analyse data from Household Budget Survey to logically group EU countries with similar consumer behaviour. Kozak et al. (2022) evaluated the consumer behaviour of Polish households at the regional level using the TOPSIS method. This method allows for the ranking of regions based on socio-economic indicators and ordering them by expenditure levels. We decided to test whether statistically significant differences in household expenditure structure exist among Slovak regions, and therefore applied the MANOVA method.

5 Conclusion

The results of the analysis confirm the existence of statistically significant regional differences in the structure of consumer expenditures of Slovak households. Despite a similar expenditure structure across regions in relative terms, multivariate analysis using PERMANOVA and post-hoc tests identified significant differences between specific regions.

The Bratislava Region stands out from the rest – not only in the total level of expenditures but also in the nature of consumption. Significantly higher spending on housing, restaurants and hotels, clothing and footwear, as well as postal and telecommunications services, point to a higher standard of living, a different lifestyle, and likely a higher level of technological advancement and service availability.

However, apart from the Bratislava Region, notable differences were also observed between other regions in certain expenditure categories. For example, in the Trnava Region, expenditures on food and non-alcoholic beverages were significantly higher than in all other regions, which may indicate a different household structure or price level in the region. Similarly, higher housing expenditures, besides Bratislava, were also observed in the Trenčín, Trnava, Nitra, Prešov, and Košice Regions compared to the Žilina and Banská Bystrica regions.

Increased expenditure on restaurants and hotels in the Prešov, Žilina, Banská Bystrica, and Trnava Regions compared to the Nitra and Košice Regions may indicate the development of tourism or a greater focus on experience-based consumption. The Trnava Region also reported significantly higher expenditures on furniture and household equipment, as well as on postal and telecommunications services.

Significant differences also appeared in the area of transport – higher expenditures were recorded in the Trenčín, Žilina, and Prešov Regions compared to Bratislava and Košice. This could be related to higher commuting rates or limited availability of public transport in these regions.

These findings highlight not only the specific characteristics of each region but also broader disparities between western and eastern Slovakia, where western regions – especially Bratislava and Trnava – show higher levels of spending and consumption in many areas. These differences reflect the economic performance of regions, availability of services, household income levels, and their consumer preferences.

These results can be useful for shaping regional policies aimed at reducing inequalities and supporting the balanced development of Slovak regions.

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