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Comprehensive assessment of the relationship between economic growth and material welfare

Abstract
This article proposes the contemporary statistical methodology for assessment of relationship between economic growth and material welfare of the Ukrainian regions in 2016 by using the method of complex statistical coefficients. The theoretical and applied aspects of opportunities of studied method for comprehensive rating assessment of Ukrainian regions through standardizing the values of examined indexes in economic and material welfare spheres are considered.
Structured and logical schema of mutual influence between the spheres of economics and material welfare of a population is suggested by the author. It was found that the standard of living of a population directly generates material welfare that in turn to be a background for a quality of life. At the same time such distribution of macroeconomic definitions is a new approach enable for statistical studying of relationship between the state of economy and the sphere of material welfare of Ukrainian population. Rating assessment is calculated by available statistical data obtained from the results of state statistical observation performance.
The article proclaims that statistical studying of correlation between indexes of economic sphere and indexes in the sphere of material welfare is necessary. For that purpose, it has been developed the way of assessment the degree of relationship of studied spheres based on complex weighted coefficient of variances according to the formula proposed by the author. From the results of calculations of that coefficient and according to the criteria for assessing the stability of a correlation it is justified that the gap between the levels of economic development and material welfare of a population of Ukrainian regions should be reduced. Such approach is considered to determine exact tasks for public administration policy to increase economic growth in relationship with material welfare of a population.

Keywords
comprehensive statistical assessment of indexes, method of complex statistical coefficients, weighted coefficient of variances, ranking, economic growth, material welfare of a population, degree of relationship

1 Statement of the problem

IEconomic development provides a possibility for the creation conditions for economic growth and improving well-being, while well-being provides a source of demand that makes economic growth possible. These conditions can be used for all over the spheres of socio-economic development and based on data from the current statistical reporting. Therefore, each country, region or business need comprehensive assessment about its socio-economic development.

The main problems solved by the method of complex statistical coefficients through standardizing the values of the studies indexes irrespective of their expression form (absolute values, ratios or mean values of statics and dynamics, or ratio of dynamics and fulfilment of plan) are ranking of regions by socio-economic development (business and financial performance of enterprises) in a given period.

2 Latest scientific progress and publications review

There are numerous scientific studies dedicated to theoretical and applied aspects of comprehensive statistical assessment of absolute values, ratios or mean values of statics and dynamics, or ratio of dynamics and fulfilment of plan of socio-economic development of a country and its regions. Among them are scientific works of Ukrainian famous scientists such as O. Kulynych and R. Kulynych [1; 2], O. Osaulenko, O. Dluhopolskyi and researchers from all over the world as E. Denison, W. Lewis [3], A. William, E. Mansfield and others.

3 The purpose and problem of research

The purpose of the study is to apply and develop the statistical methodology of comprehensive statistical assessment of indexes for Ukrainian regions by using the system of indicators that describe the relationship between the state of economic development and material welfare of a population. Use of complex statistical coefficients for characteristics of economic activities or regions is a necessary condition of this important objective.

4 Results of the research

Performance of the method of complex statistical coefficients can be approached using the several circumstances:

- statistical data sets (business and financial performance of enterprises);
- computation of complex index for assessment of results at business and financial performance of enterprises or socio-economic development;
- compiling scale rankings of regions (enterprises or organizations).

The comprehensive assessment index of weighted coefficient of variances of business and financial performance of enterprises is calculated by the formula [1]

$$K_v = \sum \frac{x_{\max} - x_i}{x_{\max} - x_{\min}} + \sum \frac{x_i - x_{\min}}{x_{\max} - x_{\min}},$$

where K_v denotes the comprehensive assessment index of weighted coefficient of variances;
x_i is the value of the studied index;
$x_{\min}$, $x_{\max}$ represents minimal and maximal value of the index respectively.

The calculations are based on the proof system:

1) If $x_i = 0$, then $K_v = 1$, or
$$\frac{x_{\max} - (x_i = 0)}{x_{\max} - x_{\min}} = 1.$$
2) If $x_i = x_{\max}$, then the growth rate of a value shows a positive change $K_v = 0$ (positive correlation), or
$$\frac{x_{\max} - (x_i = x_{\max})}{x_{\max} - x_{\min}} = 0,$$
and the growth rate of a value shows a negative change $K_v = 1$ (negative correlation), or
$$\frac{(x_i = x_{\max}) - x_{\min}}{x_{\max} - x_{\min}} = 1.$$
3) If $x_i = x_{\min}$, then the growth rate of a value shows a positive change $K_v = 1$, or
$$\frac{x_{\max} - (x_i = x_{\min})}{x_{\max} - x_{\min}} = 1,$$
and the growth rate of a value shows a negative change $K_v = 0$, or
$$\frac{x_i - (x_i = x_{\min})}{x_{\max} - x_{\min}} = 0.$$
4) If the coefficient of variances goes down from region to region (enterprises or organization) from the maximum level (if the growth rate of a value shows a positive change), minimum level (if the growth rate of a value shows a negative change) in all the regions (enterprises or organization), complex statistical coefficient gets reduce. As less that coefficient than management level is more effective and the position of a region is higher.
5) If the growth rate of a value shows a positive change, calculations of variances are made for maximum level ($x_{\max}$), and if the growth rate of a value shows a negative change – for minimum value ($x_{\min}$) [2, p. 57-58].

Complex statistical coefficients of absolute, intensity or dynamic values focused on:

1) assessment of results of business and financial performance of enterprises or regions;
2) assessment of stability of currency rate and effectiveness of its exchange rate (buy/ sell), that is based on contradiction between banks and individuals;
3) assessment of fostering sustainable human development;
4) assessment of relationship between economic growth and material welfare of a population.

Material welfare of a population is determined in time quantitative-qualitative characteristic of standard of living of population of a country as summarized result of the state policy in social field and economic activity of a population in production and consumption fields.

Description of a number of indicators relative to material welfare of a population and economics is given in figure 1. In order to rank the Ukrainian regions, the indicators have been divided into several groups by blocks in analysed spheres.

Correlations of indexes of material welfare sphere and economic activity sphere are represented in the chart below (Figure 2).

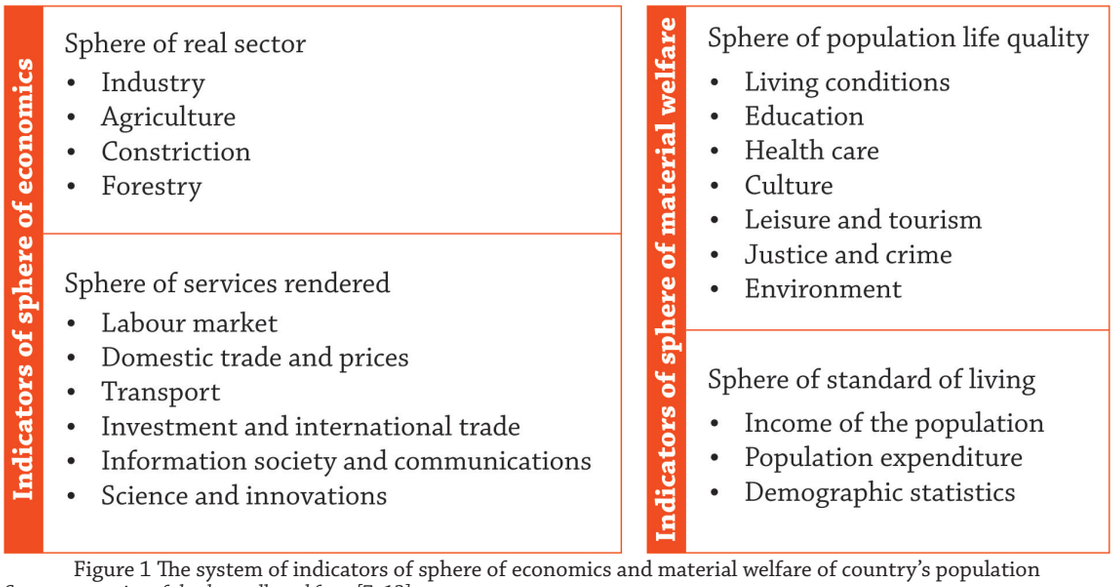

Figure 1 The system of indicators of sphere of economics and material welfare of country's population
Source: processing of the data collected from [7–13]

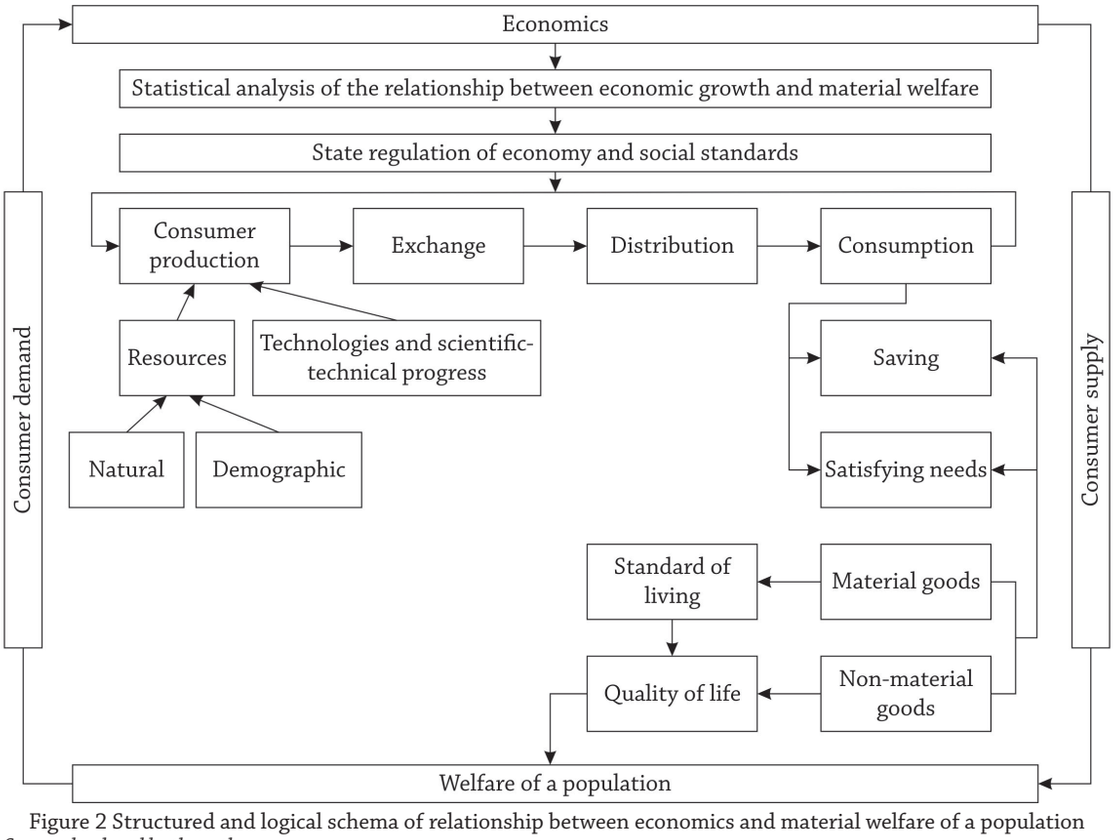

Figure 2 Structured and logical schema of relationship between economics and material welfare of a population
Source: developed by the author

As a consequence, a conclusion is made that material welfare of a population is a correlation between socio-economic phenomena and processes, which describes the standard of living and quality of life and as well as the state of economic development in complex in a viewpoint to enable for taking sound decisions on performance enhancement for the economic and social policies with determined place and time (especially in regional level).

The results have been determined and calculated according to the application of the method of complex statistical coefficients and using modern computer software for assessment relationship between economic development and material welfare of Ukrainian regions.

The principle of comprehensive assessment of indexes is based on replacing the ranks on top when the coefficients are sorted from minimum to maximum. Observation the ranks of these coefficients of examined indexes by Ukrainian regions is given in Table 1.

TABLE 1 Results of comprehensive statistical assessment of indexes of economic development and material welfare of the Ukrainian regions in 2016

Region	The sphere of material welfare of a population		The sphere of economic development		Comprehensive assessment of correlation between economics and material welfare	
	Kv_{mw}	rank	Kv_{e}	rank	$Kv_{total}=Kv_{mw}+Kv_{e}$	rank
Vinnytsya	34,49	19	27,19	2	61,67	4
Volyn	33,11	16	35,47	18	68,59	20
Dnipropetrovsk	32,20	13	32,25	7	64,46	7
Donetsk	34,95	20	40,28	24	75,23	24
Zhytomyr	35,03	21	32,70	9	67,73	16
Zakarpattya	31,39	6	37,83	23	69,22	21
Zaporizhzhya	31,01	3	35,58	19	66,59	13
Ivano-Frankivsk	31,89	8	36,38	20	68,27	18
Kyiv	32,63	15	28,85	3	61,47	3
Kirovohrad	36,08	24	34,06	14	70,14	23
Luhansk	37,44	25	42,18	25	79,62	25
Lviv	27,20	1	32,89	11	60,09	2
Mykolayiv	31,91	10	34,60	15	66,51	11
Odesa	31,15	5	31,29	5	62,44	6
Poltava	35,08	22	31,65	6	66,73	14
Rivne	31,85	7	36,59	21	68,45	19
Sumy	35,38	23	32,80	10	68,18	17
Ternopil	32,54	14	34,75	16	67,29	15
Kharkiv	31,91	9	30,33	4	62,24	5
Kherson	31,03	4	35,12	17	66,14	10
Khmelnytskiy	32,14	11	32,99	13	65,13	8
Cherkasy	33,13	17	32,93	12	66,05	9
Chernivtsi	32,15	12	37,59	22	69,73	22
Chernihiv	34,26	18	32,32	8	66,58	12
Kyiv city	28,87	2	14,21	1	43,07	1

Source: own calculations

The data received by calculations of statistical assessment of regional development in material welfare of a population and economics in 2016 is represented in the map of Ukraine in Figure 2.

As it shown in figure 2 there are 5 major groups of regions according to their statistical assessment. On the one hand the highest-ranking positions are in Kyiv city, Lviv, Kyiv, Vinnytsya and Kharkiv regions (from 1 to 5 position in the ranking, respectively), on the other hand the lowest

Figure 2 The ranking of Ukrainian regions by the system of indicators to characterise the correlation between economics and material welfare of a population in 2016

Source: the data in Table 1

positions are in Zakarpattya, Chernivtsi, Kirovohrad, Donetsk and Luhansk regions.

It is concluded from the results that the method of complex statistical coefficients can be successfully used to justify comparisons of socio-economic development at regional level. Such a comprehensive assessment of indexes of economic sphere and material welfare in a whole is methodologically accompanied or can be used to evaluate necessary blocks in groups.

For example, Kirovohrad region took the 23rd place out of 25 Ukrainian regions. This region would need to be transformed in such spheres as justice and crime (in which the region took the last 25th place), demography (24th place), environment (24th place), construction (23rd place), education (22nd place), information and communications (20th place). At the same time this region took the leading position in the spheres of agriculture (4th place), health care (4th place) and leisure and tourism (7th place).

Thereby, Kirovograd region has imbalance in its development: if it occupies the last place in the sphere of material welfare, then economic situation is slightly better (14th place) due to the high level of agricultural development (4th place).

In our opinion it's also important to define the coefficient of correlation between economic activity and material welfare of a population that based on weighted coefficient of variances by using the formula: $K_{emw} = 1 - \frac{K_w}{n}$, where K_{emw} denotes the coefficient of correlation between economic activity and material welfare of a population, that can take on values a ranging between 0 and 1; the closer the value of the coefficient to zero the stronger the relationship between two variables – economic development and material welfare; K_w is a weighted coefficient of variances calculated on the method of complex statistical coefficients basis; n – a number of indexes involved in calculations.

The values of proposed coefficient are given in the table 2.

It is inferred from the data given in the table 2 that it is suggested to divide the studied regions into some groups based on their score on an assessment of coefficient value K_{emw}. On the basis of the scale of dependence assessment 24 out of 25 studied regions refer to the group of a very low level of unstable correlation. Here is only Kyiv city is possible to refer to the group as the noticeable level of unstable correlation representing the value of coefficient K_{emw}. In generally, if it is ranking all the values of coefficients K_{emw} of regions (table 2) and compare them with the results of comprehensive statistical assessment of indexes of economic development and material welfare (table 1), it is received equality, that indicates that calculations have been made correctly.

5 Conclusions

Thus, it has been applied the comprehensive statistical assessment of the relationship between indicators in economic development and material

TABLE 2 Values of the coefficients of correlation between economics and material welfare of a population of the Ukrainian regions in 2016

Region	The value of coefficient K_{emw}	Region	The value of coefficient K_{emw}
Vinnytsya	0,48	Odesa	0,48
Volyn	0,42	Poltava	0,44
Dnipropetrovsk	0,46	Rivne	0,42
Donetsk	0,37	Sumy	0,43
Zhytomyr	0,43	Sumy	0,43
Zakarpattya	0,42	Kharkiv	0,48
Zaporizhzhya	0,44	Kherson	0,44
Ivano-Frankivsk	0,43	Khmelnytskiy	0,45
Kyiv	0,48	Cherkasy	0,44
Kirovohrad	0,41	Chernivetska	0,41
Luhansk	0,33	Chernivtsi	0,44
Lviv	0,50	Kyiv city	0,64
Mykolayiv	0,44		

Source: own calculations

welfare of Ukrainian regions on the basis of available statistical data sets. From the results of calculations, it has been proposed the formula to measure the degree of relationship between indicators in spheres of economic activity and material welfare of a population based on complex weighted coefficient of variances. From the results of calculations of that coefficient and according to the criteria for assessing the stability of a correlation it may be stated that the gap between the levels of economic development and material welfare of a population of Ukrainian regions should be reduced. We can make a conclusion that it's necessary to improve the values of coefficient as minimum to 0,7.

The method for ranking of the Ukrainian regions by indexes of statics, dynamics and intensity of socio-economic development by use of the method of complex statistical coefficients through standardizing the values of the studied indexes enable for modelling of processes taking place at country and regional level, to find the nature of structural change and predict its consequences.

The results of this study showed a trend of increasing application of statistical methods, providing the analytical information for public authorities, responsible for social and economic policies and taking sound decisions on performance enhancement for the entities with bottoms ranks in the overall rating. It can be an effective tool for managing the state of affairs, planning in performance management process and improving the value of relationship between the levels of development in the spheres under review.

It is expedient to use the results of conducted research for complex statistical study of rational and actual food consumption experiences of a population for further researches in sphere of material welfare. Obtained results of these studies can be reflected in planning state regional programs in social and economic spheres to indicate the factors and resources for increasing indexes in material welfare of a population and information support in realization socio-economic policy.

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