

## Modeling Financial Supply of State Social Expenditures: The «Human-Center» Tax Principle

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### Abstract

Comprehensive economic development is possible only with the balance of interests of business entities and the state, which should be reflected in financial policy. In this case, the transformation of the fiscal system should take into account the stage of economic development of the country. An information array consisting of 36 countries and 10 socio-economic indicators was adopted as the basis for the development of benchmarks for assessing the effectiveness of public resources for the implementation of social policies in the region. The basic features which characterize the state of social orientation of the state policy of the countries in correlation of the spheres of social expenditures and the national system of taxation as social arguments are outlined. Comparative intercluster characteristics are identified and essential differential and baseline characteristics are distinguished. In order to determine the rationality and effectiveness of the current tax system and its impact in the field of social guarantees of the state as well as to increase the degree of social protection of the most needy population, a methodological approach was proposed, using a multidimensional statistical procedure, cluster ranking, which allows the grouping of objects on several grounds simultaneously to define main characteristics of the studied world economies for simulation of "bench marking" – system of financial support of state social expenditures, built on the principle of "human-center" taxation.

**Keywords:** Finance; Supply management; Taxation; Social expenditures; Clustering; State policy.

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## **1. Introduction**

The question of the existence of a modern economy in the global space largely depends on the priority of the development of the social sphere, human potential, improving the quality of life, reducing poverty, unemployment and creating an effective social sphere. The state, if it wants to be fair, is obliged to help disabled and unprivileged invalid people, pensioners, orphans, in order to make the lives of such people decent and the basic benefits to be accessible to them. The key to achieving this is to solve the classic problem of the effective functioning of the economic system, to meet the boundless and ever-growing needs of society in the harsh condition of constant scarcity of resources.

Social progress depends not only on the growth of incomes and material living conditions of people, but also on their health status, the level of social security and its accessibility, as well as other social factors that determine the possibility of realization of the individual, whose importance is the qualitative level of functioning of the system. social institutions, the nature of social mobility, motivations and interests.

One form of financial support for the qualitative and quantitative interconnection of budget components in the process of budgeting, improving the quality of life of citizens and the level of provision of public goods, is to adapt the tax system to socially oriented content.

The factors that determine the quality of life of a person and the degree of socialization of a country are characterized primarily by the size of real incomes, the volume of goods consumed and services used, the conditions of its life, as well as the availability of education, medical and cultural services.

State social expenditures have been and remain one of the most important indicators of the living standard of the population and the degree of its financial support is a priority of public policy. We propose to consider "social economic growth" in the context of statistical measurements, and interpret it as a dynamic series of growth (increase) of the result of economic activity of the territory, more precisely - tax revenue, in correlation with the isolated social arguments. Adjustment of the country's financial policies and macroeconomic indicators (national currency rate, inflation rate) substantiates the need to clarify tax policy priorities and consider possible directions for improving the existing tax system towards social orientation. Hence, it is of utmost importance to adequately assess the impact of possible changes in the tax space on social development, not only at country level as a whole, but also at the level of global space. Consequently, a methodological approach was proposed, using a multidimensional statistical procedure, cluster ranking, which allows the grouping of objects on several grounds simultaneously to define main characteristics of the studied world economies for simulation of "bench marking" – system of financial support of state social expenditures, built on the principle of "human-center" taxation.

## **2. Research analysis and assignment.**

The theoretical, methodological and practical issues related to the financial support of state social expenditures as a result of optimization of the tax burden have been studied in the writings of many scholars. Alireza Goli has obtained results that optimize the EPPS problem on social media developed a hybrid fuzzy multi-objective optimization algorithm, named as NSGA-III-MOIWO encompassing the non-dominated sorting genetic algorithm III (NSGA-III) and multi-objective invasive weed optimization (MOIWO) algorithms (Goli, A., 2020). The main question that arises is that how we can affect our closed-loop supply chain by considering social responsibility (Sebt. M., Sasanian Asl. F, 2021). The problems of social security in the context of management are considered in their research by researchers (Modak, N., 2018). Hong Nhat Nguyen has obtained results that allow Vietnamese politicians, academic researchers, auditors, and investors to further study the impact of the tax rate on business performance (Nguyen H, 2020). Rachmawati Meita Oktaviani analyzed the impact of taxpayers' knowledge and tax socialization on taxpayers' compliance mediated by taxpayers' awareness (Oktaviani, R., 2020). "International tax planning is indeed a critical component of business strategy that requires attention from managers of all functional areas in the firm" (William F. Yancey, 1998). Scientists are also exploring the association between mandatory corporate social responsibility (CSR) disclosure and economic contribution (tax payments) in China (Kenny Z. Lin, 2017). "This research attempts to examine how specific stakeholder groups influence multinational enterprise (MNE) corporate social responsibility (CSR) practices in South Korea" (Byung Il Park, 2014). Some researchers have identified that the institutional approach to solving socio-economic problems of society does not always meet the interests and needs of such actors as state, business and society (Yelagin, V, 2019). Financial supply chains are studied by scientists such as Pant, S. and Mahapatra, S. (Pant, S., 2018). Supply management studies and analyzes Nicolaos Pavlis (Pavlis, N., Moschuris, S., Laios, L., 2018). The researchers also focus on the problems of modernity, which were aggravated by the pandemic (Larue, B. 2020, Hobbs, J., 2020., Ivanov, D., and Dolgui, A. 2020). The coronavirus (COVID-19) has already left its footprints over vast geography worldwide and the rest of the globe is also

under a big threat to this ongoing pandemic. Its effect can be felt amongst every sector of the economic system (Mor, R., Srivastava, P., 2020).

So far, it has not been possible to build a worldwide benchmarking system of financial support for public social expenditures that would facilitate the efficient use of public funds aimed at social support for the population. The inevitable search for unity in global diversity, which means focusing on taking advantage of each economy in shaping the integrity and unity of the global economy as the overriding imperative of the strategy for the future, given that the financial support of state social expenditures is largely entrusted to economic entities, the importance of optimal allocation of available state resources and the application of the principle of "human-center" taxation.

The purpose of the article is to determine, among the world's economies, a "bench marking" – system of financial support for public social expenditures through "human-center" taxation by the method of clustering.

### 3. Methods.

Economy clustering is a popular area of innovation development. The world experience of the last few decades is full of many examples of creation and functioning of cluster entities in different sectors of the economy. Many European countries have built their development strategies on the basis of national cluster programs. The main advantage of the cluster approach as a tool in solving the economic problem is the presence of a synergistic, multiplier effect, which increases the overall efficiency of the activity, making the clustering a strategic tool for planning the medium and long-term development of countries.

Cluster analysis is a multidimensional statistical procedure whose main task is to group a significant number of objects based on their characteristics into homogeneous groups or clusters. Cluster ranking makes it possible to merge objects into groups, taking into account all grouping characteristics simultaneously (Kuksa, I., Vasyurenko, L., 2018).

With regard to determining the composition of features and modeling their impact on the formation of characteristics of socially oriented tax policy, there is an evolution of approaches in terms of models specification and the identification of factors that act in these models as predictors. The functions describe the economic-mathematical relationship between the magnitude of the effect (this may be, for example, the value of gross domestic product, tax revenue, etc.) and various arguments (ensuring the effect of equitable socialization in the country). Function parameters help to assess the scale, effectiveness of predictors, identify the mechanism of the impact of tax revenue growth on the living standards and dynamics of the population (King, R., 2014).

The implementation of the proposed methodological approach is carried out in several stages (Fig.1):

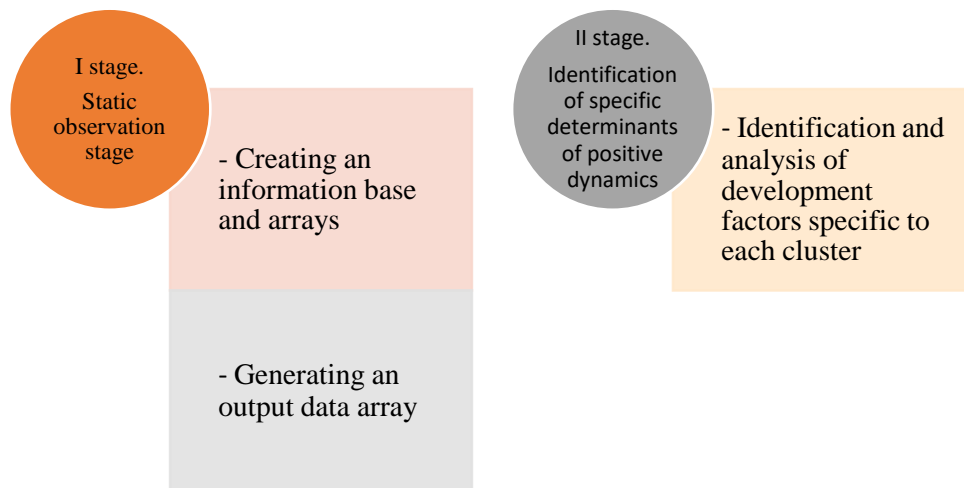


Figure 1. Stages of The Methodological Approach\*

\* Source: own development

I. Stage of static observation, which is the formation of a system of indicators and arrays of output data.

- Formation of information base and arrays. Investigation of the factors of financial support of state social payments of territories can be carried out both as in the context of the subjects of the world economy as in the interstate one. The following principles should be followed when designing a system of statistical indicators:

- the principle of systematicity - the system of indicators, which characterizes the phenomenon under study, must be complete, i.e. cover different aspects of the social sphere;

- the principle of formality, indicators that are included in the system should be developed by the official statistical accounting authorities;

- the principle of maximum coverage – the indicators selected in the system must be disaggregated to the level of subjects;

- principle of continuity - statistics that form the array must be obtained by continuous or periodic statistical observations and presented at the maximum time interval.

- Formation of the output data set. The original set of features is a feature space, determined on the basis of official statistics. Logical and arithmetic control of data is carried out. For the purposes of the study, it is necessary that the system of indicators fills the following sections of the information base:

- indicators that characterize the dynamics of socially oriented growth: indicators of the dynamics of tax income;

- indicators that characterize the point factors of socially-oriented growth - the poverty threshold, government expenditures on older people, the percentage of payroll tax, etc.;

- to identify one of the mechanisms of cluster formation - indicators that characterize the potential of the subject to cluster formation.

II. Identification of specific determinants of positive dynamics. At this stage, the development factors specific to each cluster are identified and analyzed. The identified specific factors can later be used as predictors in territorial development models.

The data array was formed on the basis of the data source of the Organization for Economic Cooperation and Development (OECD, 2020).

The advantages of the proposed method are the ability to group the objects of research into certain groups (clusters) according to several characteristics at the same time, which allows us to demonstrate in detail the detailed qualitative characteristics of the object in our study. These are social arguments). The disadvantage of this methodological approach is that it is impossible to take into account the satisfaction of the population from the introduction and use of certain tax instruments by state institutions during the experiment. In this situation, the primitive aspect would be the use of the method of expert assessments (conducting surveys, questionnaires). This can serve as a basis for our further research in this area.

The result of our research will be the maintenance of typology, clusters, which can then be used to study trends (trends) in the development of the territory, econometric modeling and implementation of factor forecasting of socially fair economic growth.

#### **4. Results of the research.**

In order to assess the condition of financial support for state social expenditures in different world economies and to look for a reference application of the taxation system, we consider it necessary to cluster the entities, which will allow the construction of homogeneous groups with characteristic features.

In order to clarify the role and significance of budget expenditures in the socio-economic life of the objects under study (36 countries were selected, according to the Organization for Economic Co-operation and Development (OECD, 2020), as well as to streamline the budget process in the country, 10 indicators were singled out - social spending indicators of the state and effective indicators of tax filling of the budget (social arguments) (Table 1.2).

**Table 1.** Array of features (Dataset: Global Statistics Database - Selection of social arguments (2018 year))\*

№	Social argument	Indicator	Measure	
1	Total tax revenue	Tax revenue as % of GDP	In percentage	<b>A</b>
2	Taxing Wages - Comparative tables	Average tax wedge (% labour costs)	Single person at 100% of average earnings, no child	<b>B</b>
3	Social Expenditure - Aggregated data	Net Total	In percentage of Gross Domestic Product	<b>C</b>
4	Net childcare cost for parents using childcare	Average Wage	Percentage of the average wage	<b>D</b>
5	Social Expenditure (Old age and Survivors)	Cash benefits	In percentage of Gross Domestic Product	<b>E</b>
6	Social Expenditure (Incapacity related)	Cash benefits	In percentage of Gross Domestic Product	<b>F</b>
7	Social Expenditure (Family)	Cash benefits	In percentage of Gross Domestic Product	<b>G</b>
8	Social Expenditure (Family)	Benefits in kind	In percentage of Gross Domestic Product	<b>H</b>
9	Hours of work needed to escape poverty for workless families	Average Wage	Single person without children	<b>I</b>
10	Adequacy of Guaranteed Minimum Income benefits	Include housing benefits	Single person without children	<b>J</b>

\* Source: (OECD, 2020)

**Table 2.** Array of objects (Dataset: Global Statistics Database - Selection of social arguments (2018 year))

№	Country	№	Country	№	Country	№	Country
1	Australia	10	France	19	Korea	28	Portugal
2	Austria	11	Germany	20	Latvia	29	Slovak Republic
3	Belgium	12	Greece	21	Lithuania	30	Slovenia
4	Canada	13	Hungary	22	Luxembourg	31	Spain
5	Chile	14	Iceland	23	Mexico	32	Sweden
6	Czech Republic	15	Ireland	24	Netherlands	33	Switzerland
7	Denmark	16	Israel	25	New Zealand	34	Turkey
8	Estonia	17	Italy	26	Norway	35	United Kingdom
9	Finland	18	Japan	27	Poland	36	United States

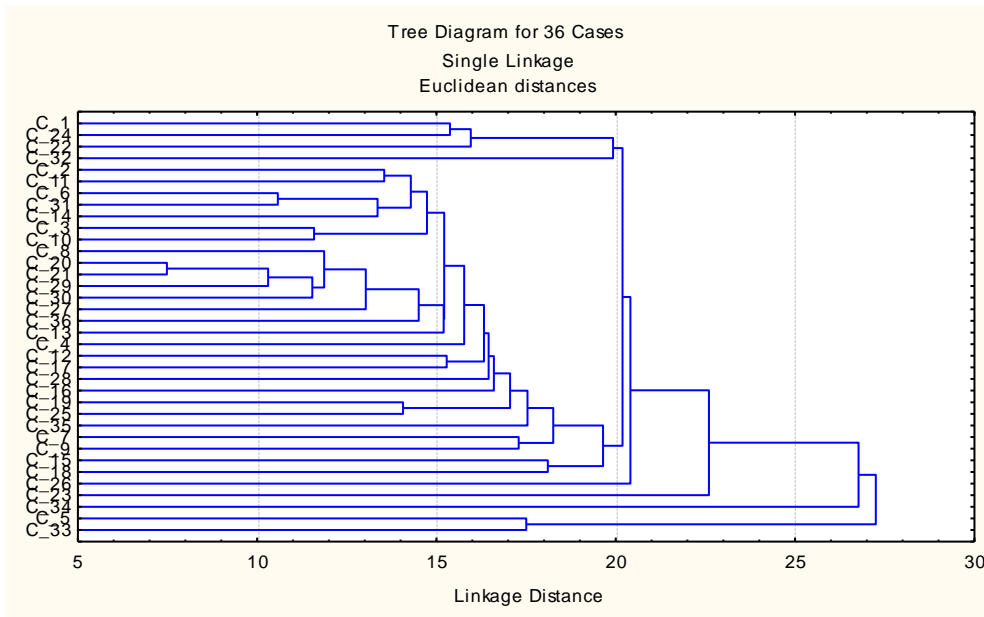
\* Source: (OECD, 2020)

In order to confirm the hypothesis that there is a general tendency of the grouping of objects according to the state of social argument indicators in the plane of the selected subjects, we conducted a cluster ranking using the tree clustering method, investigating a separately defined period of time, chosen with taking into account the principle of continuity of statistical observations on all features and for each subject, within the set period, which is presented in Fig. 2.

The essence of the algorithm of this method is as follows: merge objects into large enough clusters, using some degree of similarity or distance between objects. The result of such a cluster ranking is a hierarchical tree constructed in the form of a dendrogram [10]. The construction of the dendrogram is analyzed from the left, from each subject (country) in its own cluster, heading to the right, which are "closer to each other" - uniting and forming clusters. Each delineated degree of the dendrogram represents the union of two or more clusters, the position of the degrees on the horizontal axis determines the distance at which the respective clusters were merged.

The constructed dendrograms give the opportunity to form a decision on a steady tendency of formation of the marked five clusters, three of which are the most significant. Therefore, we propose the hypothesis that there is a trend of grouping objects into clusters based on the state of social arguments in the countries studied.

We will test the proposed hypothesis by dividing the input information base by the K-means method into 3 clusters, in order to determine the characteristics for each level, the significance of differences between the obtained groups in the studied period. The rationale for using this method is its available tools, which have the function of embedding the required number of clusters in the calculation algorithm, according to the constructed dendrogram, these are three clusters.



**Figure 2.** Visualization of the trend of subjects grouping into homogeneous groups at the same time selected \*

\* Source: own development

The method of K-means is as follows: the calculations begin with k-randomly selected observations (in our case  $k = 3$ ), which become the centers of groups, after which the object composition of the clusters changes in order to minimize the variability within the clusters and maximize the variability between the clusters. Each subsequent observation ( $K + 1$ ) belongs to the group whose degree of similarity with the center of gravity is minimal. After changing the composition of the cluster, a new center of gravity is calculated, often as a vector of averages for each parameter. The algorithm continues until the composition of the clusters ceases to change. Once the classification results are obtained, it is possible to calculate the average of the values for each cluster to evaluate how different they are from each other (Reynolds, A. 2006).

The purpose of constructing the k-means clustering algorithm is to solve the clustering problem for 36 countries among social arguments, with a distinctive focus on the critical view of tax revenue. It is assumed that one traffic stream implements (or participates in) one of the possible communication services. A finite set of k-types of subjects is thus possible. Each of the subjects has certain characteristics that are reflected in its parameters, perhaps some of the features that can be obtained by monitoring it. Consider the k-means clustering algorithm, which allows you to allocate a given number of clusters. The peculiarity of the clustering (classification) of countries is as follows: the total number of characteristics of social arguments available for monitoring is quite large; traffic is characterized by 10 different parameters having different units and ranges of possible numerical values; the number of observations (monitoring results, flows) changes over time.

The selection of clusters is carried out according to the k-means algorithm, i.e. it is an iterative procedure, during which the redistribution of elements by clusters and the recalculation of centers of mass are carried out, until the centers of the clusters are stabilized. The found mass centers can be used in the task of classifying subjects with respect to socially oriented taxation.

To summarize the input data, we calculated averages for each attribute of the cluster ranking for the analytical period of the study. The results of the cluster ranking method K-means are presented in table 3,4,5, where: V - Variable; M – Mean; S - Standard; Var – Variance.

**Tabl.3.** Descriptive Statistics for Cluster 1 (Cluster contains 5 cases)\*

V	M	S	Var
A	<b>27,20153</b>	4,65776	21,6947
B	18,04093	6,45016	41,6045
C	15,20920	4,23811	17,9616
D	4,57200	5,43638	29,5542
E	4,40180	1,51977	2,3097
F	1,44720	0,88863	0,7897
G	0,88580	0,48763	0,2378
H	0,93440	0,25424	0,0646
I	13,20000	2,16795	4,7000
J	20,40000	17,8969	320,300

**Tabl.4.** Descriptive Statistics for Cluster 2 (Cluster contains 14 cases)\*

V	M	S	Var
A	<b>33,94405</b>	4,363380	19,03909
B	39,36865	5,667587	32,12155
C	19,23007	6,732315	45,32406
D	14,47071	8,879973	78,85393
E	8,52386	4,528920	20,51112
F	1,64586	0,793992	0,63042
G	1,17743	0,639435	0,40888
H	0,71800	0,504377	0,25440
I	14,14286	3,779645	14,28571
J	19,85714	9,346798	87,36264

**Tabl.5.** Descriptive Statistics for Cluster 3 (Cluster contains 17 cases)\*

V	M	S	Var
A	<b>35,43439</b>	8,73046	76,2209
B	39,38425	8,72655	76,1527
C	20,94171	7,58532	57,5370
D	22,11471	16,22477	263,2430
E	8,01482	3,59913	12,9538
F	1,66459	0,80787	0,6527
G	1,27188	0,59830	0,3580
H	1,06888	0,65462	0,4285
I	6,76471	6,45687	41,6912
J	48,82353	9,52126	90,6544

\* Source: own development

Looking at the clusters that have been formed, it can be argued that a logical grouping of countries with proportionally formed characteristics within each cluster can be obtained.

The first cluster included five entities, Chile, Israel, Korea, New Zealand, Switzerland, which have the lowest social argument scores among the clusters by the individual nature of each indicator. A basic-determinant argument A, Tax revenue as % of GDP, has the lowest cluster value, with 27.2% of the country's gross domestic product accounting for tax revenue.

The cluster 2 includes fourteen objects, Canada, Estonia, Greece, Hungary, Italy, Latvia, Lithuania, Norway, Poland, Portugal, Slovak Republic, Slovenia, United Kingdom, United States. The basic-determinant argument A, Tax revenue as % of GDP, has an average value among clusters, with 33.9% of the country's gross domestic product accounting for tax revenue.

The third cluster has united the following seventeen objects: Australia, Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Iceland, Ireland, Japan, Luxembourg, Mexico, Netherlands, Spain, Sweden, Turkey. A basic-determinant argument, Tax revenue as % of GDP, has the highest value among clusters, with 35.4% of the country's gross domestic product accounting for tax revenue.

But the content of our study is to track the way of taxes spending, collected by the government, on social spending. In this we formulate the essence of the principle of "human-center" taxation and search for the model of "bench marking" - system of financial support of state social expenditures among the world economies. We hypothesize about the conformity of objects of cluster No. 3, as a standard of socially oriented taxation, on the basis of the highest indicators obtained by cluster ranking.

Let us analyze in more detail the comparative intercluster characteristics of traits and distinguish them substantially differentiated. Cluster-wide parallel dynamics of trait magnitude growth are observed in relation to the increase in the value of argument A. At the same time, a significant difference in the amount of value, 7-9% between clusters, has an argument B, the percentage of the tax burden on wages.

Significant difference among the three clusters is the value of social argument (J), Adequacy of minimum income benefits, this indicator measures the income of jobless families relying on guaranteed minimum income benefits as a percentage of the median disposable income in the country. Housing supplements are included subject to relevant eligibility conditions. The 3rd cluster has the highest value of this indicator, with a significant difference between the 1st and 2nd clusters. That is, guaranteed social security from the state during unemployment is almost half of the average earnings of a working citizen (48%), which creates a considerable social standard.

Let us look at argument (D), this indicator measures the net costs paid by parents for full-time center-based childcare, after any benefits designed to reduce the gross childcare fees. Childcare benefits can be received in the form of childcare

allowances, tax concessions, fee rebates and increases in other benefits entitlements, which is 63% greater in cluster 3 relative to cluster 2 and 16 times greater than cluster 1.

Therefore, the amount of all necessary payments related to children in the country is guaranteed from a sufficiently large percentage (22% of income) of funds, which creates another significant social standard in the country.

Another social argument (I), this indicator measures the weekly hours that a family claiming is guaranteed a minimum benefit needs to work to exit poverty. The measure is expressed for three hourly wage rates. The poverty line is calculated as 50% of the median disposable income in the country, significantly different in cluster 3 - 6.4 hours a week to work to reach the poverty line for an individual family, compared to 14 hours from the other two clusters.

In Fig. 3, to summarize the results of the cluster ranking and visualize the perception of the analytical study, a graph of the mean and confidence intervals of the characteristics for each of the three clusters is presented. The confidence interval allows you to estimate an unknown value of the general population with a given accuracy. Within the limits of confidence, you can have a certain level of confidence in the presence of a specific value of a feature of the general population. Next, we calculate the average indicators of the results of such observations and get a certain figure.

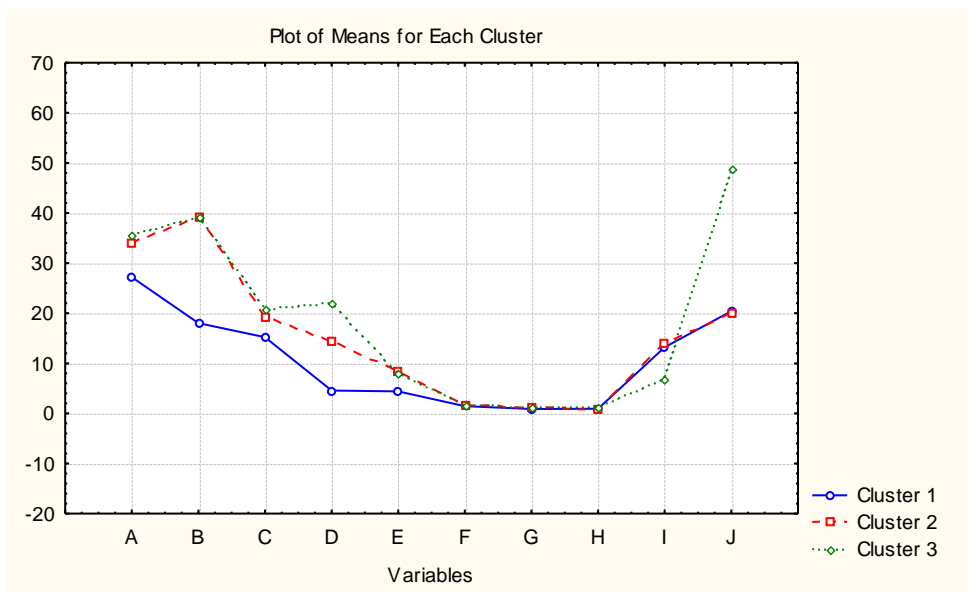
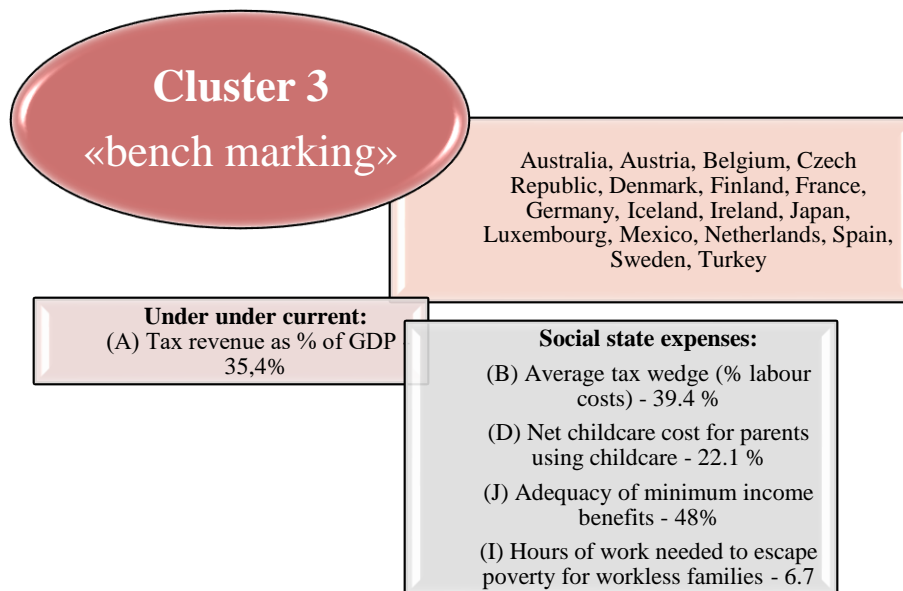


Figure 3. Graph of the mean and confidence intervals for traits in each cluster

\* Source: own development

That is, we confirm the hypothesis and propose to recognize cluster No. 1, that is, the institutions of these entities, as a model of "bench marking" - system of financial support of state social expenditures, built on the principle of "human-center" taxation. Schematically this conclusion will be summarized in Figure 4. That is, as an example of a reference economy that tends to have human-centered social security, we have a list of countries for further research. Four social arguments were also obtained as tools of influence to achieve optimal indicators of socialization of the tax system in the country.





**Figure 4.** Modeling of “bench marking” - a system of financial support of state social expenditures, built on the principle of "human-center" taxation \*.

\* Source: own development

Further detailed study of the economic characteristics, structure of the tax burden, social security system and other factors within this group and individually in the environment of each entity will serve as the basis for the construction of differential reference models for finding reserves for financial support of state social expenditures and reaching a consensus between rigid tax paternalism and social equity.

## 5. Conclusions.

A detailed description of the financial mechanism of implementation of the social expenditure policy of the state in terms of market relations is presented, including the distinctive features of the financial mechanism of each country, as well as the factors that influence the formation of financial mechanism type in the field of public social expenditures. In all spheres of modernization, it should be borne in mind that a real positive effect can only be achieved by increasing public funding for social spending to the average level of developed countries (in % of GDP).

The fine structure of the experimental actions demonstrates the hierarchical cluster organization of the study environment. The tendency to form this hierarchy is more pronounced for objects characterized by a hierarchical spatial relation. Thus, the individual characteristics of objects obtained by k-means ranking have large stable clusters, whereas in the case of hierarchy, clusters are less stable in the form of a hierarchy. The theoretical and numerical peculiarity of the formed hierarchy of clusters is not related to the properties of the studied conformations, but is a reflection of the discreteness of the individual characteristics of the objects. Conducting analytical studies within the presented methodological approach allows to create scenarios of development of the world economy subjects, which can be used in the development and adjustment of documents of strategic planning, regional and programs of socio-economic development, improvement of the system of taxation on the principle of "human-center" and making management decisions aimed at stimulating the economic growth of the territory.

A practical limitation of the introduction of this study is the difficulty of taking into account the socio-cultural and psychological characteristics of the country's citizens, established traditions when making decisions in the field of taxation.

When predicting the application of the results obtained, management decisions should be based on the following principles:

1. When developing tax rates, it is necessary to take into account the level of real incomes of the population. We must not forget the axiom: with a drop in demand from the population, production also fade.

2. A high level of taxation can lead to restrictions on production and employment in it, which requires additional costs to provide a significant part of the population with means of subsistence.
3. The level of the tax rate should take into account the taxpayer's capabilities, i.e. the level of his income.
4. It is necessary to conduct comprehensive organizational and educational work with taxpayers, regulate and improve information flows between taxpayers and control bodies for their payment.
5. The construction of a certain tax system should be based on the economic doctrine of the state, which is based on forecasting the volume of state expenditures. This projected indicator is the determining basis for establishing the tax rate in the country.

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