Factor determinants of the consumer market development

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CHRONICLE	ABSTRACT
	This paper substantiates that increasing the capacity of the consumer market is an important direction of the life quality improvement policy. Its implementation is the major strategic priority of all reforms in Ukraine. Based on the methods of economic and mathematical modeling, namely constructing the linear multiple regression equation, the level of impact of stimulating and destimulating factors on the consumer capacity of the oblasts of the Carpathian region is determined.

1. Introduction

Increasing the consumer market capacity is an important priority of the implementation of economic, social, and managerial reforms directed at improving the quality of life. The consumer market is the most developed goods market in Ukraine since the domestic producers provide the domestic consumer market with 81.4% of food products. Food companies nowadays, on the one hand, play an important role for the creation of value chains by securing the entire technological cycle of agricultural processing, and on the other hand, are active participants of the country's foreign trade, forming over 50% of the foreign trade turnover of agricultural products (Milk.UA.info, 2018). Therefore, to determine the factors that impact the functioning of regional markets, we focus on the development of the regional consumer market (food market).

2. Literature review

The issues of the consumer market development in Ukraine nowadays are becoming increasingly relevant in the context of currently aggravated global problems. A range of scientists devotes their research to this problem. In particular, Haydutsky (2004) and Pavlova et al. (2021) examined the global experience of food provision and draw parallels with domestic practice. Ivanyuk (2015) and Hurmak (2017) researched the agricultural market, represented the structure of food consumption, and defined the major elements of the consumer market provision with food. Meeting the needs for quality goods at accessible prices through the

change of the mechanism of the consumer market development is covered by Kolomiyets (2016). Tolok (2018), and Yakymchuk et al. (2020) characterized the impact of environmental conditions on the quality and safety of consumer goods. Panuhnyk et al. (2019) examined the socio-economic nature of consumer market support in Ukraine, namely its entities and main macroeconomic functions oriented at production, sales, and consumption of food that are performed by the country to secure the consistent social reproduction process and guarantee the security of the country. Shushpanov addresses the issue by defining the risk groups among the population for whom food consumption is one of the leading health determinants. The population is researched across gender, age, marital status, social status, income, and place of residence (Shushpanov, 2016). Barna (2017) constructed a model to study the differences in the purchase behavior of the population on the consumer market of the EU Member States and Ukraine. The model provided the authors with an opportunity to argue that income is the main factor of differences, just like the same as tastes and preferences of consumers. Zhang et al. (2016) studied the consumer confidence in food products and determined that the confidence was formed in different ways. Among other things, it is about personal relations or various organizational mechanisms established by governments, private companies, or civil society organizations. Wong et al. (2018) in their research of the consumer market, focused on environmental problems accompanying food production paid special attention on the development of the Theory of Planned Behavior research model and prognosis of consumers' purchase intention to organic food. Nagyová et al. (2016) emphasized the efficiency of agricultural companies' policy and their opportunity to access financial resources. Pruntseva et al. (2021) examined the provision of the consumer market with food and define the risks of impact on agricultural companies as the basis for agricultural production. Toderasc (2017) researched the process of transition of consumers' provision from the wholesale to the retail level, emphasizing the importance of all trade institutes in the process. Irtyshcheva et al. (2020) analyzed the business activity in the food industry and calculated the regional capacity of the food security on the example of the Black Sea Region of Ukraine. It contributed to showing the condition of the consumer market and defining the priorities of its provision with food. Zablodska et al. (2020) and Simkiv et al. (2020) and Dziabenko et al. (2018) considered the consumption in conditions of sustainable development of business processes at Ukrainian companies.

The authors of the paper hypothesize that the households' monetary expenditures, average monthly wages, consumer price index, and dynamics of the expenditures of the population are the major stimulating factors that increase consumer capacity of the population in the oblasts of the Carpathian region.

3. Materials and Methods

The method of factor analysis was used to find the relationship between the factors of the regions' socio-economic development and the consumer capacity of the regional food market. The method provides an opportunity to qualitatively and quantitatively estimate the changes of certain indicators against the final values and generate on this basis the efficient managerial decisions regarding the regulation of regional markets' development.

Economic-mathematical modeling with correlation analysis shows the relationship between the volume of sold products on regional food markets of Ukrainian regions (output indicator – the volume of sold food products of regions, Y_1, Y_2, Y_3, Y_4, Y_5) and socio-economic factors of impact on the development of the industry and a consumer (independent variable, indicator, factor, X_n: X_1 – disposable income per capita, UAH; X_2 – average monthly wages, UAH; X_3 – GRP per capita, UAH; X_4 – consumer price index; X_5 - households' monetary expenditures on food, UAH/month; X_6 – total consumer expenditures, %; X_7 – change of volumes of the populations' income, %; X_8 - change of volumes of the populations' expenditures, %; X_9 – number of population (actual), thous. persons; X_{10} – export, mln. UAH; X_{11}- import, mln. UAH). The capital region and the oblasts of the Carpathian region (Kyivska, Chernivetska, Zakarpatska, Lvivska, and Ivano-Frankivska oblasts) are selected for the analysis.

Over 60 factors were selected at the initial stage of the research based on the official statistical data – the indicators of the regional food market and consumer behavior in Ukrainian regions in 2008-2018 (X_n). The availability of correlation with the output indicators (Y_1, Y_2, Y_3, Y_4, Y_5) and the absence of multicollinearity between two and more independent factors was researched for the correct analysis and construction of multifactor regression models. After the factors were verified for the absence of linear dependence, 16 independent variables were selected. To construct adequate econometric models, the data was standardized and homogenized to avoid a high non-standardized error.

4. Results and discussion

The results of the correlation analysis in Table 1 prove the existence of a strong relationship between the selected economic factors and independent variables – most correlation coefficients are close to 1. The density of the relationship is verified by the coefficients of the determination (R^2), which are also getting close to 1, while the reliability of results is verified by Student's t-test.

Table 1
Analysis of factors' impact on the volumes of sold food products

X_n	Correlation coefficient	Coefficient of determination	Student's t - test	Significance value	Slope coefficient (Y)	Slope coefficient (X)
			Y_1-X_n			
X_1	0.950090	0.902672	9.13623	0.000008	0.950090	0.950090
X_2	0.960064	0.921723	10.29449	0.000003	0.960064	0.960064
X_3	0.948985	0.900572	9.02874	0.000008	0.948985	0.948985
X_4	0.832291	0.810427	1.02357	0.332764	0.322911	0.322911
X_5	0.955712	0.913386	9.74214	0.000004	0.955712	0.955712
X_6	0.782859	0.846630	2.80416	0.020572	0.682859	0.682859
X_7	0.816345	0.802672	0.49703	0.631080	0.163450	0.163450
X_8	0.916172	0.902615	0.49162	0.634753	0.161717	0.161717
X_9	0.954094	0.929261	1.92948	0.085743	0.540939	0.540939
X_{10}	0.907210	0.823029	6.46961	0.000115	0.907210	0.907210
X_{11}	-0.864241	0.841269	-2.51475	0.033052	-0.642406	-0.642406
			Y_2-X_n			
X_1	0.962401	0.926216	10.02121	0.000008	0.091628	-0.093380
X_2	0.970170	0.941229	11.31910	0.000003	0.069948	-0.069557
X_3	0.925005	0.855633	6.88582	0.000126	0.096281	-0.092090
X_4	0.828342	0.803283	0.83592	0.427461	0.002663	0.035345
X_5	0.977767	0.956028	13.18844	0.000001	0.061594	-0.061429
X_6	0.818923	0.670635	4.03598	0.003757	-0.034864	0.041235
X_7	0.839765	0.815812	1.22580	0.255131	-0.137549	0.092457
X_8	0.933703	0.911359	1.01251	0.340935	-0.100308	0.069817
X_9	0.761416	0.737471	2.49429	0.037272	0.109239	-0.057709
X_{10}	0.827225	0.684301	4.16421	0.003147	-0.094369	0.091499
X_{11}	0.827588	0.807611	0.81182	0.440378	-0.010360	0.039247
			Y_3-X_n			
X_1	0.987903	0.975953	19.11183	0.000000	0.987903	0.987903
X_2	0.976783	0.954106	13.67858	0.000000	0.976783	0.976783
X_3	0.993900	0.987837	27.03629	0.000000	0.993900	0.993900
X_4	0.817673	0.803123	0.53866	0.603188	0.176727	0.176727
X_5	0.993062	0.986172	25.33447	0.000000	0.993062	0.993062
X_6	0.761429	0.737735	2.33545	0.044350	0.614287	0.614287
X_7	0.813194	0.801741	0.39932	0.698968	0.131943	0.131943
X_8	0.942908	0.905900	0.75122	0.471704	0.242908	0.242908
X_9	-0.925564	0.856669	-7.33428	0.000044	-0.925564	-0.925564
X_{10}	0.837619	0.701605	4.60015	0.001290	0.837619	0.837619
X_{11}	0.802831	0.800801	0.08495	0.934158	0.028306	0.028306
			Y_4-X_n			
X_1	0.940672	0.916542	1.335613	0.214467	0.406718	0.406718
X_2	0.834331	0.811786	1.096576	0.301300	0.343310	0.343310
X_3	0.854701	0.829922	1.960327	0.081601	0.547013	0.547013
X_4	0.971932	0.945149	2.721796	0.023539	0.671932	0.671932
X_5	0.940230	0.916184	1.318269	0.219976	0.402296	0.402296
X_6	0.824967	0.806233	0.773490	0.459066	0.249665	0.249665
X_7	-0.811852	0.801405	-0.358074	0.728543	-0.118517	-0.118517
X_8	-0.821901	0.804796	-0.673363	0.517633	-0.219005	-0.219005
X_9	0.827563	0.807597	0.860200	0.412006	0.275627	0.275627
X_{10}	-0.801534	0.800024	-0.046028	0.964293	-0.015341	-0.015341
X_{11}	0.924820	0.906160	0.768648	0.461795	0.248199	0.248199

Note: calculations based on statistical data.
Comment:

Y_1 – the volume of sold food products in Chernivetska oblast, thous. UAH; Y_2 – the volume of sold food products in Zakarpatska oblast, thous. UAH; Y_3 – the volume of sold food products in Lvivska oblast, thous. UAH; Y_4 – the volume of sold food products in Ivano-Frankivska oblast, thous. UAH.

X_1 – disposable income per capita, UAH; X_2 – average monthly wages, UAH; X_3 – GRP per capita, UAH; X_4 – consumer price index; X_5 – households' monetary expenditures on food, UAH/month; X_6 – total consumer expenditures, %; X_7 – change of volume of the populations' income, %; X_8 - change of volume of the populations' expenditures, %; X_9 – number of population (actual), thous. persons; X_{10} – export, mln. UAH; X_{11}- import, mln. UAH.

The results of the correlation analysis show that the factor of average monthly wages (correlation coefficient 0.960064) has the strongest impact on the volume of sold food products in Chernivetska oblast (Y_1) and the import of products in the region (correlation coefficient shows the inverse relationship and amounts to -0.864241) has the least impact. Such factors as total

consumer expenditures and change of volume of the populations' income have the weakest impact on the output variable in terms of the volume of the region's consumer market with the respective correlation coefficients of 0.782859 and 0.816345.

Such socio-economic factors as the households' monetary expenditures on food products and average monthly wages (with the correlation coefficients of 0.977767 and 0.970170, respectively) substantially impact the volume of sold food products in Zakarpatska oblast (Y_2).

Meanwhile, GRP per capita and households' monetary expenditures on food (coefficients are 0.993900 and 0.993062) have the strongest impact on the volume of sold food products in Lvivska oblast (Y_3). The consumer price index and the change of volume of the populations' expenditures have the strongest impact on the volume of sold food products in Ivano-Frankivska oblast (Y_4) among the factors with the direct and inverse relationship (correlation coefficients 0.971932 and -0.821901, respectively).

The linear multiple regression equation for Lvivska oblast (Table 2) shows that the consumer price index (X_4), GDP per capita (X_3), change of volume of the populations' income (X_7), households' monetary expenditures on food (X_5), and export (X_{10}) are the stimulators of the consumer capacity development of food industry market in the region, while import (X_{11}) is the destimulator.

Table 2 presents the results of the research on the quality and reliability of the developed multiple linear regression.

Table 2
Results of the regression analysis of the consumer capacity of the regional food market in Lvivska oblast and socio-economic factors

Groups of factors	Regression equation parameters			
	Standardized regression coefficients	Standard error b	Student's t-test	Significance value
Intercept	0.00001	0.0144	0.0000	1.0000
Consumer price index, X_4	0.4690	0.0868	5.4011	0.0057
GRP per capita, X_3	0.3844	0.0634	6.0617	0.0037
Change of volume of the populations' income, X_7	0.0392	0.0208	1.8854	0.1325
Households' monetary expenditures on food, X_5	0.0745	0.0199	3.7502	0.0199
Export, X_{10}	0.1446	0.0532	2.7201	0.0530
Import, X_{11}	-0.0330	0.0281	-1.1739	0.3056
Regression analysis				
Multiple correlation coefficient	0.99954074			
Coefficient of determination	0.99908168			
Adjusted coefficient of determination	0.99770420			
F-test	$725.2981 > F_{tabl.}$			
Degrees of freedom	6.4			
Standard deviation	0.04791			
Probability level (p)	0.000010			

Multiple regression equation: $Y_3 = 0.00001 + 0.4690X_3 + 0.3844X_3 + 0.0392X_7 + 0.0745X_5 + 0.1446X_{10} - 0.0330X_{11}$ (1)

Note: calculations based on statistical data.

Therefore, the results of the analysis confirm that the volume of sold food products in Lvivska oblast mostly depends on the financial instability of households, consumer price index, and volume of foreign trade activity (export and import of consumer products). The consumer price index has the strongest impact on the consumer capacity of Lvivksa oblast (standardized regression coefficient is 0.4690), which shows that even the slightest changes in the price policy of food producers and suppliers can have a substantial effect on the level of consumption of food products. According to the received results, the GRP per capita that characterizes the level of economic development, the results of economic activity of all economic entities in the region, its production capacity, and the productivity of the economy in general is the second parameter by the impact on the output indicator (standardized regression coefficient is 0.3844). The import of food products has the least impact on the volume of sold food products in the region (standardized regression coefficient is – 0.0330). Import's impact on consumer behavior in the region in the total set of socio-economic factors is only 3.30%. In our opinion, it is caused by the prevailing consumption of domestic products and location close to the border, which brings more opportunities to buy the consumer products in the neighboring countries (Poland, Hungary).

Table 3 shows the results of the verification of the reliability of the developed economic-mathematical model by the parameters of stepwise regression and factors ranking by partial correlation coefficients.

Table 3
Results of reliability of the constructed multiple regression equation for the consumer capacity of the regional food market in Lvivska oblast

Factors	**Detailed multiple correlation analysis**					
	Partial correlation coefficients	Semipartial correlation coefficients	Coefficients of determination	Standard error	Student' s t-test	Significance value
X_4	0.93777	0.08184	0.03044	0.96956	5.40114	0.00569
X_3	0.94964	0.09185	0.05710	0.94290	6.06166	0.00374
X_7	0.68595	0.02857	0.53071	0.46929	1.88540	0.13245
X_5	0.88236	0.05682	0.58253	0.41747	3.75023	0.01994
X_{10}	0.80566	0.04121	0.08119	0.91881	2.72006	0.05298
X_{11}	-0.50619	-0.01779	0.29009	0.70991	-1.17389	0.30556
	Analysis of stepwise regression					
	Multiple correlation coefficient	Coefficients of multiple determination	Adjusted coefficient of multiple determination	F- test	Slope coefficient (Y)	
X_4	0.993900	0.987837	0.987837	730.9612	0.000000	
X_3	0.996640	0.993292	0.005455	6.5059	0.034139	
X_7	0.997460	0.994927	0.001634	2.2549	0.176887	
X_5	0.998491	0.996985	0.002058	4.0963	0.089412	
X_{10}	0.999382	0.998765	0.001780	7.2098	0.043553	
X_{11}	0.999541	0.999082	0.000316	1.3780	0.305560	

Note: calculations based on statistical data.

The results confirm the decisive impact of the GRP per capita indicator and consumer price index on the volume of sold food products in Lvivska oblast. The level of consumption on the regional food market depends on them at 94.96 % and 93.78 %. 80 % of food consumption depends on the expenditures and income of the population.Below are the results of the regression analysis of the estimation of factors' impact on the consumer market of Chernivetska oblast. The results of the analysis of the multiple regression by stepwise regression with F-test are given in Table 4.

Table 4
Results of the multiple regression of the dependence between the volume of sold food products in Chernivetska oblast and socio-economic factors

Factors	**Parameters of regression equation and correlation coefficients**						
	Standardized regression coefficients	Standard error	Student' s t-test	Significance value	**Partial correlation**		
					Partial correlation coefficients	Semipartial correlation coefficients	Acceptable deviation
Intercept	0.00001	0.0008	0.00001	1.0000	0.9987	0.0226	0.0016
GRP per capita, X_3	0.5702	0.0207	27.5261	0.0013	0.9999	0.0979	0.1759
Households' monetary expenditures on food,	0.2334	0.0020	119.001	0.0001	0.9992	0.0287	0.1449
Change of volume of the populations'	0.0755	0.0022	34.9254	0.0008	0.9951	0.0117	0.0082
Import, X_{11}	0.1289	0.0091	14.2200	0.0049	0.9996	0.0416	0.0046
Consumer price index, X_4	0.6135	0.0121	50.5260	0.0004	-0.9997	-0.046	0.0573
Export, X_{10}	-0.1938	0.0034	-56.424	0.0003	-0.9965	-0.014	0.0052
Total consumer expenditures, X_6	-0.1907	0.0114	-16.766	0.0035	-0.9687	-0.005	0.0025
Average monthly wages, X_2	-0.0909	0.0165	-5.5152	0.0313	0.9987	0.0226	0.0016
Multiple analysis coefficients							
Multiple correlation coefficient	0.99999932						
Coefficient of determination	0.99999865						
Adjusted coefficient of determination	0.99999324						
F-test	184799.8 > $F_{tabl.}$						
Degrees of freedom	8.2						
Standard deviation	0.00001						
Probability level (p)	0.00260						

Note: calculations based on statistical data

According to Table 4, the volume of the sold food products in Chernivetska oblast closely correlates with such parameters as GRP per capita (X_3), consumer price index (X_4), and households' monetary expenditures on food (X_5). They all directly impact the level of consumer capacity in the region (standardized regression coefficients are 0.5702, 0.6135, and 0.2334, respectively) and impact the volumes of food products sales by the other eight independent socio-economic factors at 23-57%.

The factors included in the multiple models of consumer capacity of the regional food market under research are both stimulators (GRP per capita, households' monetary expenditures on food, change of volume of the populations' income, import, and consumer price index), the regression coefficients are positive, and destimulators (export, total consumer expenditures of the population, and average monthly wages), where the respective coefficients are negative.

Among all the selected factors, income of the population and foreign economic activity impact the volume of sold food products on the regional market of Chernivetska oblast the most. Calculations of multiple regression show that GRP per capita (X_3) impacts the volume of food products sales at 99 % (partial correlation coefficient), while the impact of the income of the population (X_7) is lower and amounts to only 7.55 %.

The equation of the model of dependence between the factors of socio-economic development of Chernivetska oblast (X_3, X_5, X_7, X_{11}, X_4, X_{10}, X_6, X_2) and the volume of sold food products in the region (Y_1) are represented by the Formula (2).

$$Y_1 = 0.00001 + 0.5702X_3 + 0.2334X_5 + 0.0755X_7 + 0.1289X_{11} + 0.6135X_4 - 0.1938X_{10} - 0.1907X_6 - 0.0909X_2 \qquad (2)$$

Zakarpatska oblast has its features in terms of forming the regional consumer market. The analysis of the factors' impact on the development of the regional food market in Zakarpatska oblast allows presenting the following results (Table 5).

Table 5
Results of the regression analysis of the consumer capacity of the regional food market in Zakatpatska oblast and socio-economic factors

Groups of factors	Parameters of regression equation			
	Standardized regression coefficients	Standard error b	Student's t – test	Significance value
Intercept	0.00001	0.0062	0.0000	1.0000
Total consumer expenditures, X_6	-0.6401	0.0770	-8.3106	0.0037
Import, X_{11}	0.2774	0.0260	10.6766	0.0018
Change of volume of the populations' income, X_7	0.3890	0.0149	26.0289	0.0001
Consumer price index, X_4	1.0121	0.0689	14.6851	0.0007
Export, X_{10}	-0.4886	0.0314	-15.5609	0.0006
Households' monetary expenditures on food, X_5	0.1303	0.0103	12.6774	0.0011
GRP per capita, X_3	0.4929	0.0423	11.6401	0.0014
Regression analysis				
Multiple correlation coefficient	0. 99993746			
Coefficient of determination	0. 99987492			
Adjusted coefficient of determination	0. 99958306			
F-test	$3425.9 > F_{tabl.}$			
Degrees of freedom	7.3			
Standard deviation	0.02042			
Probability level (p)	0.000010			

Multiple regression equation:

$$Y_2 = 0.00001 + 0.6401X_6 + 0.2774X_{11} + 0.3890X_7 + 0.0121X_4 - 0.4886X_{10} + 0.1303X_5 + 0.4929X_3 \qquad (3)$$

Note: calculations based on statistical data

The consumer price index impacts the consumer capacity of the region the most (standardized regression coefficient is 1.0121). Same as in the other regions under research, the parameter has a dominating impact on the volume of food products sales.

According to the received results, total consumer expenditures of the population in Zakarpatska oblast is the second parameter by the impact on the output indicator (standardized regression coefficient is -0.6401). The parameter acts as a destimulator because it has an inverse impact on the volume of sold food. It can be explained by the fact that the region under research is oriented at imported products bought abroad and is confirmed by a high level of the coefficient of determination that amounts to 0.2774. The

higher is the impact of the indicator on the volume of food consumption in the region, the higher yet inverse is the impact of food products export in the region (standardized regression coefficient is -0.4886).

The households' monetary expenditures on food have the least impact on the volume of sold food products (standardized regression coefficient is 0.1303). It is caused by the fact that food products in the region under research constitute the low elasticity category of goods on the consumer market. It is the category of goods that hardly respond to the price, and the population will buy the goods even if the prices grow.

Ranking of factors by partial correlation coefficients and the results of verification of the reliability of the developed economic-mathematical model by the parameters of stepwise regression are given in Table 6.

Table 6
Results of the reliability of the constructed multiple regression equation for the consumer capacity of the regional food market in Zakarpatska oblast

Factors	Detailed multiple correlation analysis					
	Partial correlation coefficients	Semipartial correlation coefficients	Acceptable deviation	Standard error	Student' s t-test	Significance value
X_6	-0.9790	-0.0537	0.0070	0.9930	-8.3106	0.0037
X_{11}	0.9871	0.0689	0.0618	0.9382	10.6766	0.0018
X_7	0.9978	0.1681	0.1867	0.8133	26.0289	0.0001
X_4	0.9931	0.0948	0.0088	0.9912	14.6851	0.0007
X_{10}	-0.9939	-0.1005	0.0423	0.9577	-15.5609	0.0006
X_5	0.9908	0.0819	0.3944	0.6056	12.6774	0.0011
X_3	0.9891	0.0752	0.0233	0.9767	11.6401	0.0014
	Stepwise regression analysis					
	Multiple correlation coefficient	Coefficients of multiple determination	Adjusted coefficient of multiple determination	F - test	Slope coefficient (Y)	
X_6	0.958993	0.919667	0.919667	103.0334	0.000003	
X_{11}	0.982589	0.965482	0.045815	10.6182	0.011552	
X_7	0.990066	0.980230	0.014748	5.2219	0.056208	
X_4	0.993683	0.987406	0.007176	3.4188	0.113946	
X_{10}	0.996140	0.992296	0.004890	3.1735	0.134947	
X_5	0.997109	0.994226	0.001930	1.3369	0.311936	
X_3	0.999937	0.999875	0.005649	135.4917	0.001362	

Note: calculations based on statistical data

Multiple correlation coefficients show the strongest impact of the change of the income of the population in the region and export of food products (standardized regression coefficients are 0.9978 and -0.9939, respectively). The data in Table 4 and Table 8 lead to the conclusion that the parameters of export and import of food products have the strongest impact, adjusting 98 % and 99 % of the variation of the dependent variable.

The regional specifics of the factor analysis of the regional food market in Ivano-Frankivska oblast is shown in Table 7.

The factors included in the multiple model of the consumer capacity of the regional food market under research are both stimulators (GDP per capita, number of the actual population, and disposable income per capita) because the standardized regression coefficients are positive and destimulators (consumer price index, change of the volume of income and expenditures of the population, export) with negative respective coefficients.

GDP per capita (standardized regression coefficient is 0.9681) has the strongest impact on the volume of sold food products among all the selected factors. The parameter correlates at 42.44% (partial correlation coefficient) at the leveled values of other socio-economic factors.

Table 7

Results of multiple regression of the dependence between the volume of sold food products in Ivano-Frankivska oblast and socio-economic factors (estimation by stepwise regression with F-test)

Factors	Standardized regression coefficients	Standard error	Student's t-test	Significance value	Partial correlation coefficients	Semipartial correlation coefficients	Acceptable deviation
					Partial correlation		
Intercept	0.00001	0.0309	0.0000	1.0000	0.9552	0.1813	0.0351
GRP per capita, X_3	0.9681	0.1732	5.5882	0.0113	-0.4244	-0.0263	0.0331
Consumer price index, X_4	-0.1447	0.1782	-0.8118	0.4763	-0.9167	-0.1289	0.4119
Change of volume of the populations' income, X_7	-0.2008	0.0506	-3.9729	0.0285	-0.8190	-0.0802	0.1525
Change of volume of the populations' expenditures, X_8	-0.2054	0.0831	-2.4719	0.0899	-0.9400	-0.1548	0.1307
Export, X_{10}	-0.4282	0.0897	-4.7718	0.0175	0.9207	0.1326	0.1891
Number of population (actual), X_9	0.3050	0.0746	4.0876	0.0265	0.8806	0.1045	0.2581
Disposable income per capita, X_1	0.2056	0.0639	3.2194	0.0486	0.9552	0.1813	0.0351
Multiple coefficients							
Multiple correlation coefficient	0.99841985						
Coefficient of determination	0.99684220						
Adjusted coefficient of determination	0.98947400						
F-test	$135.29 > F_{tabl.}$						
Degrees of freedom	7.3						
Standard deviation	0.1026						
Probability level (p)	0.00096						

Note: calculations based on statistical data

The equation of the model of dependence between the independent features of the socio-economic development in the region (X_3, X_4, X_7, X_8, X_{10}, X_9, X_1) and the volume of sold food products in Ivano-Frankivska oblast (Y_4) is represented by Formula (4).

$$Y_4 = 0.00001 + 0.9681X_3 - 0.1447X_4 - 0.2008X_7 - 0.2054X_8 - 0.4282X_{10} + 0.3050X_9 + 0.2056X_1 \qquad (4)$$

Another two factors substantially impact the volume of sold food products in Ivano-Frankivska oblast compared to the other four regions under research – the number of the actual population in the region (X_9) and disposable income per capita (X_1). It can be explained by the fact that the region has a geographic-economic peculiarity (mountain area), namely a large number of small villages that form the need of the population for food and a large share of employed abroad, who send money home, thus forming high income per capita.

The reliability of the conducted analysis with a stepwise estimation of multiple regression is presented in Table 8.

Table 8

Results of the reliability of the constructed multiple regression equation for the regional consumer market capacity in Ivano-Frankivska oblast

	Multiple correlation coefficient	Coefficients of multiple determination	Adjusted coefficient of multiple determination	F- test	Slope coefficient (Y)
GRP per capita, X_3	0.951579	0.905502	0.905502	86.2402	0.000007
Consumer price index, X_4	0.971447	0.943709	0.038207	5.43001	0.048144
Change of volume of the populations' income, X_7	0.979339	0.959105	0.015396	2.63532	0.148540
Change of volume of the populations' expenditures, X_8	0.985437	0.971087	0.011982	2.48645	0.165903
Export, X_{10}	0.988466	0.977065	0.005978	1.30318	0.305340
Number of population (actual), X_9	0.992941	0.985932	0.008867	2.52133	0.187510
Disposable income per capita, X_1	0.998420	0.996842	0.010910	10.3648	0.048605

Note: calculations based on statistical data

It is worth mentioning that the factors included in the multiple regression equation like GRP per capita, number of the actual population in the region, and disposable income per capita are the stimulators because the regression coefficients are positive. Other parameters of the economic-mathematical model are destimulators and their growth will affect the consumer capacity of the region.

5. Conclusion

The results of calculations have shown that the consumer capacity of each oblast of the Carpathian region under research is influenced by a range of stimulating and destimulating factors. Moreover, the dominating factors determined in the process of regression equations constructing have indicated the features and problems of forming and use of the consumer capacity in the oblasts of the Carpathian region. The consumer price index and GRP were established to have a substantial impact on the volume of sold food products in all oblasts. GRP and households' monetary expenditures on food have the strongest impact on the volume of food products consumption in Lvivska oblast. Average monthly wages, consumer price index, and dynamics (change) of the volume of the population's expenditures are of the highest level of impact in other oblasts of the Carpathian region.

The factors determined in the process of carrying out the analysis can be the ground for the selection of priority directions for regional economic policy that would promote the strengthening of regions' competitive advantages or elimination of the negative impact of destimulating factors.

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