

STATISTICAL ANALYSIS APPLIED TO THE DATA ON CONSUMER MONETARY EXPENDITURE IN BULGARIA

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Abstract

The current paper studies data concerning consumer monetary expenditure in Bulgaria. They are structured and saved in several tables of a built data base. The considered objects are 10 different expenditures. A statistical analysis applied to these data on consumer monetary expenditure in Bulgaria is presented for the time period 2012-2021. The necessary information is searched and extracted from the indicated data base. As a result of the performed analysis of variance and Tukey's test four groups with statistically proven differences are obtained for the examined expenditures, average per household. A similar conclusion can be formed about the considered expenditures, average per person. As a whole, consumer monetary expenditure, average per household, increased in eight of the listed ten years. A quite small decline is found during 2016 as well as 2020. It is 1.36% for the first of the listed years and 1.32% for the second one. Approximately the same results are established for the consumer monetary expenditure average per person, where an insignificant decrease is calculated only for 2020.

Key words: consumer monetary expenditure, database, statistical analysis.

INTRODUCTION

Household expenditures have always been of interest and have been the subject of research in a number of scientific studies [15]. According to Dimitrova T., (2012) [4] "Households play a specific role in the financial system and also have specific features which distinguish them from the state and corporations as economic agents" [4]. The study of Kurshumov and Radev, (2022) [10] notes that consumers reallocate their costs to certain specific foods and beverages. The same authors point out that "In pandemic conditions, Covid-19 was not found to pose a serious risk to food and beverage safety, which is essential for consumers" [10].

The data concerning household expenditures are presented in electronic form. The choice of information sources largely depends on whether they contain the necessary data [2], [9]. The sources that contain data related to the consumer monetary expenditure in Bulgaria are mostly structured. They are published by the Bulgarian National Statistical Institute [13]. The mentioned data are extracted from xls files [13] and are presented in a relational database [5], [6].

The aim of this article is to present a statistical analysis applied to the data on consumer monetary expenditure in Bulgaria for the period from 2012 to 2021. The necessary information is searched and extracted from the indicated database.

MATERIALS AND METHODS

The investigated objects in the current work are related to the following types of expenditures:

- for foods and non-alcoholic beverages;
- for clothing and footwear;
- for housing, water, electricity, gas and other fuels;
- for furnishing and maintenance of the house;
- for alcoholic beverages and tobacco;
- for health;
- for transport;
- for communication;
- for recreation, culture and education;
- for miscellaneous goods and services.

These listed expenditures are included in the consumer monetary expenditure. The characteristics of the above-mentioned elements are searched from the corresponding fields of the database tables (Fig. 1). Some

selected fields from these tables can be integrated and then certain queries can be created. Records from these queries may also be limited. In this case, certain parameters must be defined. They may include:

- chosen expenditure in the researched period;
- time interval where the indicated set of expenditures is displayed;
- selection of indicators that are related to the examined group of expenditures.

The considered database is intended for use primarily by economists and statisticians. Searching the relevant elements from several tables can sometimes be a quite difficult task [3]. In this case, certain types of queries could be used. The information from them is studied and analysed during this ten-years period. The obtained data about the listed expenditures,

average per household and person are summarized.

The method of analysis of variance [11], [14] is applied to the investigated data in the current work. The study of Adeniran, A. T., et al., (2021) [1] notes that “Analysis of variance (Anova) test has long been an essential tool for researchers conducting studies on multiple experimental groups with or without one or more control groups” [1]. Separately, the information about each one from the listed expenditures is also examined and assessed in the mentioned time segment. Software products such as Microsoft Excel [17], [12] and R Commander [7], [8] are used for the data processing. The obtained results are presented in an xlsx file format.

Countries				
id_c	name			
1	Bulgaria			
id_group	expenditure group			
4	Housing, water, electricity, gas and other fuels			
5	Furnishing and maintenance of the house			
6	Health			
9	Recreation, culture and education			
17	Foods and non-alcoholic beverages			
Year	average per household	average per person	structure %	
2012	3209	1355	33,4	
2013	3512	1480	33,2	
2014	3534	1458	32,3	
2015	3510	1463	31,4	
2016	3432	1464	30,8	
2017	3613	1573	30,1	

Fig. 1. Examined elements from the database tables
 Source: Data from [13].

RESULTS AND DISCUSSIONS

The expenditures concerning the considered elements are investigated in the years 2012-2021. In this connection, analysis of variance was applied to the listed data included in the consumer monetary expenditure. The results of the calculations are presented in Table 1. As can be seen from it, the value in the column P-value is less than $\alpha=0.05$. In the case, there are statistically significant differences between the studied expenditures, average per household. According to Tukey's test [16], results from the performed

comparative analysis are shown in Table 2. The obtained four groups are as follows:

- The expenditures for clothing and footwear, furnishing and maintenance of the house, communication, alcoholic beverages and tobacco, miscellaneous goods and services, as well as the expenditures for recreation, culture and education are presented in an individual group. Their values are the lowest;
- The next group includes the expenditures concerning health and transport;
- The examined expenditures about housing, water, electricity, gas and other fuels are

presented in one group. The obtained values of these expenditures are comparatively high.

Table 1. Visualization of the results from the analysis

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	94051953	9	10450217	464.920	0.00	1.986
Within Groups	2022973	90	22477.478			
Total	96074926	99				

Source: Own calculations on the basis of data from [13].

- The considered expenditures, average per household concerning foods and non-alcoholic beverages form a separate group. Their values are the highest, as can be seen from Table 2.

Table 2. Results about the studied expenditures, average per household

Consumer monetary expenditure	Assessment of the expenditures (BGN)	
Clothing and footwear	412.50	a
Furnishing and maintenance of the house	467.10	ab
Alcoholic beverages and tobacco	504.80	ab
Miscellaneous goods and services	524.80	ab
Communication	525.71	ab
Recreation, culture and education	550.70	ab
Health	677.90	bc
Transport	837.40	c
Housing, water, electricity, gas and other fuels	1,687.60	de
Foods and non-alcoholic beverages	3,697.50	e
means with the same letter are not significantly different		

Source: Own calculations on the basis of data from [13].

The processed information for the listed expenditures, average per person showed similar results. The calculated value in the column P-value is less than α ($\alpha=0.05$) (Table 4). Therefore, the performed analysis of variance displayed statistically significant differences between the indicated data for the examined elements.

As a result of applying Tukey's test, four groups are obtained. One of these mentioned

groups contains the first seven types of expenditures, which are visualized in Table 3.

Table 3. Assessment of the expenditures (BGN), average per person

Expenditures	Assessment	
Clothing and footwear	181.60	a
Furnishing and maintenance of the house	206.80	a
Alcoholic beverages and tobacco	222.40	a
Communication	231.70	ab
Miscellaneous goods and services	231.70	ab
Recreation, culture and education	242.60	ab
Health	300.00	ab
Transport	369.30	b
Housing, water, electricity, gas and other fuels	743.40	c
Foods and non-alcoholic beverages	1,626.90	d
means with the same letter are not significantly different		

Source: Own calculations on the basis of data from [13].

The next two groups include the expenditures, average per person, concerning transport as well as housing, water, electricity, gas and other fuels, respectively.

Quite naturally, the expenditures, average per person, about foods and non-alcoholic beverages are also included in an individual group. In the case, the values of the mentioned elements are the highest.

The change of 6 from the listed ten expenditures, average per household was studied and analysed, as can be seen from the diagram in Fig. 2.

Table 4. Presentation of the performed calculations related to the examined expenditures, average per person

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	18194386.64	9	2021598.52	218.58	0.00	1.9856
Within Groups	832392.4	90	9248.80			
Total	19026779.04	99				

Source: Own calculations on the basis of data from [13].

As a result, the following dependencies are established. An increasing tendency for the expenditures concerning communication is observed. At the end of the considered time segment the values of the indicated element are about 1.5 times higher in comparison with these ones for the first year of the examined period. Only these considered expenditures increased constantly in the years between 2012 and 2021. A different process is observed in 2019 with the expenditures for recreation, culture and education. They are quite higher for the listed year. The other five types of expenditures are comparatively lower during this period. The COVID-19 pandemic did not have a significant impact in the change of the examined elements. Certain reduction is obtained for two of them in 2020. Here, the decrease of the expenditures for clothing and footwear is about 8.18%. As can be seen from Fig. 2, the reduction of the expenditures concerning recreation, culture and education is more than 1.3 times. In addition, there has been a growth in the listed six expenditures for the last year of the considered time segment.

The largest increase is calculated for the expenditures, average per household, for furnishing and maintenance of the house in the period from 2012 to 2021. It is more than 2.2 times. It should also be noted that, the expenditures for alcoholic beverages and tobacco are reduced only for 2016. Here, the decline is very small. In this case, it is about 1.02%.

The next two investigated elements are expenditures for health and transport. The calculations showed a decrease from 0.71% for the first of them in 2020, while for the second studied element the found decrease was 0.87% during 2015, 3.78% in 2017 and 12.19% in 2020 (Fig. 3). The expenditures, average per household, for foods and non-

alcoholic beverages reduced in 2015 and 2016, while those for housing, water, electricity, gas and other fuels during 2014, 2016 as well as 2018.

The present work also analyzes and estimates the indicated expenditures, average per person. The results of the analysis of variance showed that seven of the considered expenditures were presented in one group (Table 3). A continuous growth of four of these expenditures was established during the examined period. In the case, they are the following:

- expenditures for furnishing and maintenance of the house;
- expenditures for alcoholic beverages and tobacco;
- expenditures for communication;
- expenditures for health.

The largest change is observed in the expenditures for furnishing and maintenance over the considered time segment. Here, the increase is almost 2.5 times. The other two expenditures from this group reduced only for 2016.

The expenditures for miscellaneous goods and services decreased by 3.50% and those for recreation, culture and education by 4.44%. The decline for the expenditures about clothing and footwear was 3.51% during 2015.

An increasing tendency was presented for the rest three expenditures. In addition, there was a slight decrease of about 1.49% in the expenditures for foods and non-alcoholic beverages during 2014. In the same year, a reduction of about 4.11% in the expenditures for housing, water, electricity, gas and other fuels was calculated.

A higher decline (about 11.13%) in the expenditures for transport was obtained during 2020.

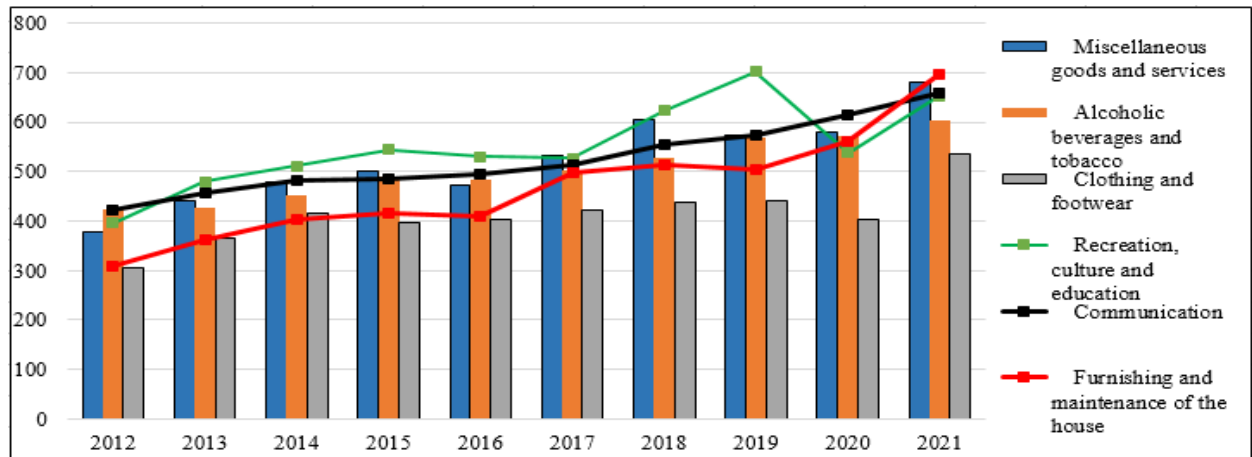


Fig. 2. The change of the listed expenditures (BGN), average per household
 Source: Data from [13].

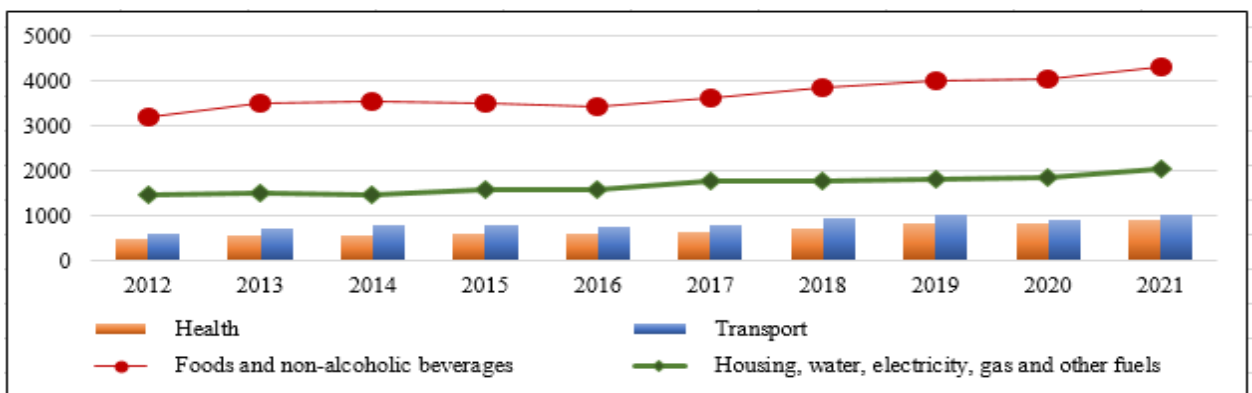


Fig. 3. The change of the other four expenditures (BGN), average per household
 Source: Data from [13].

It can be summarized that the consumer monetary expenditure, average per household, increases for almost whole investigated time period, with an exception for 2016 and 2020 (Fig. 4). In the indicated two years, the reduction is very small. It is 1.36% for the first of the listed years and 1.32% for the second one.

Approximately the same results are obtained for the consumer monetary expenditure, average per person for this studied time period. In the case, the calculated decrease is about 0.22% during 2020, as can be seen from Fig. 4.

Moreover, in the conditions of the COVID-19 pandemic, the investigated expenditures have changed insignificantly.

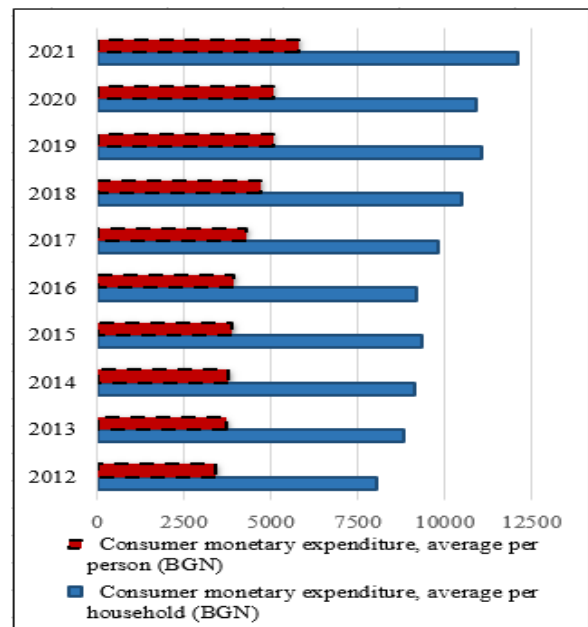


Fig. 4. Results for the consumer monetary expenditure
 Source: Data from [13].

CONCLUSIONS

The present paper studies ten types of expenditures concerning:

- foods and non-alcoholic beverages;
- clothing and footwear;
- housing, water, electricity, gas and other fuels;
- furnishing and maintenance of the house;
- alcoholic beverages and tobacco;
- health;
- transport;
- communication;
- recreation, culture and education;
- miscellaneous goods and services.

They are included in the consumer monetary expenditure. The considered elements are organized and saved in a built relational database.

Statistical analysis applied to the data on consumer monetary expenditure in Bulgaria is presented for the time period from 2012 to 2021. This examined information is searched from the mentioned database.

As a result of the performed analysis of variance and Tukey's test four groups with statistically proven differences are obtained for the considered expenditures, average per household. A similar conclusion is drawn for the indicated expenditures, average per person.

As a whole, consumer monetary expenditure, average per household increased in eight of the listed ten years. Approximately the same results are also established for the consumer monetary expenditure, average per person, where an insignificant decrease is calculated only for 2020.

REFERENCES

- [1]Adeniran, A. T., Olilima, J. O., Akano, R. O., 2021, Analysis of Variance: The Fundamental Concepts and Application with R, International Journal of Mathematics and Computer Research, Vol. 09(10):2408-2422.
- [2]Blagoeva, N., Georgieva, V., 2021, Tax Expenditures as an Incentive for the Agriculture in Bulgaria, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 21(1):85-92
- [3]Blagoeva, N., Georgieva, V., 2020, Analysis of Tax the Legislation, Applicable to Income Taxation of

Agricultural Holders - Legal Entities, Jubilee International Scientific Conference "Economic and Social [DIS] Integration", Plovdiv University "Paisii Hilendarski",525-536.

[4]Dimitrova, T., 2012, Households in Bulgaria – Financial Categories and Dependencies, Economic Archive, Issue 3, 20-38, D. A. Tsenov Academy of Economics, Svishtov, Bulgaria, [in Bulgarian].

[5]Dimova, D., 2013, Data Modeling Concerning Households' Income and Expenditure by Districts in Bulgaria, International Conference Automatics and Informatics' 2013, Sofia, Bulgaria, I-13-I-16, [in Bulgarian].

[6]Dimova, D., 2021, Comparative Analysis of the Rabbit Meat Production in Balkan Countries, Members of the European Union, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.21(1):227-232

[7]Fox, J., 2016, Using the R Commander: A Point-and-Click Interface for R, Chapman and Hall/CRC, New York.

[8]Fox, J., 2007, Extending the R Commander by "plug-in" Packages. R News, 7(3): 46–52, ISSN 1609-3631, https://cran.hafro.is/doc/Rnews/Rnews_2007-3.pdf#page=46, Accessed on December 22, 2022.

[9]Georgieva, V., Blagoeva, N., 2019, Analysis of the Tax Legislation Applicable in Taxing the Incomes of the Farmers as Natural Persons, Management and Education, Vol. 15 (1):115-120.

[10]Kurshumov, V., Radev, R., 2022, Consumption, Production and Safety of Food and Beverages in Bulgaria in the Conditions of COVID Pandemic, "Izvestiya" Journal of Varna University of Economics, 66(1):23- 41, [in Bulgarian]

[11]Larson, D. A., Hsu, K-C., 2010, Analysis of Variance with Summary Statistics in Microsoft Excel. American Journal of Business Education, Vol. 3(4): 7-12. <https://doi.org/10.19030/ajbe.v3i4.406>

[12]Mayes, T.R., 2020, Financial Analysis with Microsoft Excel, 9th edition, Cengage Learning, Boston, USA.

[13]National Statistical Institute, Bulgaria, <http://www.nsi.bg>, Accessed on Dec. 3th, 2022.

[14]Seth, R., Ghosh, D. K., Shah, N. D., 2018. Comparison Between Regression Analysis and Analysis of Variance Techniques. Int. J. Agricult. Stat. Sci., Vol. 14(1): 23-34, ISSN: 0973-1903

[15]Stoyanova V., 2021, Economic Effects on Households in Bulgaria in the Conditions of COVID 19, Industrial Relations and Public Development. "Higher Education" Trade Union "Podkrepa" CL, Issue 3, 50-65 [in Bulgarian].

[16]Tukey, J. W., 1949, Comparing Individual Means in the Analysis of Variance, International Biometric Society, Biometrics, Vol. 5, No.2:99-114.

[17]Winston, W., 2016, Microsoft Excel 2016 Data Analysis and Business Modeling, 5th edition, Microsoft Press, USA.