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**Editors office address:**

Simon Kuznets Kharkiv National University of Economics  
61166, 1-A Inzhenerny Ln., Kharkiv, Ukraine  
E-mail: [info@ecdev.com.ua](mailto:info@ecdev.com.ua)  
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**Tetiana Cherkashyna\***

Simon Kuznets Kharkiv National University of Economics  
61166, 9A Nauka Ave., Kharkiv, Ukraine

## Taxonomic Analysis of Income Inequality in the EU Countries

**Abstract.** The problem of population economic inequality is an actual issue for all countries of the world, but the peculiarity of economic inequality in EU countries lies in the differentiation of non-labor incomes received from property ownership, and also in the uneven distribution of residential and commercial real estate. Therefore, the analysis of population economic inequality in the EU countries is an urgent scientific and practical task. The purpose of this study was to determine the degree of economic inequality and the optimal rate of population income differentiation in the EU countries, and to develop measures based on this to reduce the degree of property inequality in the countries of this region. To achieve the goal, the taxonomy method was used, as well as general scientific methods (dialectics, analysis, synthesis, induction, deduction). For the quantitative description of the obtained results, the Harrington factor-criterion scale was used, which made it possible to divide 27 EU countries into three groups (clusters): countries with a high degree of economic inequality (Bulgaria, Latvia, Lithuania); countries with an average degree of economic inequality (Austria, Belgium, Greece, Spain, Italy, Cyprus, Luxembourg, Germany, Poland, Portugal, Romania, Hungary, Croatia, Finland, France, Sweden); countries with a low degree of economic inequality (Denmark, Estonia, Ireland, Malta, the Netherlands, Slovakia, Slovenia, the Czech Republic). To reduce the population economic inequality in the countries of the third group, the following measures have been proposed: stimulation of domestic and foreign investments; ensuring a high return on financial assets at the state level; creating more favorable conditions for the development of industry and increasing the wages of workers at the industrial enterprises. The obtained results have scientific and practical value on how to improve the economic policy of the countries of Northern and Eastern Europe and can be used in further theoretical researches on problems of population economic inequality in the countries of this region and for the specification of applied measures to reduce economic inequality in Bulgaria, Latvia and Lithuania

**Keywords:** property inequality, income differentiation, the Gini coefficient, the Palma index, decile coefficient, taxonomy method

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### INTRODUCTION

The problem of population economic inequality is relevant for all countries of the world, with economically developed countries, in particular the countries of the European Union (EU) being not an exception. However, the peculiarity of economic inequality in the EU countries, is mostly not in the differentiation of labor income (wages, intellectual rent, individual entrepreneurial income), but in the differentiation of non-labor income received from property ownership (monopoly rent, land rent and rent), or financial capital (interest, dividends, profit). Thus, according to the data of the statistical service of the European Union

(Eurostat) [1; 2], 10% of the richest citizens of EU countries own aggregate financial assets (cash, securities (shares, bonds, bills of exchange, treasury bills, investment certificates, etc.), deposits in commercial banks or other financial and credit institutions, insurance policies, share contributions in the capital of enterprises, savings certificates, etc.) worth more than 800 billion euros; at the same time, 10% of the poorest citizens of the EU countries own aggregate financial assets worth no more than 500 million euros. Besides, the population economic inequality in European countries is manifested in the uneven distribution of

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\*Corresponding author



residential and commercial real estate, as a result of which only 40% of the population uses property objects as intended, more than 40% of citizens are unable to purchase their own housing and are forced to rent it, while almost 20 % invest free money in real estate solely for the purpose of receiving rent or letting. That is why determining the degree of economic inequality and the optimal rate of differentiation of population incomes in different types of economic systems is an extremely urgent scientific and practical task.

The purpose of this study was to analyze the degree of economic inequality in the EU countries by calculating taxonomic coefficients and to develop on this basis scientific and practical recommendations for reducing the degree of population income differentiation in the countries studied.

## LITERATURE REVIEW

The analysis of professional literature [3-5] showed that in modern science there are three groups of methodological approaches to the study of problems of the population economic inequality in the EU countries. The first group of scientific approaches brings together scientists who use empirical analysis – quantitative and qualitative analysis of statistical data – to study economic inequality and the degree of property differentiation of population incomes in the countries of the European Union. Thus, O. Rakauskienė and L. Volodzkienė [6] analyzed the state of economic inequality of the population in 27 countries of the European Union and found that the main causes of property differentiation in the countries of this region are ineffective social policy, disproportionate taxation policy, uneven distribution of residential real estate, psychological peculiarities of individuals, etc. The scientists came to the conclusion that it is housing conditions that are a key indicator that determines the degree of inequality in the level and quality of life of the population, and according to this indicator, the highest degree of economic inequality among the EU countries is characteristic of Estonia, Spain and Latvia. Rakauskienė and Volodzkienė [6] also found that members of Greek, German, Romanian, Bulgarian, and Dutch families spend the largest share of disposable income (more than 40%) on utility bills. Moreover, the scientists found out that the highest housing provision is typical for Denmark (54.36 m<sup>2</sup>/person), Cyprus (48.8 m<sup>2</sup>/person), Italy (42.62 m<sup>2</sup>/person), and the lowest – for Romania (21.23 m<sup>2</sup>/person), Slovakia (24.51 m<sup>2</sup>/person) and Poland (24.7 m<sup>2</sup>/person). In turn, D. Furceri and J. Ostry [7] analyzed the degree of inequality in the incomes of population of the EU countries using an empirical model that takes into account the influence of three factors: the demographic structure of society, the level of unemployment, and the degree of globalization. They found that there is a close asymmetric relationship between trade and financial globalization: the expansion of a country's export-import activity contributes to the reduction of socio-economic inequality, at the same time, the strengthening of financial ties between countries, on the contrary, leads to its growth. Therefore, the deregulation of the national financial system and the introduction of technological advances are the main factors that increase the population economic inequality in the developed countries of the world, in particular the EU countries.

At the same time, within the first group of methodological approaches, the number of publications dedicated

to the analysis of the COVID-19 pandemic impact on the dynamics of economic inequality and poverty in various types of economic systems is significantly increasing. Most scientists draw attention to the fact that the introduction of quarantine restrictions has had an extremely negative effect not only on the economic development of the so-called “third” countries, but also on the economic growth of the most developed countries in the world. In particular, C. D'Ambrosio, A. Clark and A. Lepinteur [8] conducted an empirical analysis of the coronavirus disease impact on the population well-being of four EU countries (Spain, Italy, Germany and France) and found out that the available personal income of the population in these countries significantly decreased during the first wave of the COVID-19 pandemic (2020), primarily among middle-income households, due to the fact that the key state social support programs were aimed at protecting the most vulnerable segments of population (pensioners, disabled, unemployed, large families, etc.), not the representatives of the “middle” class. At the same time, during the pandemic, the degree of relative inequality of population decreased the least in France, and the degree of absolute inequality decreased equally in all four analyzed countries.

Representatives of the second group of scientific approaches to the study of the problem of population economic inequality use mainly mathematical and statistical methods. For example, C. Jones and J. Kim [9] examine the trends of economic inequality in three centers of the world: the United States, the European Union, and Japan. The peculiarity of the Jones-Kim study is the analysis of income inequality among only one category of population – entrepreneurs. Based on the calculation of the power law exponent, these scientists [9] found that in the USA, Great Britain and Norway, economic inequality in terms of entrepreneurial income is significantly higher than in France and Japan, which is explained by the positive consequences of globalization processes, which facilitate access to the latest information technologies and innovative developments and, therefore, increase the profit of entrepreneurs from the export of innovative products. Instead, L. Kiss in [10] studies the quantitative relationship between the degree of economic inequality and inequality in land ownership in European countries. Mathematical calculations carried out by L. Kiss and their verification based on the Dickey-Fuller, Phillips-Perron tests, and the cointegration test showed that this problem is most burning in Bulgaria and Romania, as it leads to the growth of “informal” employment and illegal income in these countries.

Representatives of the third group of approaches to the study of economic inequality mainly use methods of economic and mathematical modeling, in particular regression and cluster analysis. So, Z. Darvas [11; 12] used the poverty risk indicator as an independent variable, which determines the specific weight of households that receive less than 60% of the average disposable income, and the Gini coefficient by income as a factor indicator. In his research, the scientist built regression models of two types (linear and non-linear), which clearly indicate the existence of a positive correlation between input factors and the resulting indicator in most EU countries, in particular Bulgaria, Greece, Latvia, Romania. A. Mehedintu, G. Soava and M. Sterpu [13] came to the similar conclusions, they found that the faster the speed

of economic inequality growth, the greater the threat of poverty and economic decline in the country. Meanwhile, T. Cherkashina [14] investigated the problems of population economic inequality in the post-socialist countries of Central and Eastern Europe, which are members of the EU, with the help of cluster analysis and found out that the highest degree of population economic inequality is characteristic of the Baltic “tigers” (Estonia, Latvia and Lithuania), and the lowest – of Eastern European countries (Albania, Moldova, Poland, Slovakia, Slovenia and Ukraine).

Despite the significant scientific contribution of these authors, there are still almost no studies dedicated to the quantitative assessment of the degree of population economic inequality in the EU countries on the basis of a generalizing indicator. This determines the relevance of further scientific investigations and a more in-depth study of issues related to the formation of a comprehensive indicator of population economic inequality in the EU countries.

## MATERIALS AND METHODS

In order to determine the degree of population economic inequality in the EU countries, the author used the method of taxonomic analysis. The basis of taxonomic analysis is the definition of the so-called “taxonomic distance” – the distance between points of a multidimensional space, whose dimension is determined by the number of features (indicators) that characterize the object under study. The definition of “taxonomic distance” characterizes the degree of remoteness of the studied object from the nearest competitor or the standard, and makes it possible to determine the location of each individual point (object) relative to others and, in this way, to structure the entire set of input features-indicators. In this study, the use of taxonomic analysis was expedient, as it made it possible to obtain a quantitative assessment of the degree of population economic inequality in each country, to determine the rank (rating) of each EU country, to distribute EU countries depending on the values of taxonomic coefficients, and on this basis, to propose directions that reduce the degree of income differentiation, and also to more fully determine the social policy reserves for countries of this region.

The taxonomic analysis of the population economic inequality of EU countries involves standardization of input data, i.e., bringing them to the same dimensionless values, which characterize the ratio of the deviation of each indicator from its average value for the group of EU countries to the root mean square (or standard) deviation for this feature. Standardization of input data was carried out according to the formula:

$$z_{ij} = \frac{x_{ij} - \bar{x}_j}{s_j}, \quad (1)$$

where  $z_{ij}$  – the standardized value of the  $j_{th}$  feature for the  $i_{th}$  country;  $x_{ij}$  – the value of the  $j_{th}$  feature (indicator) for the  $i_{th}$  country;  $\bar{x}_j$  – the average arithmetic value of the  $j_{th}$  feature;  $s_j$  – the standard deviation of the  $j_{th}$  feature (index).

After that, the input features of the observation matrix were divided into stimulators (indicators whose increasing values positively affect the degree of economic inequality in the country’s economy, therefore, the highest value of the stimulator indicators corresponds to the highest degree of uneven distribution of income between different stratified population groups) and extremators-stimulators (indicators,

the positive effect of which on the degree of population economic inequality is not monotonic and has the properties of a stimulator if the values of the indicators are less than optimal and the properties of a destimulator if the values of the indicators are less than optimal). The normalization of indicators was carried out according to the following formulas:

$$X_s = \frac{X_{fact} - X_{min}}{X_{max} - X_{min}}, \quad (2)$$

$$X_e = \frac{X_{max} - X_{fact}}{\delta_j}, \quad (3)$$

where  $X_s$  – the normalized value of the stimulator indicator;  $X_e$  – the normalized value of the extremum indicator;  $X_{fact}$  – the actual value of the indicator;  $X_{max}$  – the maximum value of the indicator;  $X_{min}$  – the minimum value of the indicator;  $\delta_j$  – the root mean square deviation of the indicator from the average for the group of EU countries.

Next, the distance between individual objects and the so-called “reference point” was determined, and the closer the aggregate unit ( $X_i$ ) is located to the “reference point”, the smaller the value of the reference distance will be. The calculation of distances between multidimensional “variant units”, that is, the coordinates of the standard vector, was carried out using the formula:

$$\sigma_j = \sqrt{\frac{1}{m} \sum_{i=1}^m (c_{ij} - \bar{c}_j)^2} \quad (4)$$

where  $\sigma_j$  – the mean square deviation of the random variable from the reference point;  $c_{ij}$  – the value of the indicator of a specific object (country);  $\bar{c}_j$  – the value of the “reference point”;  $m$  – the number of input indicators.

The calculations made became the basis for determining the taxonomic coefficients of the degree of population economic inequality in the EU countries:

$$d_i = 1 - \frac{c_{i0}}{c_0}, \quad (5)$$

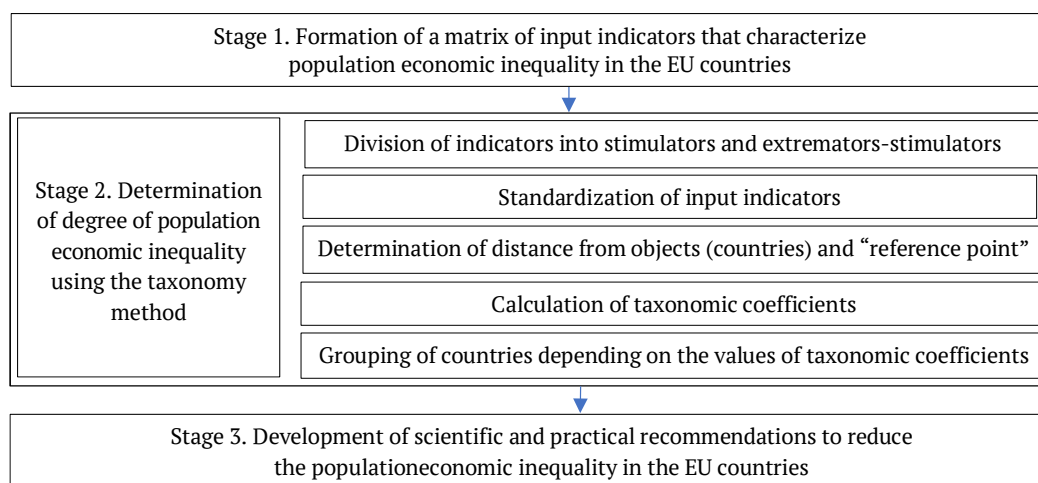
$$K_i = 1 - d_i, \quad (6)$$

where  $K_i$  – the taxonomic coefficient of population economic inequality;  $d_i$  – deviation of the indicator from the standard;  $c_{i0}$  – the maximum distance between the object (country) and the “reference point”;  $c_0$  – the distance between a specific object (country) and the “reference point”.

The taxonomic analysis of the population economic inequality in the EU countries was carried out in three stages (Fig. 1).

At the beginning of the study, a matrix of observations has been formed, the elements of which are the numerical values of the input features-indicators that characterize the degree of population economic inequality in the EU. A detailed study of the existing scientific literature on this issue [15-17] allowed the author to attribute the Gini coefficient by income to these indicators that shows the degree of uneven distribution of income between different stratification groups; Gini coefficient by property that shows the degree of uneven distribution of property (residential and commercial real estate objects, movable and immovable property, land, financial and digital assets) between different stratification groups; decile coefficient that shows the ratio of the total incomes of 10% of the richest to the total incomes of 10% of the poorest of the population; the quantile coefficient that shows the ratio of the total incomes of 20% of the richest to the total incomes of

20% of the poorest of the population; the Palma index that shows the ratio of the share of total income of 10% of the richest of the population to the share of the gross national income (GNI) of 40% of the poorest.



**Figure 1.** Sequence of stages of taxonomic analysis of population economic inequality in the EU countries

**Source:** developed by the authors

27 countries of the European Union have been selected as objects of the taxonomic analysis of economic inequality: Austria, Belgium, Bulgaria, Greece, Denmark, Estonia, Ireland, Spain, Italy, Cyprus, Latvia, Lithuania, Lux-

embourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Hungary, Finland, France, Croatia, the Czech Republic, and Sweden. The collected information on the studied objects (countries) is given in the Table 1.

**Table 1.** Input indicators that characterize the degree of population economic inequality in the EU countries (2020)

Country	Gini coefficient by income	Gini coefficient by property	Decimal coefficient	Quantile coefficient	Palma index
Austria	30.44	35.1	7.8	4.84	1.09
Belgium	27.57	32.2	6.19	4.06	0.96
Bulgaria	37.15	72.08	17.15	8.2	1.5
Greece	36.47	66.09	9.96	5.73	1.27
Denmark	28.5	34	6.18	3.93	1.1
Estonia	32.18	38.05	7.77	4.8	1.12
Ireland	30.77	31.5	6.97	4.56	1.15
Spain	36.89	44.78	12.45	6.55	1.58
Italy	35.92	46.12	13.63	6.8	1.42
Cyprus	33.5	49.21	7.29	4.72	1.197
Latvia	33.71	48.46	10.23	5.92	1.38
Lithuania	36.98	50.04	10.58	6.11	1.45
Luxembourg	35.11	46.09	9.21	5.75	1.35
Malta	29.74	34.85	8.03	4.86	1.17
The Netherlands	28.31	34.89	7.03	4.42	1.07
Germany	32.33	39.06	8.097	5.05	1.21
Poland	30.19	42.74	7.5	4.5	1.2
Portugal	34.9	46.15	9.29	5.38	1.27
Romania	35.14	44.02	5.0	4.1	1.2
Slovakia	25.77	29.13	4.00	3.8	.09
Slovenia	24.84	27.54	3.8	3.7	0.8
Hungary	29.76	45.16	7.51	4.9	1.1
Finland	26.89	32.78	6.05	4.03	0.996
France	32.55	39.45	8.34	5.1	1.28
Croatia	29.8	32.47	7.4	4.62	1.02
The Czech Republic	25.43	36.09	5.12	3.8	0.9
Sweden	30.00	33.46	7.83	4.63	1.04

**Source:** [1; 2]

Next, the input indicators were standardized, as a result of which the average values for each investigated feature are equal to 0, and their variances are equal to 1. This made it possible to obtain an  $m \times n$  matrix of normalized values (observations), in which each EU country can be interpreted as some point  $P_i$  in an  $n$ -dimensional vector space whose coordinates are the values  $z_{ij}$  ( $i=1, \overline{m}, j=1, \overline{n}$ ). The distance between individual objects and the so-called "reference point" has also been determined. However, the obtained value of the reference distance does not give a complete description of the degree of distance of a population unit from the ideal (or "reference") point, therefore, in this study, the ratio of the reference distance to the maximum possible in the studied population has been determined. Usually, this ratio varies from 0 to 1 ( $d \in [0, 1]$ ) and reflects the degree of proximity of any unit of the population to the "reference point". Note that according to the rules of taxonomic analysis, under the condition of a normal distribution of the random value of the maximum distance between the object (country) and the "reference point" (or efficiency point) of each multidimensional unit to the

reference point, it is considered that 97.58% of all distance values are no more than this distance. Let us add that the maximum value of the calculated taxonomic indicator of the degree of economic inequality in the country equals 1, so the closer the value is to 1, the higher the inequality of the population in the country; and, conversely, the further the obtained value is from 1, the lower the inequality of the population in the country.

## RESULTS AND DISCUSSION

**Analysis of taxonomic indicators of population economic inequality in the EU countries.** Let us consider the results of the author's research in more detail. Tables 2-3 show that the highest values of taxonomic coefficients and, accordingly, the highest degree of population economic inequality are characteristic of three post-socialist countries: Bulgaria ( $d_i=0,8622$ , rank 1), Lithuania ( $d_i=0,8342$ , rank 2) and Latvia ( $d_i=0,8026$ , rank 3). This is largely due to the rapid capitalization of intangible assets and excessive concentration of financial capital in these countries as a result of their accession to the EU in 2004-2007.

**Table 2.** Normalized values of indicators that characterize the degree of population economic inequality in the EU countries (2020)

Country	Gini coefficient by income	Gini coefficient by property	Decimal coefficient	Quantile coefficient	Palma index
Austria	0.45	0.178	0.299	0.253	0.78
Belgium	0.22	0.11	0.179	0.08	0.205
Bulgaria	1	1	1	1	0.897
Greece	0.94	0.867	0.461	0.451	0.603
Denmark	0.297	0.156	0.178	0.051	0.385
Estonia	0.593	0.244	0.297	0.244	0.41
Ireland	0.596	0.244	0.237	0.191	0.449
Spain	0.98	0.378	0.648	0.633	1
Italy	0.9	0.422	0.736	0.689	0.795
Cyprus	0.703	0.489	0.261	0.227	0.509
Latvia	0.72	0.467	0.482	0.493	0.744
Lithuania	0.986	0.511	0.508	0.536	0.833
Luxembourg	0.834	0.422	0.405	0.456	0.705
Malta	0.398	0.156	0.317	0.258	0.474
The Netherlands	0.282	0.156	0.242	0.16	0.346
Germany	0.608	0.267	0.322	0.3	0.526
Poland	0.435	0.4	0.277	0.178	0.513
Portugal	0.817	0.422	0.411	0.373	0.603
Romania	0.837	0.377	0.089	0.089	0.513
Slovakia	0.076	0.044	0.015	0.022	0.128
Slovenia	0	0	0.07	0	0
Hungary	0.399	0.333	0.278	0.267	0.385
Finland	0.166	0.11	0.169	0.073	0.251
France	0.626	0.267	0.34	0.311	0.615
Croatia	0.387	0.21	0.269	0.206	0.282
The Czech Republic	0.048	0.2	0.099	0.022	0.128
Sweden	0.419	0.133	0.302	0.207	0.308

Source: developed by the author

**Table 3.** Dynamics of taxonomic indicators of the degree of population economic inequality in the EU countries (2020)

Country	Value ( $K_i$ )	Deviation ( $d_i$ )	Rank
Austria	0.6962	0.3068	14
Belgium	0.6712	0.3288	19
Bulgaria	0.8622	0.1378	1
Greece	0.7945	0.2055	4
Denmark	0.5026	0.4974	27
Estonia	0.5241	0.4759	23
Ireland	0.5162	0.4838	25
Spain	0.789	0.211	6
Italy	0.7111	0.289	13
Cyprus	0.6942	0.3058	15
Latvia	0.8026	0.1974	3
Lithuania	0.8342	0.1658	2
Luxembourg	0.7294	0.2706	10
Malta	0.5097	0.4903	26
The Netherlands	0.577	0.423	22
Germany	0.6911	0.3089	18
Poland	0.7155	0.2845	4
Portugal	0.7492	0.2508	9
Romania	0.6966	0.3034	16
Slovakia	0.6329	0.3671	20
Slovenia	0.5229	0.4771	24
Hungary	0.7622	0.2378	8
Finland	0.6939	0.3061	17
France	0.7911	0.2089	5
Croatia	0.7113	0.2887	12
The Czech Republic	0.5811	0.4189	21
Sweden	0.7829	0.2171	7

**Source:** developed by the author

At the same time, the lowest values of taxonomic coefficients among the EU countries are characteristic of other post-socialist countries: Estonia, Slovakia, Slovenia and the Czech Republic. This phenomenon is explained by an effective budget and tax policy aimed at equalizing the gap between the incomes of different stratification groups and forming additional reserves to support the most vulnerable social strata of the population from the negative impact of external economic shocks [18; 19]. Thus, the instruments of the budget and tax policy in Slovakia and Slovenia combine a system of “zero” taxation, when individuals with the lowest incomes (not higher than the subsistence minimum) are generally exempt from paying taxes, with the mechanism of “dispersion” of capital through the repurchase of shares by employees of corporations on preferential terms (the so-called “ESOP programs” or the plan for the distribution of company shares among employees (Employee Stock Ownership Plan)) [19; 20]. Also, low values of the taxonomic coefficients of economic inequality are characteristic of the leading countries of Western Europe, in particular Germany and the Netherlands, so they occupy 20th and 21<sup>st</sup> place respectively in the ranking of countries in terms of economic inequality, which indicates the presence of the most effective institutions of ownership and income distribution within pan-European space.

Regarding the dynamics of taxonomic indicators of population economic inequality in the EU countries, it should be noted that it changed somewhat during 2019-2021 (Fig. 2).

The calculated values of the taxonomic coefficients of economic inequality in the EU countries in 2019-2021 indicate that there is a tendency to increase the degree of differentiation of the population in income and ownership of property and estate in almost all EU countries, primarily in the countries of Southern Europe (in Greece – from 0.7911 in 2019 to 0.8074 in 2021, in Spain – from 0.7542 in 2019 to 0.8267 in 2021, in Italy – from 0.7785 in 2019 to 0.8246 in 2021) and Northern Europe (in Latvia – from 0.7844 in 2019 to 0.8509 in 2021, in Lithuania – from 0.8476 in 2019 to 0.8692 in 2021). In our opinion, this is due to the negative consequences of the coronavirus pandemic, as a result of which the level of unemployment among stratified groups with medium and low incomes increased.

**EU countries clustering results that depend on the values of the taxonomic coefficients.** The obtained results have been given an economic interpretation using Harrington factor-criterion scale, according to which the gradation of the numerical values of the taxonomic coefficients is as follows: if the value of the taxonomic coefficient varies from 0.0 to 0.2, then the degree of



population economic inequality is very low; if the value of the taxonomic coefficient varies from 0.2 to 0.37, then the degree of population economic inequality is low; if the value of the taxonomic coefficient varies from 0.37 to 0.64, then the degree of population economic inequality is average; if the value of the taxonomic indicator

varies from 0.64 to 0.8, then the degree of economic inequality is high; if the value of the taxonomic coefficient varies from 0.8 to 1.0, then the degree of population economic inequality is very high. According to this scale, 27 countries of the European Union were divided into three groups (Table 4).

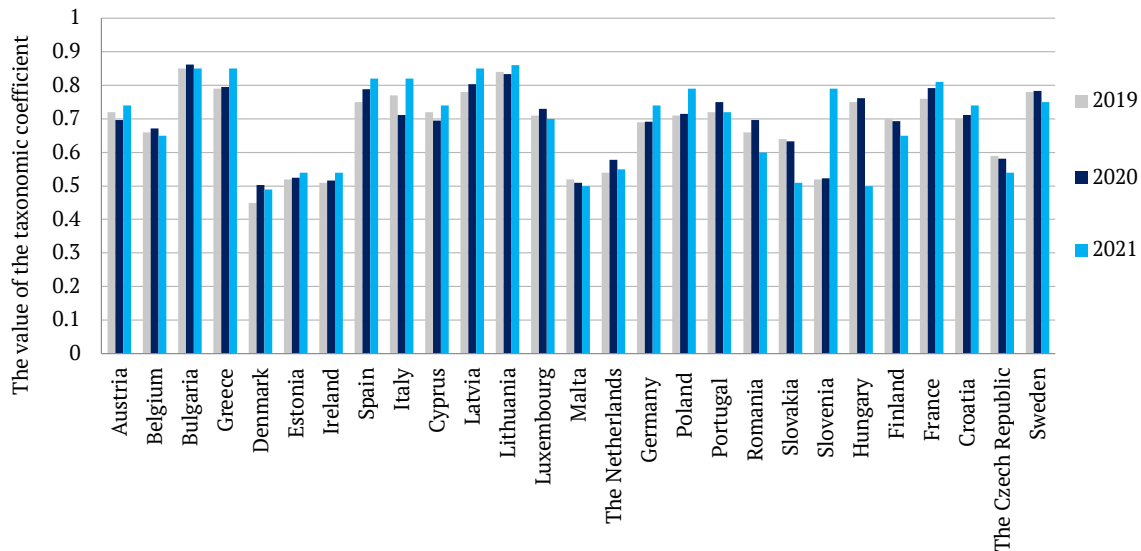


Figure 1. Dynamics of taxonomic coefficients of population economic inequality in the EU countries

Source: developed by the authors

Table 4. Dynamics of taxonomic indicators of the degree of population economic inequality in the EU countries (2020)

A group of countries	Number of countries in the group	Composition of the group	The value of the taxonomic coefficient	Group characteristics
I	3	Bulgaria, Latvia, Lithuania	0.8-1.0	A very high degree of property inequality and income differentiation of the population
II	16	Austria, Belgium, Greece, Spain, Italy, Cyprus, Luxembourg, Germany, Poland, Portugal, Romania, Hungary, Finland, France, Croatia, Sweden	0.64-0.8	High degree of income differentiation and possession of physical, human, intellectual and social capital of the population
III	8	Denmark, Estonia, Ireland, Malta, The Netherlands, Slovakia, Slovenia, The Czech Republic	0.37-0.64	Average degree of population economic inequality, high share of the "middle" class

Source: developed by the author

Table 4 shows that the first group includes three countries: Bulgaria, Latvia, and Lithuania. As for the "Baltic tigers" (Latvia and Lithuania), the high population economic inequality is associated with a very high degree of openness of national economies as a result of the accelerated pace of structural reforms (1991-2006), which consisted in a significant reduction of the government role and the development of market economy based on free pricing, entrepreneurial initiative and a flexible labor market. At the same time, the key actions of Latvia and Lithuania governments were aimed at increasing the investment attractiveness of national economies and the inflow of FDI and portfolio investments, primarily from the leading countries of the EU (France, Germany, Italy, the Netherlands). As a result, this formed a certain dependence of these countries on foreign financial capital, associated with the growth

of credit risks, exchange rate fluctuations, changes in the effective interest rate, therefore, in our opinion, the main directions to reduce economic inequality in the Baltic countries (Latvia and Lithuania) can be the stimulation of domestic investments and ensuring the high yield of domestic government bonds (DGB) [20-22].

Instead, the main reason for the economic inequality of population in Bulgaria is the disproportionality of deindustrialization processes, which have led to changes in the sectoral structure of employment, an increase in the role of service sector and job cuts in the main industries (mining, metallurgy, machine-building, chemical industry, food industry, light industry, textile industry) [9]. Besides, a number of non-economic factors (complicated bureaucratic procedures, high level of corruption, low level of public trust in the judicial system, instability of the regulatory

and legal framework) restrain the development of private entrepreneurship and, at the same time, contribute to the further differentiation of both labor and non-labor incomes of the population. Given this situation, the most effective measures for the Bulgarian economy can be the creation of favorable conditions for the development of industry, in particular, mining, and the growth of wages for employees in the industry [23; 24].

The second group includes 16 countries, including the most developed EU countries (Austria, Belgium, Luxembourg, Germany, Poland, Finland, Sweden) and some post-socialist countries (Romania, Hungary, Croatia). We believe that for these countries, economic inequality is a certain driver of economic development, as it stimulates high innovative activity and technological competitiveness of the national economy. The third group included both the developed countries of Northern Europe (Denmark, Estonia, Ireland, Malta, the Netherlands) and the countries of the former “socialist camp” (Slovakia, Slovenia, the Czech Republic). This group is characterized by a low degree of population economic inequality, which, in particular in post-socialist countries, was achieved through the implementation of effective market reforms, that ensured their successful convergence to the single European space and to some extent neutralized the negative impact of external imbalances of the global market on technological modernization and social progress, which is confirmed by the list of key global indices: the human development index (HDI) of Slovakia =0.860, HDI of Slovenia =0.917, HDI of the Czech Republic =0.9), the social progress index (SPI of Slovakia =80.43, SPI of Slovenia =85.8, SPI of the Czech Republic =84.36) and the prosperity index (LPI of Slovakia =70.6, LPI of Slovenia =74.8, LPI of the Czech Republic =74.6) [25].

**Proposed measures to reduce the population economic inequality.** To reduce the population economic inequality in countries with a high degree of population economic inequality, the author proposed the following measures: stimulating domestic and foreign investments; ensuring high profitability of financial assets at the state level; creating more favorable conditions for the development of industry and increasing wages for employees in industry. Thus, in order to reduce the population economic inequality in Bulgaria, it is proposed to create more favorable conditions for the development of industry, in particular the mining industry, and to increase the wages of employees in this industry. It is known that, despite the fact that in terms of geological distribution of mineral deposits, Bulgaria is not a leader among the EU countries, however, according to the sectoral structure of the national economy of this country, the share of coal and brown coal mining, as well as lignite, which is a rather rare type of natural resources, is quite high. Also, according to Eurostat data [1], the added value of mining enterprises in Bulgaria’s GDP is relatively high (more than 10%), which actualizes the improvement of the organizational and economic mechanism of managing the country’s mining complex as a component of the national economic policy to reduce the population economic inequality. In our opinion, the key element of this mechanism should be the reform of the taxation system of enterprises in the mining industry of Bulgaria. However, the study of the current state and trends of taxation of mining enterprises in Bulgaria clearly indicates the following shortcomings: irrational distribution of the tax

burden along the technological chain; lack of consistency in regulating the mining complex; lack of differentiation of deposits depending on mining conditions and equalization of all mining enterprises to pay a single income tax of 20%; receipt of excess profits by the largest mining companies; special conditions for taxation of enterprises that work under the terms of a production sharing agreement (PSA).

In this regard, the author proposes a significant reduction of taxes on mineral extraction in Bulgaria and their replacement with additional income tax (AIT). The purpose of introducing a tax on additional income is not to tax natural resources (hard coal, brown coal, lignite) at the time of their extraction, but the accumulated profit during the period of development of deposits, which is the difference between income and expenses for the entire period of development of the site. However, additional income tax (AIT) is a form of special tax on natural (resource) rent, which is widespread in the USA, Norway, Denmark, Saudi Arabia, the United Arab Emirates (UAE), Kuwait, Qatar, etc. Since all the mining, geological and geographical characteristics of the deposit are ultimately reflected in the income received during its development, this approach will ensure automatic differentiation of the tax burden depending on the specific conditions of extraction of natural resources, as well as changes in tax regimes for the use of subsoil depending on the type of deposit and stage of its development. Note that the changes in the tax regime for the mining sector are also aimed at minimizing the withdrawal of funds from mining enterprises during the exploration period and at the initial stage of production, however, at the peak of production, maximum payments to the State Budget of Bulgaria are envisaged. In the perspective of reforming the taxation system of mining enterprises in Bulgaria, it will allow the release of part of the income tax, will promote the activation of internal reproductive innovation and investment processes, the creation of additional reserves of labor employment in industry, the achievement of a balance of interests between the state and citizens, and in the end will ensure the growth of wages of employees and, therefore, a significant reduction in the differentiation of incomes of the country’s population.

At the same time, to reduce the population economic inequality in the Baltic countries (Latvia and Lithuania), the author proposes the following. In order to stimulate domestic investments in these countries, the author considers it necessary to introduce more flexible monetary policy instruments, in particular, to ensure the discount rate at a level of at least 2%, which is typical for most EU countries, and simultaneously increase the yield of long-term bonds with fixed income. In the author’s opinion, such actions will stimulate the development of the national debt capital market and the desire of domestic investors to invest free money in Baltic commercial banks even in the face of global uncertainty and geopolitical threats. The stability of the interest rate will also contribute to an increase in the discount rate of future cash flows from investing in other financial assets (real estate and land), an increase in the market value of shares of Latvian and Lithuanian companies, and a simultaneous increase in the yield of other securities (domestic government bonds, Eurobonds, municipal bonds, targeted bonds, general coverage loans), bills of exchange, bank certificates, warrants, bills of lading, credit

notes, options, futures, forwards, etc). In the future, this will contribute to reducing the dependence of the Latvian and Lithuanian economy on foreign capital, ensuring stability in the national financial market, and the interest of the population in receiving non-labor income (dividends, loan interest, annuity), which is the basis for reducing economic inequality in the countries of this region.

The conducted research is significantly different from the existing ones, because in modern science there are almost no publications dedicated to the quantitative assessment of the population economic inequality in the EU countries. Therefore, the key difference of the author's research is the formation and calculation of quantitative taxonomic coefficients of economic inequality, which can be given an economic interpretation. However, despite the difference in the analysis tools used, the research results obtained by the author are quite similar to the results of the scientific works of other authors. First of all, the obtained results largely coincide with the results of the analysis conducted by other Ukrainian scientists A. Stavvtskyi and M. Kozub [21], who carried out a quantitative assessment of the degree of property inequality in the EU countries based on the construction of a dynamic stochastic model of general equilibrium (DSGE) In [21], these scientists found that the highest level of property inequality is characteristic of four countries of Central-Eastern Europe (Romania, Bulgaria, Lithuania and Latvia), which is explained by fluctuations in domestic and foreign investments and a violation of the overall macroeconomic balance. Instead, the lowest indicators of property inequality are characteristic of Slovenia, the Czech Republic, Finland and Slovakia, which, according to A. Stavvtskyi and M. Kozub, is ensured by the implementation of effective budget, tax and social policies in these countries.

Also, the results of the author's research are similar to the results of the research conducted by Lithuanian scientists O. Rakauskienė and L. Volodzkienė [6]. These scientists proved that the highest degree of economic inequality among the EU countries is characteristic of Estonia, Spain and Latvia and explained this disproportion in the distribution of non-labor income (monopoly rent, land rent, rent) and financial assets (cash, securities (shares, bonds, bills of exchange, treasury bills, investment certificates, etc.) ineffective social and fiscal policy in the countries of this region. We should add that scientists O. Rakauskienė and L. Volodzkienė in their study [6] also took into account the influence of housing conditions on the dynamics of inequality in the level and the quality of life of the EU population; at the same time, in the study conducted by the author of this article, the influence of housing conditions on the degree of economic inequality of population has not been not taken into account.

At the same time, the author of this study assigned the Polish economy to a group (cluster) with an average level of economic inequality, which fully corresponds to the results of the analysis conducted by the famous Polish scientist M. Brzeziński [25], who used economic and mathematical methods to prove that Poland is a country with an average level of differentiation of labor and non-labor incomes, it managed to achieve rapid rates of economic growth with the help of effective market reforms, which ensured the country's successful convergence to the single European

space and neutralized the negative impact of external economic shocks on the global resource and labor market.

On the other hand, the author of this article has determined the negative consequences of the COVID-19 pandemic for the population economic inequality in the EU countries. French economists A. Clark, C. D'Ambrosio and A. Lepinteur, who in [8] conducted an empirical analysis of the impact of the COVID-19 pandemic on the level and quality of life of the population of Spain, Italy, Germany, and France, also came to similar conclusions. The results of the analysis [8] clearly indicate that the national income in the specified countries decreased significantly in 2020, primarily among representatives of the "middle" class, since the national social security programs for the population were aimed, first of all, at protecting households with low incomes (pensioners, disabled, unemployed, large families, etc.), and not households with average incomes. It should be noted that scientists. Clark, C. D'Ambrosio and A. Lepinteur [8] also took into account the degree of absolute and relative inequality of the EU population; at the same time, in the study conducted by the author of this article, the influence of the specified indicators on the dynamics of population economic inequality has not been taken into account.

## CONCLUSIONS

A taxonomic analysis of the degree of population economic inequality in the EU countries has been carried out using the taxonomy method in several stages: the formation of a list of indicators-features that characterize economic inequality, namely the Gini coefficient by income, the Gini coefficient by property, decile coefficient, quantile coefficient, Palma index; the formation of an input indicators matrix; division of indicators into stimulators and extremators-stimulators; determination of distance from objects (countries) and a "reference point"; calculation of taxonomic coefficients of population economic inequality. The calculated values of taxonomic coefficients indicate that during 2019-2021 the highest values of taxonomic coefficients and, accordingly, the highest degree of population economic inequality are characteristic of three post-socialist countries (Bulgaria, Latvia and Lithuania), which is largely due to the rapid capitalization of intangible assets and excessive concentration of financial capital in these countries as a result of their accession to the EU in 2004-2007. At the same time, the lowest values of taxonomic indicators among EU countries are characteristic of other post-socialist countries of Eastern Europe (Estonia, Slovakia, Slovenia, the Czech Republic), which is the result of the implementation of the "zero" taxation system and "dispersion" of financial capital through the purchase of shares by employees of corporations on preferential terms (the so-called "ESOP programs"). For the quantitative description of the obtained results, the Harrington factor-criterion scale has been used, which made it possible to divide the 27 countries of the European Union into three groups (clusters): the first group, which is characterized by a high degree of population economic inequality due to the rapid pace of carrying out structural reforms and reducing the role of the state in the economy, includes three countries (Bulgaria, Latvia, Lithuania); the second group, which is characterized by an average degree of economic inequality, includes 16 EU countries (Austria, Belgium, Greece, Spain,



Italy, Cyprus, Luxembourg, Germany, Poland, Portugal, Romania, Hungary, Croatia, Finland, France, Sweden); the third group, which is characterized by a low degree of economic inequality, includes 8 EU countries (Denmark, Estonia, Ireland, Malta, the Netherlands, Slovakia, Slovenia, the

Czech Republic). The obtained results are of scientific and practical value for improving the economic policy of the countries of Northern and Eastern Europe and can be used in further theoretical studies of the problems of population economic inequality in Bulgaria, Latvia and Lithuania.

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**Тетяна Сергіївна Черкашина**

Харківський національний економічний університет імені Семена Кузнеця  
61166, просп. Науки, 9А, м. Харків, Україна

## **Таксономічний аналіз економічної нерівності населення в країнах Європейського Союзу**

**Анотація.** Проблема економічної нерівності населення є актуальною для усіх країн світу, однак особливість економічної нерівності в країнах ЄС полягає у диференціації нетрудових доходів, отриманих від володіння власністю, а також нерівномірному розподілі житлової та комерційної нерухомості. Тому аналіз економічної нерівності населення в країнах ЄС є актуальним науково-практичним завданням. Метою даного дослідження було визначення ступеня економічної нерівності та оптимальної норми диференціації доходів населення в країнах ЄС, а також розробка на цій основі заходів щодо зниження ступеня майнової нерівності в країнах цього регіону. Для досягнення поставленої мети було використано метод таксономії, а також загальнонаукові методи (діалектику, аналіз, синтез, індукцію, дедукцію). Для кількісного опису отриманих результатів використано факторно-критеріальну шкалу Харрінгтона, яка дала змогу розподілити 27 країн ЄС на три групи (кластери): країни з високим ступенем економічної нерівності (Болгарія Латвія, Литва); країни з середнім ступенем економічної нерівності (Австрія, Бельгія, Греція, Іспанія, Італія, Кіпр, Люксембург, Німеччина, Польща, Португалія, Румунія, Угорщина, Хорватія, Фінляндія, Франція, Швеція); країни з низьким ступенем економічної нерівності (Данія, Естонія, Ірландія, Мальта, Нідерланди, Словаччина, Словенія, Чехія). Для зменшення економічної нерівності населення в країнах третьої групи запропоновано такі заходи: стимулювання внутрішніх і зовнішніх інвестицій; забезпечення високої дохідності фінансових активів на державному рівні; створення більш сприятливих умов для розвитку промисловості та підвищення оплати праці найманих працівників у цій галузі. Одержані результати становлять науково-практичну цінність для удосконалення економічної політики країн Північної та Східної Європи та можуть бути використані у подальших теоретичних дослідженнях проблем економічної нерівності населення в країнах даного регіону та для конкретизації прикладних заходів зменшення економічної нерівності в Болгарії, Латвії та Литві

**Ключові слова:** майнова нерівність, диференціація доходів, коефіцієнт Джині, коефіцієнт Палма, децільний коефіцієнт, метод таксономії

Igor Matyushenko<sup>1,2\*</sup>, Serhii Hlibko<sup>2</sup>, Olena Khanova<sup>1</sup>, Yelyzaveta Kudlai<sup>1</sup>

<sup>1</sup>V.N. Karazin Kharkiv National University  
61022, 4 Svoboda Sq., Kharkiv, Ukraine

<sup>2</sup>Scientific and Research Institute of Providing Legal Framework for the Innovative Development of the National Academy of Legal Sciences of Ukraine  
61002, 80 Chernyshevsky Str., Kharkiv, Ukraine

## Investment Climate of the EU Countries and Ukraine in the Context of Realization of “Green” Economy

**Abstract.** In the current context of the development of the world economy, one of the main priorities of the country’s economic development is the intensification of investment processes, because they have a positive impact on economic growth and efficient functioning of a country’s economy. The modern investment market is full of competition among countries in order to attract investment. The main indicator influencing the amount of funds raised in the country’s economy is the country’s investment climate. Also, in modern conditions the concept of “green” economy is actively promoted. Therefore, today the assessment of the investment climate of the EU countries and Ukraine in the implementation of the “green” economy is a very important and relevant issue. Finding ways to improve the investment climate in Ukraine is another topical issue. The main objective of this study is to assess the investment climate of the EU countries and Ukraine under conditions of realization of the “green” economy. The research uses general scientific methods of cognition: induction and deduction, analysis and synthesis, methods of qualitative and quantitative economic and statistical analysis, graphic method. Among the methods of economic-mathematical modelling, correlation analysis, trend analysis and correlation-regression analysis were used. It was established that the study of the investment climate of the EU countries and Ukraine in the context of the implementation of the “green” economy is based on objective international ratings that have a transparent calculation methodology. These international ratings are constantly updated and cover most countries of the world. So, the proposed method makes it possible to conduct an analysis of the investment climate and the “environmental friendliness” of the country’s economy according to world indices, to determine which countries are leaders and which are outsiders according to the selected indices and indicators, to study the place of Ukraine according to these indicators, and to conduct a trend analysis, to model the degree of close relationship between indices and factors of the investment climate on the basis of correlation analysis, as well as to develop recommendations for improving the investment climate of the EU countries and Ukraine in the conditions of implementation of the “green” economy

**Keywords:** investment attractiveness, European “Green Deal, competitiveness, global indices, correlation-regression model

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### INTRODUCTION

In the current context of the development of the world economy, one of the main priorities of the country’s economic development is the intensification of investment processes, because they have a positive effect on economic growth and effective functioning of a country’s economy. Therefore, the modern investment market is full of competition

among countries to attract investments into the country. The main indicator influencing the amount of funds raised in the country’s economy is the country’s investment climate. The concept of “green” and “ecological” economy is actively promoted in modern conditions of climatic and environmental challenges. The main aim of the European

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\*Corresponding author

Green Deal [1] is to achieve climate neutrality for Europe by 2050. It is important to understand what exactly affects the attractiveness of the investment climate, what contributes to and what inhibits the investment processes in the country. Therefore, it becomes relevant to study the investment climate of the EU countries and Ukraine in conditions of the implementation of the “green” economy.

There is no single definition of “investment climate” in scientific literature. As it is noted in [2], investment climate is a set of objective and subjective conditions that facilitate (inhibit) the investment process of the national economy (at the macro level) and individual enterprises, companies, industries (at the micro level).

According to S. Kovalenko, investment climate is a generalized characteristic of a set of social, economic, organizational, legal, political, socio-cultural prerequisites that leads to the attractiveness and expediency of investing in one or another economic system (the economy of a country, region, corporation) [3].

Scientist B.A. Karpinsky suggests the following definition of the investment climate: it is a complex of political, social, innovative, infrastructure elements that are available on a certain territory and give a synergistic effect in their combined manifestation [4].

At the present stage, sociologist-economist Adam Hayes states that investment climate refers to the economic, financial, and socio-political conditions in a country or region that show whether individuals, banks, and institutions are willing to lend and acquire a stake (i.e., to invest) in the businesses operating there [5].

Thus, the investment climate is a combination of legal, social, political, natural, economic and other factors that provide investment activity of Ukrainian and foreign investors. Currently, the concept of “green” or “ecological” economy is being actively promoted in the world circles. P. Söderholm gives the following interpretation of the

term: “green economy” is an alternative vision of growth and development; one that can generate economic development and improvements in people’s lives in the ways which are also consistent with advancing environmental and social well-being [6].

According to UN Environment Program (UNEP), the “green” economy is an economic activity, “that improves human well-being and ensures social equity while significantly reducing environmental risks and ecological scarcities” [1].

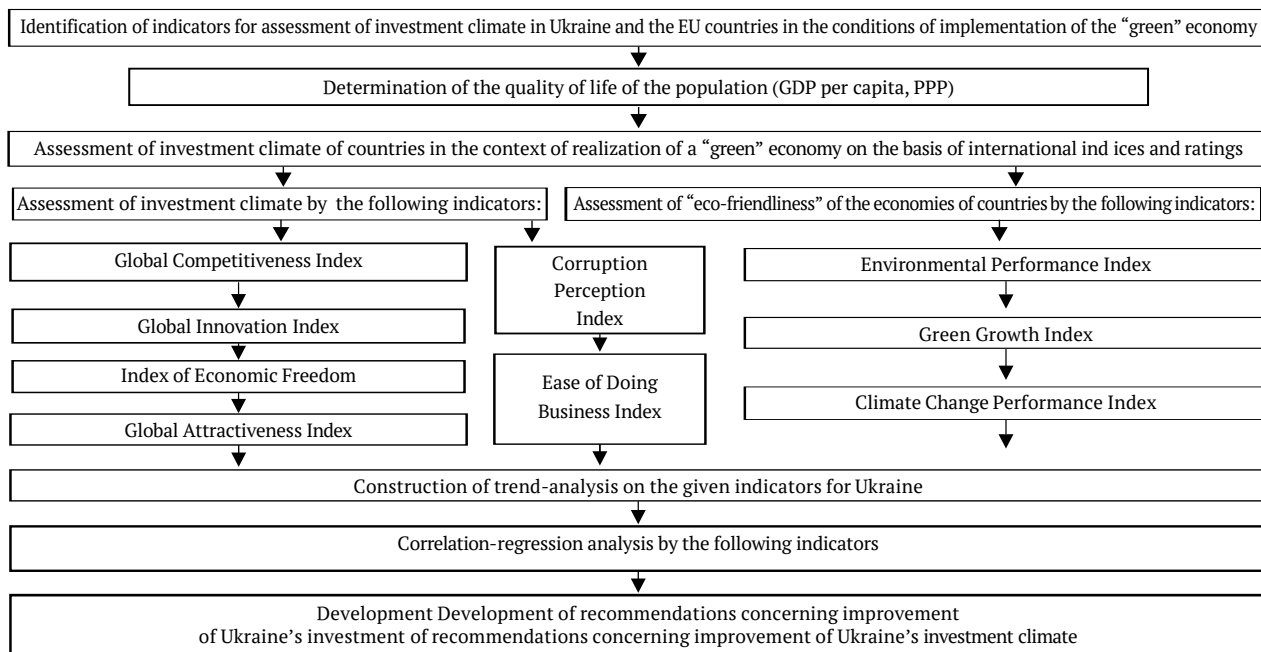
The transition to a “green” economy is a central element of the Association Agreement between Ukraine and the EU. It is a roadmap of how to move to a clean, circular economy and adapt to climate change, revert biodiversity loss and cut pollution [7]. The key objective of the European Green Deal (EGD) is climate-neutral Europe by 2050 [8].

The purpose of the article is to assess the investment climate of the EU countries and Ukraine in the conditions of implementation of the “green” economy through the assessment of the investment climate and the “greenness” of the economies of selected countries according to global indices and the analysis of the correlation of indicators of investment climate, “eco-friendliness” and the quality of life on the basis of correlation-regression analysis with development of recommendations on improvement of investment climate in Ukraine in the context of realization of the “green” economy.

## MATERIALS AND METHODS

General scientific methods of studying and economic-mathematical modeling served as methodological basis of the research; the correlation analysis is used to model the relationships between the indicators of the investment climate; the trend analysis is used to analyze the tendency of indexes).

The methodology of the estimation of investment climate of Ukraine and the EU in the conditions of implementation of a “green” economy was developed; a diagram of the methodology is shown in Figure 1 below.



**Figure 1.** Methodology of researching the investment climate of the EU countries and Ukraine in the condition of implementation of the “green” economy

**Note:** \* PPP– purchasing power parity

**Source:** compiled by the authors

As can be seen from Figure 1, this approach to researching includes a qualitative analysis of the world indices, namely: the determination of the quality of life of the population, using macroeconomic indicator – GDP per capita (PPP) (The World Bank), the assessment of investment climate according to the following indicators: the Global Competitiveness Index (World Economic Forum (WEF)), the Global Innovation Index (World Intellectual Property Organization (WIPO)), the Index of Economic Freedom (The Heritage Foundation), the Ease of Doing Business Index (The World Bank), the Global Attractiveness Index (The European House – Ambrosetti) and the Corruption Perception Index (Transparency International); the assessment of the “eco-friendliness” of the economies of countries by the following indicators: the Environmental Performance Index (Yale University and Columbia University), the Green Growth Index (Global Green Growth Institute) and the Climate Change Performance Index (Germanwatch). Therefore, it was these indicators that were used to assess the investment climate and environmental friendliness of the country’s economy

and also to develop modeling of relationships between these indexes with the help of correlation-regression analysis.

## RESULTS AND DISCUSSION

In accordance with the methodology, the investment climate of the EU and Ukraine was first evaluated according to their indicators in the indicated indices, and the quality of life of the population was determined. The economic well-being of the population was closely related to GDP per capita. GDP per capita (PPP based) is gross Ukrainian product converted into international dollars using purchasing power parity rates and divided by total population [9]. It is a universal way to see the wealth and prosperity of the country.

According to the World Bank data, among EU countries and Ukraine, the leaders, in terms of GDP per capita (PPP) in 2020, are Luxembourg, Ireland, Denmark, the Netherlands and Austria, and Ukraine has the lowest rate among these countries, while the countries that have certain economic difficulties are: Bulgaria, Greece, Croatia and Romania (Table 1, Fig. 2).

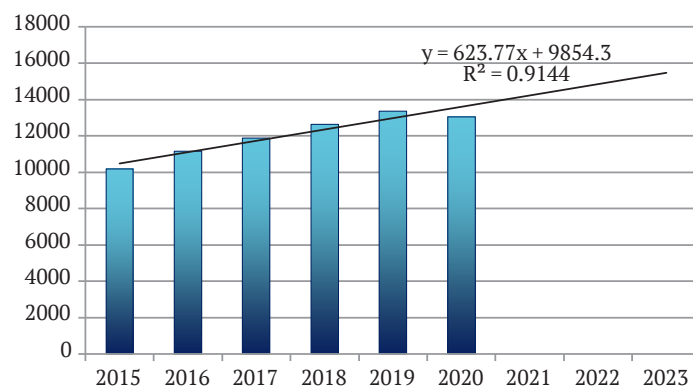
**Table 1.** Input indicators that characterize the degree of population economic inequality in the EU countries (2020)

Economy	2015	2016	2017	2018	2019	2020	2021*	2022*	2023*
Austria	49865.904	52684.02	54172.99	57059.54	58641.3	55648.88	57068.08	58487.28	59906.48
Belgium	46200.904	48597.4	50442.27	52623.56	54918.17	52626.58	54148.68	55670.78	57192.88
Bulgaria	18391.843	20074.29	21469.94	22957.4	24707.06	24619.95	25949.25	27278.55	28607.85
Greece	26760.363	27511.8	28604.86	29652.93	30841.7	28377.39	28923.76	29470.13	30016.5
Denmark	49045.339	51976.01	55356.68	57456.61	59896.57	60551.64	62934.34	65317.04	67699.74
Estonia	29175.926	31312.75	33821.93	36158.82	38294.48	37925.12	39840.22	41755.32	43670.42
Ireland	69028.773	71498.6	77749.2	84665.61	89550.73	95237.24	100726.2	106215.2	111704.2
Spain	34903.127	37286.21	39528.93	40686.99	42172.13	38343.16	39286.47	40229.78	41173.09
Italy	36899.385	39926.96	41581.12	43119.35	44950.93	41890.21	43077.81	44265.41	45453.01
Cyprus	31815.14	35719.07	38050.86	40476.39	41514.51	38458.19	39973.29	41488.39	43003.49
Latvia	24972.786	26721.73	28673.56	30811.07	32240.81	32212.39	33780.79	35349.19	36917.59
Lithuania	28834.428	30925.17	33761.87	36365.36	38805.75	39191.95	41421.45	43650.95	45880.45
Luxembourg	107859.686	113365.2	114985.8	117245.3	119415.5	118503.6	120607.3	122711	124814.7
Malta	37455.071	39886.95	42644.05	44482.24	46766.77	42640.12	44023.02	45405.92	46788.82
Netherlands	50288.5921	52288.42	55088.63	57901.1	59675.18	59334.22	61339.92	63345.61	65351.32
Germany	47609.781	50579.68	53071.46	55142.32	56284.98	54263.65	55762.35	57261.05	58759.75
Poland	26862.053	28322.11	30064.5	31978.53	34233.32	34406.24	36045.34	37684.44	39323.54
Portugal	29660.896	31607.75	33044.72	34931.79	36945.14	34090.73	35234.93	36379.13	37523.33
Romania	21605.837	24271.37	27141.92	29248.81	32323.87	31945.75	34173.25	36400.75	38628.25
Slovak Republic	29964.889	29645.74	30061.55	31530.92	32608.36	32014.55	32603.28	33192.01	33780.74
Slovenia	31628.247	33936.04	36507.55	38917.05	41197.38	40124.26	42029.26	43934.26	45839.26
Hungary	26806.595	27947.64	29501.12	31862.88	33961.57	33253.88	34757.88	36261.88	37765.88
Finland	42497.705	44934.45	47570.13	49706.6	51521.34	50810.53	52623.73	54436.93	56250.13
France	40849.997	42924.61	44577.07	46620.68	49619.91	46712.01	48181.71	49651.41	51121.11
Croatia	23301.2	25210.88	27154.09	28960.39	30989.58	29133.99	30514.19	31894.39	33274.59
Czech Republic	33899.287	36097.71	38824.89	41134.09	43316.33	42049.19	43898.19	45747.19	47596.19
Sweden	49103.133	50430.25	51947.95	53553.31	55337.88	54929.53	56228.43	57527.33	58826.23
Ukraine	10164.327	11148.2	11871.12	12634.24	13350.48	13056.7	13680.47	14304.24	14928.01

Note: \*- calculated by trend analysis

Source: compiled by the authors based on [10]





**Figure 2.** Dynamics of changes in GDP per capita (PPP) of Ukraine, 2015-2023

**Source:** compiled by the authors based on [10]

According to the results of the trend analysis, Ukraine has a positive development trend for this indicator with a high probability of the made forecast (coefficient of determination  $R=91.4\%$ ). It means that the quality of well-being and living of the population will improve, but this indicator remains low in relation to the EU countries.

Let's move on to studying the indicators of EU countries and Ukraine according to selected international indices.

One of the most influential international investment indices is the Global Competitiveness Index. The Global Competitiveness Index was designed by the World Econom-

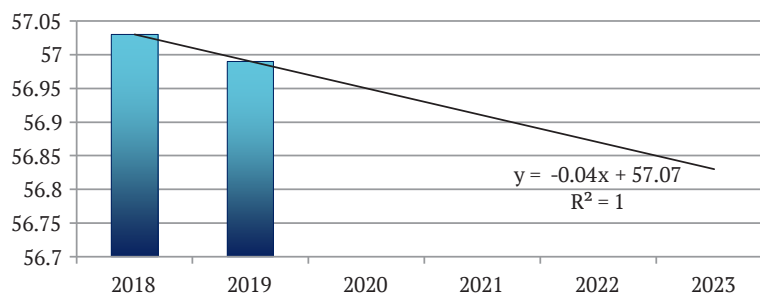
ic Forum to help policy-makers, business leaders and other stakeholders shape their economic strategies in the era of the Fourth Industrial Revolution. This index was based on a combination of publicly available statistics and the results of a survey of CEOs. According to the latest rating data of the World Economic Forum (in 2019) the most competitive country in the EU is the Netherlands, while Germany, Sweden, Denmark and Finland also take the leading positions. Ukraine ranks last in the EU for this index, the anti-leaders are also the following countries: Croatia, Greece, Romania and Bulgaria (Table 2, Fig. 3).

**Table 2.** Global Competitiveness Index of the EU countries and Ukraine, 2018-2022

Economy	2018	2019	2020*	2021*	2022*
Austria	76.3	76.6	76.9	77.2	77.5
Belgium	76.6	76.4	76.2	76	75.8
Bulgaria	63.6	64.9	66.2	67.5	68.8
Greece	62.1	62.6	63.1	63.6	64.1
Denmark	80.6	81.2	81.8	82.4	83
Estonia	70.8	70.9	71	71.1	71.2
Ireland	75.7	75.1	74.5	73.9	73.3
Spain	74.2	75.3	76.4	77.5	78.6
Italy	70.8	71.5	72.2	72.9	73.6
Cyprus	65.6	66.4	67.2	68	68.8
Latvia	66.2	67	67.8	68.6	69.4
Lithuania	67.1	68.4	69.7	71	72.3
Luxembourg	76.7	77	77.3	77.6	77.9
Malta	68.8	68.5	68.2	67.9	67.6
Netherlands	82.4	82.4	82.4	82.4	82.4
Germany	82.8	81.8	80.8	79.8	78.8
Poland	68.2	68.9	69.6	70.3	71
Portugal	70.2	70.4	70.6	70.8	71
Romania	63.5	64.4	65.3	66.2	67.1
Slovak Republic	66.8	66.8	66.8	66.8	66.8
Slovenia	69.6	70.2	70.8	71.4	72
Hungary	64.3	65.1	65.9	66.7	67.5
Finland	80.3	80.2	80.1	80	79.9
France	78	78.8	79.6	80.4	81.2
Croatia	60.1	61.9	63.7	65.5	67.3
Czech Republic	71.2	70.9	70.6	70.3	70
Sweden	81.7	81.2	80.7	80.2	79.7
Ukraine	57.03	56.99	56.95	56.91	56.87

**Note:** \* calculated by trend analysis

**Source:** compiled by the authors based on [11; 12]



**Figure 3.** Dynamics of changes in Ukraine's Global Competitiveness Index, 2018-2023

**Source:** compiled by the authors based on [11; 12]

The trend analysis indicates a disappointing trend in Ukraine's competitiveness, though the coefficient of approximation is equal to 100%, but this trend cannot be considered completely reliable because the indicators for only 2 years were taken for calculation. It was essential to increase the competitiveness of Ukraine, since this index is the standard by which political and business leaders define weaknesses and strengths in national economies, assess the effectiveness of economic policy and institutional reforms and, therefore, it affects the country's investment climate. Let us consider the following index – the Global Innovation Index,

published by the World Intellectual Property Organization in its annual report, where the analysis of innovation activity is carried out. The Global Innovation Index ranks world economies according to their innovation capabilities. It consists of roughly 80 indicators, grouped into innovation inputs and outputs, and shows different aspects of innovation [13].

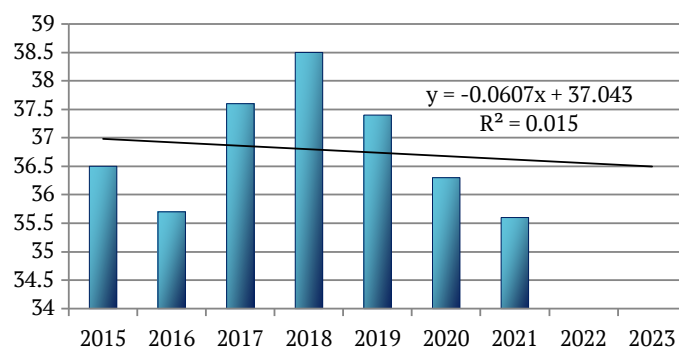
Sweden is the leader among the EU in 2021, the Netherlands, Finland, Denmark and Germany are also in the leading position; Croatia, Romania and Greece occupy lower positions in the ranking. Ukraine takes the last place among the countries studied (Table 3, Fig. 4).

**Table 3.** Global Innovation Index of the EU countries and Ukraine, 2015-2023

Economy	2015	2016	2017	2018	2019	2020	2021	2022*	2023*
Austria	54.1	52.6	53.1	51.3	50.9	50.1	50.9	50.3	49.7
Belgium	50.9	52	49.9	50.5	50.2	49.1	49.2	48.8214	48.4428
Bulgaria	42.2	41.4	42.8	42.6	40.3	40	42.4	42.2321	42.0642
Greece	40.3	39.8	38.8	38.9	38.9	36.8	36.3	35.6607	35.0214
Denmark	57.7	58.5	58.7	58.4	58.4	57.5	57.3	57.175	57.05
Estonia	52.8	51.7	50.9	50.5	50	48.3	49.9	49.3143	48.7286
Ireland	59.1	59	58.1	57.2	56.1	53	50.7	49.3	47.9
Spain	49.1	49.2	48.8	48.7	47.9	45.6	45.4	44.7143	44.0286
Italy	46.4	47.2	47	46.3	46.3	45.7	45.7	45.4929	45.2858
Cyprus	45.5	46.3	46.8	47.8	48.3	45.7	46.7	47.0536	47.4072
Latvia	45.5	44.3	44.6	43.2	43.2	41.1	40	39.1321	38.2642
Lithuania	42.3	41.8	41.2	41.2	41.5	39.2	39.9	39.4679	39.0358
Luxembourg	59	57.1	56.4	54.5	53.5	50.8	49	47.375	45.75
Malta	50.5	50.4	50.6	50.3	49	46.4	47.1	46.3929	45.6858
Netherlands	61.6	58.3	63.4	63.3	61.4	58.8	58.6	58.2429	57.8858
Germany	57.1	57.9	58.4	58	58.2	56.5	57.3	57.2143	57.1286
Poland	40.2	40.2	42	41.7	41.3	40	39.9	39.8286	39.7572
Portugal	46.6	46.4	46.1	45.7	44.6	43.5	44.2	43.6821	43.1642
Romania	38.2	37.9	39.2	37.6	36.8	36	35.6	35.1	34.6
Slovak Republic	43	41.7	43.4	42.9	42	39.7	40.2	39.7071	39.2142
Slovenia	48.5	46	45.8	46.9	45.3	42.9	44.1	43.3893	42.6786
Hungary	43	44.7	41.7	44.9	44.5	41.5	42.7	42.5393	42.3786
Finland	60	59.9	58.5	59.6	59.8	57	58.4	58.0679	57.7358
France	53.6	54	54.2	54.4	54.2	53.7	55	55.1286	55.2572
Croatia	41.7	38.3	39.8	40.7	37.8	37.3	37.3	36.6857	36.0714
Czech Republic	51.3	49.4	51	48.7	49.4	48.3	49	48.6179	48.2358
Sweden	62.4	63.6	63.8	63.1	63.7	62.5	63.1	63.0929	63.0858
Ukraine	36.5	35.7	37.6	38.5	37.4	36.3	35.6	35.5393	35.4786

**Note:** \* calculated by trend analysis

**Source:** compiled by the authors based on [14-20]



**Figure 4.** Dynamics of changes in the Global Innovation Index of Ukraine, 2015-2023

**Source:** compiled by the authors based on [14-20]

The analysis of trends showed that the level of innovation in Ukraine has negative dynamics, and this is a significant problem, since the introduction of new technologies has a positive effect on attracting investments to the country. But this trend analysis is rather unreliable, because the approximation coefficient  $R=1.5\%$ .

As for the Index of Economic Freedom, it is based on 12 factors, grouped into four broad categories: rule of law, government size, regulatory efficiency and open markets. It

is compiled by the Heritage Foundation. In general, countries with a high level of economic freedom have a higher level of welfare of citizens, personal freedom and life expectancy.

In 2021, Ireland had the highest rate while Estonia, Denmark, Lithuania, and the Netherlands were also at the top of the rating, Greece, Italy and Croatia were at the end (Table 4, Fig. 5). Ukraine had a lower rate than the EU countries and was included in the list of the “most free” countries.

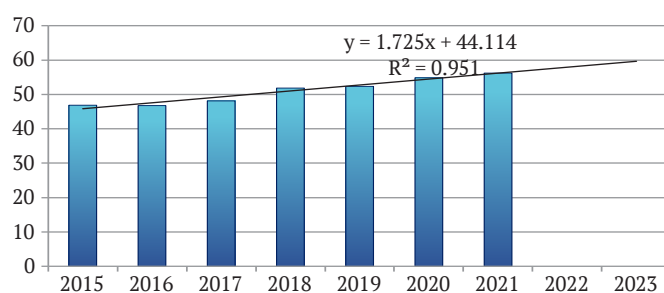
**Table 4.** Index of Economic Freedom of the EU countries and Ukraine, 2015-2023

Economy	2015	2016	2017	2018	2019	2020	2021	2022*	2023*
Austria	71.2	71.7	72.3	71.8	72	73.3	73.9	74.2929	74.6858
Belgium	68.8	68.4	67.8	67.5	67.3	68.9	70.1	70.2571	70.4142
Bulgaria	66.8	65.9	67.9	68.3	69	70.2	70.4	71.1321	71.8642
Greece	54	53.2	55	57.3	57.7	59.9	60.9	62.2143	63.5286
Denmark	76.3	75.3	75.1	76.6	76.7	78.3	77.8	78.2321	78.6642
Estonia	76.8	77.2	79.1	78.8	76.6	77.7	78.2	78.2964	78.3928
Ireland	76.6	77.3	76.7	80.4	80.5	80.9	81.4	82.3071	83.2142
Spain	67.6	68.5	63.6	65.1	65.7	66.9	69.9	70.1071	70.3142
Italy	61.7	61.2	62.5	62.5	62.2	63.8	64.9	65.4179	65.9358
Cyprus	67.9	68.7	67.9	67.8	68.1	70.1	71.4	71.8821	72.3642
Latvia	69.7	70.4	74.8	73.6	70.4	71.9	72.3	72.5286	72.7572
Lithuania	74.7	75.2	75.8	75.3	74.2	76.7	76.9	82.5571	88.2142
Luxembourg	73.2	73.9	75.9	76.4	75.9	75.8	76	76.4357	76.8714
Malta	66.5	66.7	67.7	68.5	68.6	69.5	70.2	70.8286	71.4572
Netherlands	73.7	74.6	75.8	76.2	76.8	77	76.8	77.3393	77.8786
Germany	73.8	74.4	73.8	74.2	73.5	73.5	72.5	72.2857	72.0714
Poland	68.6	69.3	68.3	68.5	67.8	69.1	69.7	69.7857	69.8714
Portugal	65.3	65.1	62.6	63.4	65.3	67	67.5	67.9679	68.4358
Romania	66.6	65.6	69.7	69.4	68.6	69.7	69.5	70.0643	70.6286
Slovak Republic	67.2	66.6	65.7	65.3	65	66.8	66.3	66.1929	66.0858
Slovenia	60.3	60.6	59.2	64.8	65.5	67.8	68.3	69.8964	71.4928
Hungary	66.8	66	65.8	66.7	65	66.4	67.2	67.2429	67.2858
Finland	73.4	72.6	74	74.1	74.9	75.7	76.1	76.6429	77.1858
France	62.5	62.3	63.3	63.9	63.8	66	65.7	66.325	66.95
Croatia	61.5	59.1	59.4	61	61.4	62.2	63.6	64.1179	64.6358
Czech Republic	72.5	73.2	73.3	74.2	73.7	74.8	73.8	74.0679	74.3358
Sweden	72.7	72	74.9	76.3	75.2	74.9	74.7	75.1321	75.5642
Ukraine	46.9	46.8	48.1	51.9	52.3	54.9	56.2	57.925	59.65

**Note:** \* calculated by trend analysis

**Source:** compiled by the authors based on [21-27]





**Figure 5.** Trend of development of the Index of Economic Freedom of Ukraine, 2015-2023

**Source:** compiled by the authors based on [21-27]

Figure 5 shows that the Index of Economic Freedom of Ukraine has quite positive dynamics and an upward trend with a probability of 95%. This analysis shows, that in 2023-2024, Ukraine may have a tendency to move to “moderately free” countries.

Another index that should be considered for the assessment of the investment climate is the Ease of Doing Business Index, completed by the World Bank. It gives an opportunity to assess the ease of doing business according to 10 main indicators and allows to compare country to country.

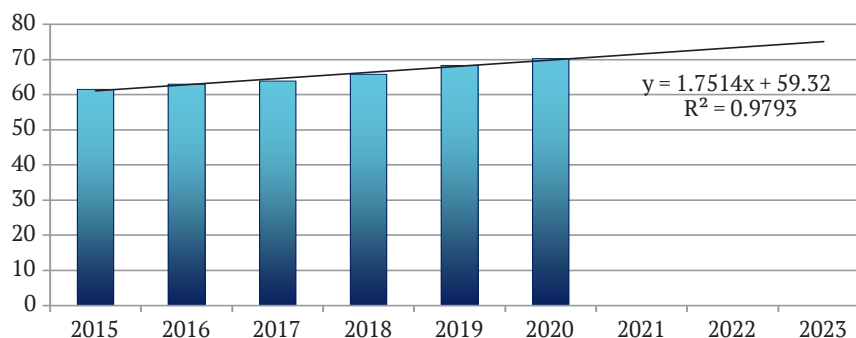
There is no Doing Business report for 2021, because the World Bank has announced that it stops publishing this report on the state and conditions of doing business in different countries, it will be replaced by the new Business Enabling Environment (BEE) project. Therefore, it was necessary to consider which countries were leaders in 2020 according to this indicator, and which were outsiders. In 2020, Denmark, Sweden, Lithuania, Estonia and Latvia became leaders, and Luxembourg, Ukraine, Bulgaria were outsiders; Malta was the main outsider. Ukraine took the 3<sup>rd</sup> place from the end (Table 5, Fig. 6).

**Table 5.** Ease of Doing Business Index of the EU countries and Ukraine, 2015-2023

Economy	2015	2016	2017	2018	2019	2020	2021*	2022*	2023*
Austria	77.4	78.4	78.9	78.5	78.6	78.7	78.8914	79.0828	79.2742
Belgium	71.1	72.5	73	71.7	74	75	75.6486	76.2972	76.9458
Bulgaria	71.8	73.7	73.5	71.9	71.2	72	71.7686	71.5372	71.3058
Greece	66.7	68.4	68.7	68	68.1	68.4	68.5971	68.7942	68.9913
Denmark	84.2	84.4	84.9	84.1	84.6	85.3	85.4514	85.6028	85.7542
Estonia	78.8	79.5	81.1	80.8	80.5	80.6	80.9343	81.2686	81.6029
Ireland	80.1	79.2	79.5	79.5	78.9	79.6	79.5029	79.4058	79.3087
Spain	73.2	74.9	75.7	77	77.7	77.9	78.8486	79.7972	80.7458
Italy	68.5	72.1	72.3	72.7	72.6	72.9	73.5829	74.2658	74.9487
Cyprus	66.6	71.8	72.7	71.6	71.7	73.4	74.3314	75.2628	76.1942
Latvia	76.7	78.1	80.6	79.3	79.6	80.3	80.9057	81.5114	82.1171
Lithuania	76.3	78.9	78.8	79.9	80.8	81.6	82.5514	83.5028	84.4542
Luxembourg	67.6	68.3	68.8	69	69	69.6	69.9514	70.3028	70.6542
Malta	62.1	63.7	65	64.7	65.4	66.1	66.8086	67.5172	68.2258
Netherlands	75	75.9	76.4	76	76	76.1	76.2543	76.4086	76.5629
Germany	79.7	79.9	79.9	79	78.9	79.7	79.5886	79.4772	79.3658
Poland	736	76.5	77.8	77.3	77	76.4	76.8286	77.2572	77.6858
Portugal	76	77.6	77.4	76.8	76.6	76.5	76.4686	76.4372	76.4058
Romania	70.2	738	74.3	72.9	72.3	73.3	73.5743	73.8486	74.1229
Slovak Republic	71.8	75.6	75.6	74.9	75.2	75.6	76.0886	76.5772	77.0658
Slovenia	699	75.6	76.1	75.4	75.6	76.5	77.4229	78.3458	79.2687
Hungary	68.8	72.6	73.1	72.4	72.3	73.4	74.0114	74.6228	75.2342
Finland	808	81.1	80.8	80.4	80.4	80.2	80.0429	79.8858	79.7287
France	73.9	76	76.3	76.1	77.3	76.8	77.32	77.84	78.36
Croatia	66.5	72.7	72.9	71.7	71.4	73.6	74.4686	75.3372	76.2058
Czech Republic	71	74	76.7	76.3	76.1	76.3	77.2257	78.1514	79.0771
Sweden	80.6	81.7	82.1	81.3	81.3	82	82.1429	82.2858	82.4287
Ukraine	61.5	63	63.9	65.8	68.3	70.2	71.9514	73.7028	75.4542

**Note:** \* calculated by trend analysis

**Source:** compiled by the authors based on [28-33]



**Figure 6.** Dynamics of changes in the Ease of Doing Business Index, 2015-2023

**Source:** compiled by the authors based on [28-33]

The value of the index for the period 2015-2020 is increasing, and as for the trend of this indicator, it was moderately positive and probable ( $R=97.9\%$ ). Thus, Ukraine can become a good environment for business and investment activities.

The next indicator is the Global Attractiveness Index developed by the European House – Ambrosetti. The GAI measures the attractiveness of a country using a range of primarily quantitative indicators which represent various aspects of a country's attractiveness, dynamism and sustainability. Specifically, the GAI analyzes attractiveness

from a dual perspective: internal – the ability to retain resources already present in the area, external – the ability to attract new resources from the outside [34].

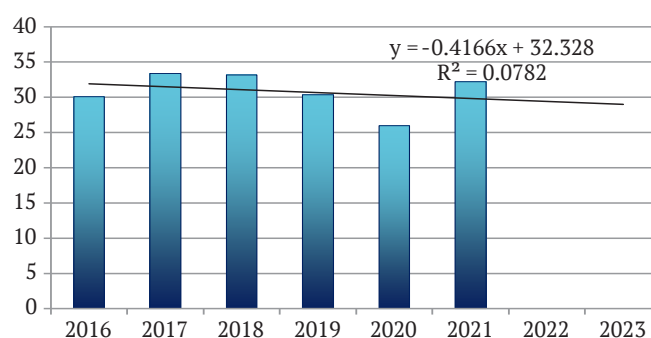
In 2021, Germany was the most attractive country among the EU countries; France, Denmark and the Netherlands were also the leading countries. The least attractive country among the EU countries was Ukraine; Bulgaria, Greece and Slovakia also belonged to this category (Table 6, Fig. 7). Although Ukraine was ranked the lowest in these countries' rating, it belonged to "medium attractiveness countries".

**Table 6.** Global Attractiveness Index of the EU countries and Ukraine, 2016-2023

Economy	2016	2017	2018	2019	2020	2021	2022*	2023*
Austria	71.8	65.7	63.6	71.03	64.73	62.73	61.5634	60.3968
Belgium	64.4	64.2	62.7	65.56	60.24	60.77	59.9937	59.2174
Bulgaria	33.5	32.3	29.1	34	31.15	33.89	33.9871	34.0842
Greece	32.1	36.7	36	39.2	31.29	33.89	33.7734	33.6568
Denmark	71.8	59.9	58.8	64.47	63.73	68.71	68.7589	68.8078
Estonia	50.8	50.3	51.2	54.11	50.02	54.47	55.0534	55.6368
Ireland	66.4	61.8	61.1	64.7	66.07	64.12	64.2631	64.4062
Spain	68.6	56.3	59.6	64.56	57.21	58.91	57.7454	56.5808
Italy	73	62.2	62	66.06	60.36	61.2	59.6097	57.8994
Cyprus	37.4	35.9	33.4	38.97	43.69	44.7	46.5697	48.4394
Latvia	37.5	39.6	37.7	41.65	37.17	42.26	42.8446	43.4292
Lithuania	37.4	34.6	34.3	36.52	35.31	40.04	40.5414	41.0428
Luxembourg	64.9	58.2	60.5	57.57	57.56	62.71	62.2586	61.8072
Malta	47.4	44.3	41.8	46.66	41.45	46.22	45.946	45.672
Netherlands	86.9	73.8	74.8	80.56	79.86	65.18	62.7611	60.3422
Germany	99.6	92.5	91.9	100	100	93.3	93.2743	93.2486
Poland	60.4	50.5	50.9	54.62	51.47	56.48	56.1094	55.7388
Portugal	42.4	41.7	42	46.67	41.52	45.24	45.7637	46.2874
Romania	38.3	38	36.2	41.08	39.36	41.59	42.316	43.042
Slovak Republic	46.3	46.8	46.1	44.74	35.98	38.31	36.2023	34.0946
Slovenia	48.4	46.9	48.1	52.98	50.42	52.85	53.9269	55.0038
Hungary	48.3	48.7	45.7	52.46	47.88	56.32	57.5886	58.8572
Finland	63.7	55.9	53.8	58.23	55.19	56.86	55.9486	55.0372
France	82.8	80.4	83.1	88.36	78.05	76.19	75.1946	74.1992
Croatia	38.5	34.4	33.9	36.42	36.08	42.83	43.6646	44.4992
Czech Republic	61	56.7	54.7	54.15	49.74	57.95	56.902	55.854
Sweden	70.2	59.5	61.9	66.16	58.14	61.55	60.3194	59.0888
Ukraine	30.1	33.4	33.2	30.35	25.94	32.23	31.8134	31.3968

**Note:** \* calculated by trend analysis

**Source:** compiled by the authors based on [35-39]



**Figure 7.** Dynamics of changes in the Global Attractiveness Index of Ukraine, 2016-2023

**Source:** compiled by the authors, based on [35-39]

The instability of Ukraine according to the attractiveness index can be seen in Figure 7: in 2021 – growth of index, and by trend analysis – a negative trend, but the approximation coefficient is too low ( $R=7.8\%$ ), so this analysis cannot be considered reliable.

The next indicator is the Corruption Perceptions Index, which has been compiled by Transparency International and used since 1995. The Index is calculated based on 13 studies of reputable international institutions and think tanks. The key indicator of the index is a number of points, not a place in the rating. The minimum score (0 points)

means that corruption actually replaces the government, while the maximum (100 points) indicates that corruption is almost absent in the society. The index assesses corruption only in the public sector [40].

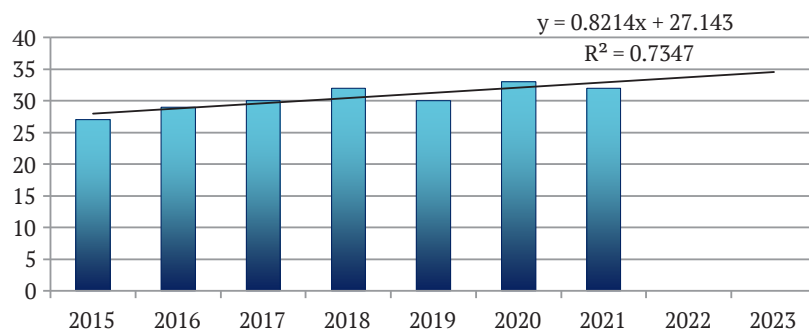
According to the rating (2021), the evident leaders are Denmark and Finland; Sweden, Luxembourg and the Netherlands also take the top positions. The lowest positions among the EU countries were occupied by Bulgaria, Romania, Hungary and Croatia; Ukraine takes the last place among these countries (Table 7, Fig. 8). So, it was shown that Ukraine is perceived as the most corrupt country in the EU.

**Table 7.** Corruption Perception Index of the EU countries and Ukraine, 2016-2023

Economy	2015	2016	2017	2018	2019	2020	2021	2022*	2023*
Austria	76	75	75	76	77	76	74	73.9286	73.8572
Belgium	77	77	75	75	75	76	73	72.5	72
Bulgaria	41	41	43	42	43	44	42	42.3214	42.6428
Greece	46	44	48	45	48	50	49	49.75	50.5
Denmark	91	90	88	88	87	88	88	87.5	87
Estonia	70	70	71	73	74	75	74	74.8929	75.7858
Ireland	75	73	74	73	74	72	74	73.82134	73.64268
Spain	58	58	57	58	62	62	61	61.7857	62.5714
Italy	44	47	50	52	53	53	56	57.824	59.648
Cyprus	61	55	57	59	58	57	53	52.3214	51.6428
Latvia	56	57	58	58	56	57	59	59.25	59.5
Lithuania	59	59	59	59	60	60	61	61.3214	61.6428
Luxembourg	85	81	82	81	80	80	81	80.4286	79.8572
Malta	60	55	56	54	54	53	54	53.1429	52.2858
Netherlands	84	83	82	82	82	82	82	81.7143	81.4286
Germany	81	81	81	80	80	80	80	79.7857	79.5714
Poland	63	62	60	60	58	56	56	54.75	53.5
Portugal	64	62	63	64	62	61	62	61.6786	61.3572
Romania	46	48	48	47	44	44	45	44.4643	43.9286
Slovak Republic	51	51	50	50	50	49	52	51.9643	51.9286
Slovenia	60	61	61	60	60	60	57	56.5714	56.1428
Hungary	51	48	45	46	44	44	43	41.8214	40.6428
Finland	90	89	85	85	86	85	88	87.5357	87.0714
France	70	69	70	72	69	69	71	71.0714	71.1428
Croatia	51	49	49	48	47	47	47	46.3571	45.7142
Czech Republic	56	55	57	59	56	54	54	53.6786	53.3572
Sweden	89	88	84	85	85	85	85	84.3929	83.7858
Ukraine	27	29	30	32	30	33	32	32.8214	33.6428

**Note:** \* calculated by trend analysis

**Source:** compiled by the authors based on [41-47]



**Figure 8.** Dynamics of changes in the Corruption Perception Index of Ukraine, 2015-2023

**Source:** compiled by the authors, based on [41-47]

For Ukraine, this indicator flags “deadlock” in the fight against corruption over the last 3 years, despite a number of really positive changes that have enhanced the anti-corruption ecosystem. In Figure 8, it is possible to see positive dynamics, which is quite probable (approximation coefficient  $R=73.5\%$ ).

Next, we should proceed to the assessment of the “environmental” indices of countries according to the following indicators: the Environmental Performance Index (Yale University and Columbia University), the Green Growth Index (Global Green Growth Institute) and the Climate Change Performance Index (Germanwatch).

The Environmental Performance Index is a method of quantifying and numerically marking the environmental

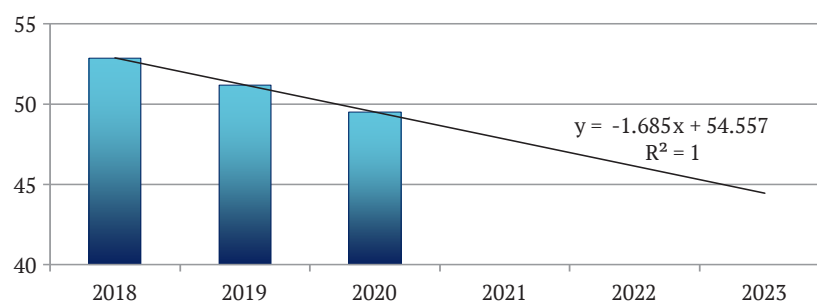
performance of a state’s policies [48]. The 2020 Environmental Performance Index (EPI) provides a data-driven summary of the state of sustainability around the world. Using 32 performance indicators across 11 issue categories, the EPI ranks 180 countries on environmental health, and ecosystem vitality. These indicators provide a gauge at a national scale of how close countries are to established environmental policy targets. The index is released once in two years [49]. Denmark tops the 2020 rankings, Luxembourg, Austria and France are also the high-scoring countries; Bulgaria, Poland, Latvia, Lithuania are lagging behind in environmental indicators. Ukraine has a lower position on this index than the EU countries (Table 8, Fig. 9).

**Table 8.** Environmental Performance Index of the EU countries and Ukraine, 2018-2023

Economy	2018	2019**	2020	2021*	2022*	2023*
Austria	78.97	79.285	79.6	79.915	80.23	80.545
Belgium	77.38	75.34	73.3	71.26	69.22	67.18
Bulgaria	67.85	62.425	57	51.575	46.15	40.725
Greece	73.6	71.35	69.1	66.85	64.6	62.35
Denmark	81.6	82.05	82.5	82.95	83.4	83.85
Estonia	64.31	64.805	65.3	65.795	66.29	66.785
Ireland	78.77	75.785	72.8	69.815	66.83	63.845
Spain	78.39	76.345	74.3	72.255	70.21	68.165
Italy	76.96	73.98	71	68.02	65.04	62.06
Cyprus	72.6	68.7	64.8	60.9	57	53.1
Latvia	66.12	63.86	61.6	59.34	57.08	54.82
Lithuania	69.33	66.115	62.9	59.685	56.47	53.255
Luxembourg	79.12	80.71	82.3	83.89	85.48	87.07
Malta	80.9	75.8	70.7	65.6	60.5	55.4
Netherlands	75.46	75.38	75.3	75.22	75.14	75.06
Germany	78.37	77.785	77.2	76.615	76.03	75.445
Poland	64.11	62.505	60.9	59.295	57.69	56.085
Portugal	71.91	69.455	67	64.545	62.09	59.635
Romania	64.78	64.74	64.7	64.66	64.62	64.58
Slovak Republic	70.6	69.45	68.3	67.15	66	64.85
Slovenia	67.57	69.785	72	74.215	76.43	78.645
Hungary	65.01	64.355	63.7	63.045	62.39	61.735
Finland	78.64	78.77	78.9	79.03	79.16	79.29
France	83.95	81.975	80	78.025	76.05	74.075
Croatia	65.45	64.275	63.1	61.925	60.75	59.575
Czech Republic	67.68	69.34	71	72.66	74.32	75.98
Sweden	80.51	79.605	78.7	77.795	76.89	75.985
Ukraine	52.87	51.185	49.5	47.815	46.13	44.445

**Note:** \* calculated by trend analysis; \*\* the average of 2018 and 2020

**Source:** compiled by the authors based on [50; 51]



**Figure 9.** Dynamics of changes in the Environmental Performance Index of Ukraine, 2018-2023

**Source:** compiled by the authors, based on [50; 51]

As can be seen, Ukraine's environmental performance has a negative dynamics and a downward trend. The coefficient of approximation was 100%, but this trend should not be considered highly probable since it is based on only 3 years of evaluation.

The next indicator is the Green Growth Index calculated by the Global Green Growth Institute. The index measures a country's performance in achieving sustainability targets including Sustainable Development Goals, Paris Climate Agreement, and Aichi Biodiversity Targets for four

green growth dimensions – efficient and sustainable resource use, natural capital protection, “green” economic opportunities and social inclusion [52].

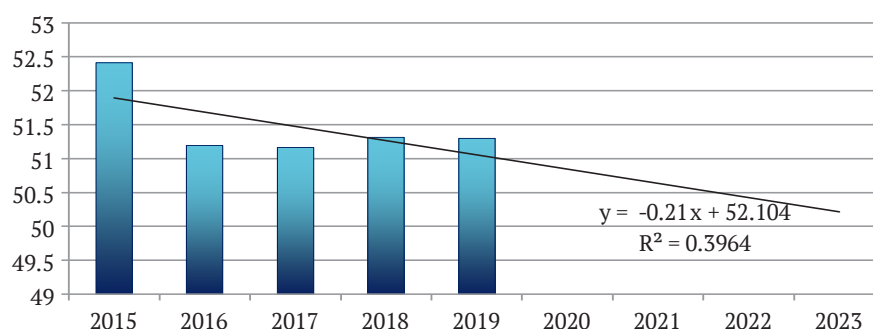
In 2019, Sweden took the first place among the EU countries, top places were also taken by Czech Republic, Denmark, Germany, Austria; Malta, Cyprus and Ireland were outsiders among the EU. Ukraine took the third place in the anti-rating among the EU countries (Table 9, Fig. 10). Although Sweden has the highest index, but is far from achieving the green growth target – 100.

**Table 9.** Green Growth Index of the EU countries and Ukraine, 2015-2022

Economy	2015	2016	2017	2018	2019	2020*	2021*	2022*
Austria	75.14	74.96	74.55	74.86	75.21	75.214	75.218	75.222
Belgium	67.2	68.8	68.97	69.07	69.07	69.471	69.872	70.273
Bulgaria	60.52	61.04	60.76	61.54	61.28	61.482	61.684	61.886
Greece	61.18	60.92	61.08	61.59	61.84	62.039	62.238	62.437
Denmark	76.59	76.32	76.53	76.79	76.76	76.841	76.922	77.003
Estonia	68.73	70.81	69.4	69.4	69.62	69.657	69.694	69.731
Ireland	50.64	51.91	52.61	52.87	52.54	53.016	53.492	53.968
Spain	65.69	66.18	66.18	66.58	66.75	67.002	67.254	67.506
Italy	62.18	67.34	68.08	68.18	68.05	69.308	70.566	71.824
Cyprus	52.27	52.68	44.44	45.11	45.22	43.053	40.886	38.719
Latvia	67.56	68.17	68.65	68.96	69.11	69.499	69.888	70.277
Lithuania	70	70.88	71.09	71.41	71.58	71.949	72.318	72.687
Luxembourg	62.05	61.68	61.25	61.6	61.65	61.562	61.474	61.386
Malta	30.84	28.91	31.64	31.69	31.76	32.222	32.684	33.146
Netherlands	66.73	66.71	66.55	67.03	67.06	67.158	67.256	67.354
Germany	74.87	75.43	75.62	75.71	75.82	76.038	76.256	76.474
Poland	67.29	67.83	68.18	69.02	68.89	69.329	69.768	70.207
Portugal	68.29	69.19	69.84	70.35	70.36	70.89	71.42	71.95
Romania	67.54	67.68	68.27	68.56	68.39	68.648	68.906	69.164
Slovak Republic	73.06	73.65	73.85	74.28	74.23	74.527	74.824	75.121
Slovenia	704	70.59	70.84	71.04	71	71.165	71.33	71.495
Hungary	71.21	71.75	71.19	71.3	71.39	71.381	71.372	71.363
Finland	73.05	73.51	74.33	74.48	74.48	74.863	75.246	75.629
France	68.45	68.86	68.39	68.95	68.85	68.939	69.028	69.117
Croatia	67.64	67.84	67.71	67.83	67.83	67.867	67.904	67.941
Czech Republic	75.89	76.4	76.29	76.7	76.73	76.928	77.126	77.324
Sweden	77.5	78.04	78.43	78.66	78.71	79.014	79.318	79.622
Ukraine	52.41	51.19	51.16	51.31	51.3	51.09	50.88	50.67

**Note:** \* calculated by trend analysis; \*\* the average of 2018 and 2020

**Source:** compiled by the authors based on [50; 51]



**Figure 10.** Dynamics of changes in the Green Growth Index of Ukraine, 2015-2023

**Source:** compiled by the authors, based on [52]

It can be seen from Figure 10 that there was a significant decline of the index in 2016, but the index remained fairly stable for the following 3 years. According to the trend analysis, the index will fall, although it is not likely enough ( $R=39.6\%$ ).

Let us consider the Climate Change Performance Index (CCPI) developed by Germanwatch. The index is calculated on the basis of 14 indicators (outer circle) and the following four categories: GHG emissions (40% of overall score), renewable energy (20%), energy use (20%) and climate policy (20%). The CCPI's unique climate policy sec-

tion evaluates countries' progress in implementing policies working towards achieving the Paris Agreement goals. It aims to enhance transparency in international climate politics and it makes possible a comparison of individual countries' climate protection efforts and progress [53].

Traditionally, the first three positions in the ranking are unoccupied, because Germanwatch is confident that no country makes enough steps to prevent a dangerous climate change. Denmark is the highest ranked country in CCPI 2022, Sweden takes the second place, outsiders of the EU are Hungary, Poland and the Czech Republic (Table 10, Fig. 11).

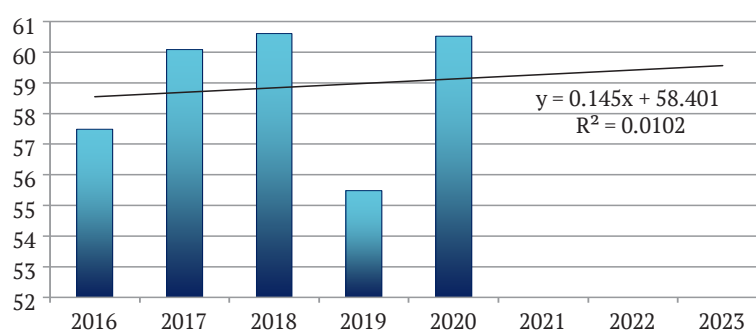
**Table 10.** Climate Change Performance Index of the EU countries and Ukraine, 2016-2023

Economy	2016	2017	2018	2019	2020	2021*	2022*	2023*
Austria	49.49	48.78	44.74	48.09	52.8	53.393	53.986	54.579
Belgium	49.6	50.63	45.73	45.11	46.27	45.052	43.834	42.616
Bulgaria	45.35	48.11	40.12	42.64	49.02	49.207	49.394	49.581
Greece	47.86	50.86	52.59	48.11	58.55	60.413	62.276	64.139
Denmark	59.49	61.96	71.14	69.42	76.92	81.152	85.384	89.616
Estonia	52.02	44.37	48.05	46.01	55.25	56.06	56.87	57.68
Ireland	38.74	40.84	44.04	45.47	48.29	50.663	53.036	55.409
Spain	48.19	48.97	46.03	45.02	54.71	55.619	56.528	57.437
Italy	59.65	58.69	53.92	53.05	55.7	54.346	52.992	51.638
Cyprus	52.29	44.34	41.66	38.73	50.89	50.049	49.208	48.367
Latvia	63.02	68.31	60.75	61.88	58.06	56.425	54.79	53.155
Lithuania	69.2	70.47	66.22	58.03	65.06	62.988	60.916	58.844
Luxembourg	55.54	59.92	60.91	55.23	61.03	61.659	62.288	62.917
Malta	61.87	65.06	60.76	62.21	64.39	64.609	64.828	65.047
Netherlands	49.49	54.11	50.89	50.96	60.81	62.759	64.708	66.657
Germany	56.58	55.18	55.78	56.39	63.82	65.389	66.958	68.527
Poland	46.53	47.59	39.98	38.94	41.01	39.041	37.072	35.103
Portugal	59.16	60.54	54.1	56.8	61.45	61.534	61.618	61.702
Romania	55.32	59.42	54.85	50.33	52.59	51.135	49.68	48.225
Slovak Republic	56.04	56.61	52.69	49.51	50.9	49.162	47.424	45.686
Slovenia	50.54	44.9	41.91	37.02	43.73	41.58	39.43	37.28
Hungary	44	46.79	41.17	38.22	40.71	39.195	37.68	36.165
Finland	66.55	62.61	63.25	62.63	62.74	61.98	61.22	60.46
France	59.8	59.3	57.9	53.72	61.33	61.078	60.826	60.574
Croatia	61.19	62.39	56.97	56.69	56.26	54.704	53.148	51.592
Czech Republic	45.13	49.73	42.93	38.98	42.53	40.935	39.34	37.745
Sweden	74.32	76.28	75.77	74.42	74.46	74.302	74.144	73.986
Ukraine	57.49	60.09	60.6	55.48	60.52	60.665	60.81	60.955

**Note:** \* calculated by trend analysis; \*\* the average of 2018 and 2020

**Source:** compiled by the authors based on [54-58]





**Figure 11.** Dynamics of changes in the Climate Change Performance Index of Ukraine, 2016-2023

**Source:** compiled by the authors, based on [54-58]

Figure 11 shows that there was a sharp decline in 2019, but in 2020 the index recovered and has a positive trend. But since the index of Ukraine was rather unstable over the years, the probability of this trend is very low ( $R=1\%$ ). However, one should hope that this positive trend can be real, because it is very important for Ukraine to raise its level of the “green” economy.

Thus, the qualitative analysis of the world indices of Ukraine shows that, according to the majority of selected indicators, Ukraine takes the position of an outsider in the EU. As shown in this section, the Global Competitiveness Index and the Global Innovation Index have negative dynamics. At the same time, the Index of Economic Freedom, the Ease of Doing Business Index, the Global and the Corruption Perception Index have had a positive dynamics over the years and a tendency to grow. The Global Attractiveness Index of Ukraine had a sharp decline in 2020, but resumed in 2021. As for “ecological” indices, the Environmental Performance Index and Green Growth Index showed negative dynamics, and the Climate Change Performance Index showed positive dynamics. Unfortunately, by the qualitative indicators, Ukraine is now in an unfavorable investment climate, but Ukraine has the potential to improve it.

The next stage of the research was the modeling of relationships between investment climate indices and factors based on correlation-regression analysis. For the correlation analysis, the above indicators were chosen, namely,

the indices of the investment climate: the Global Competitiveness Index, the Global Innovation Index, the Index of Economic Freedom, the Ease of Doing Business Index, the Global Attractiveness Index, the Corruption Perception Index; and “green economy” indices: the Environmental Performance Index, the Green Growth Index and the Climate Change Performance Index; and the indicator of the quality of life of the population – GDP per capita (PPP).

It made sense to investigate the interdependence between all these indicators. For this, one of the methods of correlation-regression analysis was used, which involves identifying the correlation between one or several factors and the resulting variable and allows determining the closeness of the relationship between them by the correlation coefficient.

It should be noted that the correlation coefficient determines the degree of dependence between variables and takes a value between -1 (the variables have a strictly negative correlation between each other) and +1 (means a strictly positive correlation of variables), if the coefficient is 0, there is no relationship between the variables (Table 11).

It is important to note that the correlation coefficient 0.70-1 is a “strong” correlation between the indices, 0.5-0.7 is “moderate”, and 0-0.5 is “weak”. For a more detailed visual understanding, the color interpretation of the correlation analysis is given in Table 12

In order to determine the interdependence of these indicators in Ukraine, a correlation analysis was made according to the indicators given in Table 13.

**Table 11.** Indicators of Ukraine for the correlation analysis, 2018-2021

		2018	2019	2020	2021
1	Global Competitiveness Index	57.03	56.99	56.95*	56.91*
2	Global Innovation Index	38.5	37.4	36.3	35.6
3	Index of Economic Freedom	51.9	52.3	54.9	56.2
4	Ease of Doing Business Index	65.8	68.3	70.2	71.9514*
5	Global Attractiveness Index	33.2	30.35	25.94	32.23
6	Corruption Perception Index	32	30	33	32
7	Environmental Performance Index	52.87	51.185**	49.5	47.815*
8	Green Growth Index	51.31	51.3	51.09*	50.88*
9	Climate Change Performance Index	60.6	55.48	60.52	60.665*
10	GDP per capita, PPP	12634.24	13350.48	13056.7	13680.47*

**Note:** \*- calculated by trend analysis; \*\*- the average of 2018 and 2020

**Source:** compiled and calculated by the authors based on [10-12; 17-20; 24-27; 31-33; 37-39; 44-47; 50-52; 56-58]

**Table 12.** Color interpretation of the correlation analysis

Positive		Negative	
Strong		Strong	
Moderate		Moderate	
Weak		Weak	

**Table 13.** Correlation coefficients between Ukraine's indicators

	1	2	3	4	5	6	7	8	9	10
1										
2	0.995039									
3	-0.96771	-0.96037								
4	-0.99639	-0.99799	0.949095							
5	0.293603	0.386563	-0.28858	-0.34885						
6	-0.30779	-0.32293	0.528453	0.26748	-0.35637					
7	1	0.995039	-0.96771	-0.99639	0.293603	-0.30779				
8	0.950586	0.92528	-0.9832	-0.92113	0.109096	-0.47464	0.950586			
9	-0.26419	-0.23978	0.496321	0.19776	0.03586	0.919157	-0.26419	-0.51581		
10	-0.82637	-0.80499	0.669796	0.840687	-0.01653	-0.27644	-0.82637	-0.69755	-0.24276	

**Source:** compiled and calculated by the authors based on Table 11 and Table 12

Let's consider in more detail the strong positive correlation. According to the correlation analysis, a strong positive relationship exists between the following indicators:

The Global Competitiveness Index and the Global Innovation Index; such a strong relationship can be explained by the fact that the country's high level of innovation affects its high competitiveness.

The Index of Economic Freedom and the Ease of Doing Business Index; there is a strong correlation between these indices, because these indicators characterize the business environment of the country.

The Global Competitiveness Index and the Environmental Performance Index, the Global Competitiveness Index and the Green Growth Index; this dependence between the "green economy" indices and the competitiveness index can be explained by the fact that in the modern world the "eco-friendliness" is an important factor that can enhance competitiveness of this country and be its advantage over other countries.

The Global Innovation Index and the Environmental Performance Index, the Green Growth Index and the Global Innovation Index, since modern ecologization requires the latest technologies.

There is also a strong positive correlation between the Ease of Doing Business Index and GDP per capita (PPP), the Climate Change Performance Index and the Corruption Perception Index, the Environmental Performance Index and the Green Growth Index.

Thus, after analyzing the results of the correlation, it should be said that our assumptions about the relationship between these indicators have been confirmed, but there are also some indicators that do not have a close relationship with each other, so it is worth noting that there are other indicators that affect these indicators and the investment climate in general. It should also be noted that investments are extremely important for the economic growth and prosperity of the country.

As the research showed, investment ratings and indices have a significant impact on the investment climate as they allow us to assess the investment climate quantitatively and qualitatively and to assess possible investment risks and the degree of investment reliability. Research of indices has demonstrated that the investment climate of Ukraine is not favorable, but it is worth considering other characteristics of Ukraine (geographical location, natural resources and reserves, demographic-labor and other factors) as an investment environment. Therefore, Ukraine's competitive advantages include: its size of territory (the largest country in Europe) and geographical location (Ukraine is geographically located at the intersection of the main trade and tourist routes between Europe, Asia and the Middle East; due to this, Ukraine has a significant potential to become a powerful Eurasian hub). Ukraine is one of the most cost-competitive production platforms in Europe by the cost of labor and utilities Ukraine boldly competes with the countries of Central and Eastern Europe), Ukraine has a highly educated and talented workforce (more than 70% of human capital have a secondary or higher education; rapid development of the Ukrainian IT industry). Ukraine has rich and fertile land, Ukraine is a country with market economy and a part of the global value chain (availability of free trade agreements with many global markets that provide access to many markets in the world). Thus, Ukraine has the following advantages: location, fertile land, moderate climate, talented human capital, cost competitiveness, and availability of free trade agreements with many global markets; these advantages provide Ukraine with the prospect of attracting in key sectors like IT, agriculture, energy, manufacturing and infrastructure [59; 60].

As for impediments to foreign investment in Ukraine, according to the survey conducted by the European Business Association (EBA), Dragon Capital, and Center for Economic Strategy (CES), in 2020 the major obstacles to foreign investment in Ukraine were lack of trust in the



judiciary and widespread corruption, the same obstacles were named by both portfolio and direct investors. Market monopolization and state capture by oligarchs is the third impediment, investors are also concerned about cumbersome and frequently changing legislation. Foreign investments are also hampered by the following: oppressive law enforcement agencies, complicated tax administration, unstable financial system and currency, military conflict, restrictive capital and foreign exchange controls, large-scale labor migration from Ukraine [60].

Effective fight against corruption will help to reduce the scale of corruption, and therefore have a good impact on the investment climate. Ukraine also needs to relaunch of judiciary and carry out reforms in it. It is necessary to separate politics and business interests, reduce influence of oligarchs. Also, as a means of improving the perception of Ukraine, can be introduction of financial incentives for new investors, provision of legislative guarantees and simplification of bureaucratic procedures. Infrastructure and logistics should also be improved. It is necessary: to monitor the level of country risks and to reduce them; to improve its competitiveness and to develop new competitive advantages of the country.

Taking into account factors of political and economic instability, corruption growth, growth of inflation, military actions, low values of the indexes, Ukraine badly needs changes and active actions to improve its investment climate. All of the above-mentioned actions will contribute to the improvement of the investment climate in Ukraine.

In his work, M. Kyzym [61] investigated the problems of assessing the investment climate of EU countries and Ukraine, although he assessed the possibility of forming innovation-investment clusters even before the emergence of the concept of a new industrial revolution and the introduction of a climate-neutral economy. In her work, V. Khaustova [62] also assessed the possibility of introducing a more favorable investment climate in the conditions of building a sustainable economy of Ukraine using the example of electrical engineering enterprises operating in the Kharkiv region. At the same time, she did not consider the prospects of introducing a green economy as a mechanism for improving the country's investment climate. I. Yegorov et al. [63] and O. Salikhova [64] investigated the impact on the investment climate of the EU countries and Ukraine of the results of the introduction of high technologies into their economies, and also evaluated the indicators of the development of ICT, biotechnology, nanotechnology, new materials and nuclear technologies in the conditions of the formation of a sustainable economy. In addition, in the studies of all these authors, there is no comprehensive assessment of the investment climate of the EU countries and Ukraine under the conditions of the implementation of the "green" economy.

L. Fedulova [65] also used many indicators in order to assess the investment climate and prospects for trade in high-tech products, as well as to justify the national priorities of the country's socio-economic development on an innovative basis, although she determined only general indicators of innovative development without taking into account the factors of the new industrial revolution and implementation of Green Deal. In her work, G. Duginets [66] analyzed the place of Ukraine in global chains of added

value and, in particular, determined the imperative to transform the investment climate and foreign trade flows of the Ukrainian economy, substantiated the need for innovative investment development of the economy as a competitive advantage in global production, and also modeled the country's participation in global chains of value creation in the formation of a sustainable economy. However, these authors did not have a comprehensive approach to the development of a methodology for researching the investment climate of EU countries and Ukraine under the conditions of the implementation of the "green" economy.

Therefore, the authors of the article consider the perspective of their research to be the assessment of the development opportunities of the investment environment of Ukraine and the EU countries within the framework of the formation of joint chains of added value and the implementation of programs Green Deal.

As for the "green" economy, global climate and environmental challenges are a significant threat factor and a source of country's instability, so the "green economy" is the way to Ukraine's carbon-neutral and more sustainable future. The EU is actively moving toward achieving climate neutrality by 2050, adopting and implementing new strategic documents and promoting the issue of decarbonization through its leadership. It is important to note that breakthrough technologies and innovative solutions are the decisive factor in achieving the goals of the European Green Deal. The implementation of the "green" economy will have a positive impact on further cooperation between Ukraine and the EU on environmental protection issues. Also, the implementation of the EGD's (European Green Deal) climate goals will improve the quality of environmental and life of citizens, the state of the investment environment, and thus contribute to the formation of a new competitive economy in Ukraine.

That is why, Ukraine should use the world experience of successful implementation of the "Green" Economy concepts. It is a new model of economic development, which contributes to the preservation of the environment by increasing the efficiency of natural resources use, structural economic restructuring, development of "green" sectors, ecologization of production and consumption. Further implementation of the "green" economy in Ukraine, taking into account the experience of the EU countries in the context of the EU, requires coordinated action of state authorities, business communities, experts and scientists.

Obviously, the EU will not be able to become climate-neutral without the help of neighboring countries and their investments in "greening". Recently, one can observe a revival in the development and implementation of climate policy in Ukraine. This has been influenced, first of all, by the adoption and active implementation of the European Green Deal by the EU. In fact, the investment climate of the country will be the decisive factor in investing. Investments will come to a country with a better investment climate. Therefore, Ukraine needs a good investment climate, as this deal provides Ukraine with a good opportunity to improve the attractiveness of investments into the country's economy.

Thus, the attractive investment climate of the country improves its economic development and makes its economy more competitive, and the implementation of a

“green economy” allows to improve the quality of the environment and the citizens’ life.

So, it can be concluded that today Ukraine is not a sufficiently attractive investment economy. The instability of the political and economic environment creates obstacles to the development of the “green” economy in Ukraine. However, it has been found that the investment environment of Ukraine has good prospects if the existing problems are solved. Thus, creating a favorable investment climate in Ukraine is one of the most important conditions for attracting investment and it remains a matter of strategic importance. The creation of such climate is one of the key factors for increasing the welfare of the population, gross Ukrainian product and the country’s reputation on the world stage.

## CONCLUSIONS

During the study, the following conclusions have been drawn:

This article has its own scheme of investment climate and “green” economy research of the EU and Ukraine, it includes: qualitative analysis of the world indices (determination of the life quality – by GDP per capita (PPP), estimation of investment climate according to the indicators, assessment of “eco-friendliness” of the economies of countries by the indices; economic and statistical analysis (assessment of the dynamics of these indicators and trend analysis of these indicators), modeling of relationships between selected indicators on the basis of correlation analysis, as well as development of recommendations for Ukraine.

It has been established that Denmark, Sweden, the Netherlands, Germany, Finland most often were the leaders by selected indices; the lowest positions among the EU countries were taken by: Croatia, Greece, Bulgaria, Romania and Ukraine. Almost all indicators show that Ukraine ranked the lowest among the EU countries, except the Ease of Doing Business Index, the Green Growth Index and the Climate Change Performance Index (according to the latest available reports, some reports for 2019, some for 2020 or 2021).

Index and the Corruption Perception Index according to this analysis have a positive trend, and the Global

Competitiveness Index, the Global Innovation Index and the Global Attractiveness Index have a negative trend according to the calculated trend analysis. As for the “ecological” indexes of Ukraine, the index of ecological efficiency and the index of green growth show some negative dynamics, while there is a positive dynamic of the Climate Change Performance Index. The probability of these trends is between 1% and 100%, each index has its own approximation coefficient. To summarize, it should be said that according to most of the selected indicators, Ukraine is an outsider among the EU countries and, unfortunately, Ukraine has an unfavorable investment climate, but on the other hand, it has the potential to improve it.

The analysis of the interdependence of indicators has been carried out using calculation of the correlation coefficients. It has been confirmed that the selected indices and indicators are interrelated, but there are also some indicators that don’t have a close relationship with each other, therefore it is worth noting that there are other indicators that influence these indicators and the investment climate in general.

On the basis of the conducted analyses the main directions of improvement of Ukraine’s investment climate in the conditions of “green” economy have been defined as follows: anticorruption measures that will help reduce the scale of corruption; relaunch and reformation of judiciary; de-oligarchy; introduction of financial incentives for new investors; provision of legislative guarantees; simplification of bureaucratic procedures; improvement of infrastructure and logistics; control of the country’s risk level and reduction of risks; development of innovative and green technologies; improvement of the country’s competitiveness; search for and development of new competitive advantages of Ukraine; fight against climate and environmental challenges; decarbonization; realization of the movement toward climate neutrality and sustainable development. Thus, the implementation of such measures is a means of improving the investment climate of Ukraine, increasing the welfare of the population, and the reputation of the country on the world stage.

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**Ігор Юрійович Матюшенко<sup>1,2</sup>, Сергій Васильович Глібко<sup>2</sup>,  
Олена В'ячеславівна Ханова<sup>1</sup>, Єлизавета Андріївна Кудлай<sup>1</sup>**

<sup>1</sup>Харківський національний університет імені В.Н. Каразіна  
61022, майдан Свободи, 4, м. Харків, Україна

<sup>2</sup>Науково-дослідний інститут правового забезпечення інноваційного розвитку  
Національної академії правових наук України  
61002, вул. Чернишевська, 80, м. Харків, Україна

## **Інвестиційний клімат країн ЄС та України в умовах реалізації «зеленої» економіки**

**Анотація.** У сучасних умовах розвитку світової економіки одним із найголовніших пріоритетів економічного розвитку країни є активізація інвестиційних процесів, бо саме вони позитивно впливають на економічне зростання й ефективне функціонування економіки країни. Сучасний ринок інвестицій повний конкуренції серед країн за залучення інвестицій. Головний показник, який впливає на обсяги залучених коштів в економіку країни – це інвестиційний клімат країни. У сучасних умовах також активно просувається концепція «зеленої» та «екологічної» економіки. Тож на сьогодні досить важливим і актуальним питанням являється оцінка інвестиційного клімату країн ЄС та України в умовах реалізації «зеленої» економіки, а також пошук способів підвищення інвестиційного клімату України. Основна мета цього дослідження – оцінка інвестиційного клімату країн ЄС та України в умовах реалізації «зеленої» економіки У дослідженні використані загальнонаукові методи пізнання: індукція і дедукція, аналіз і синтез, методи якісного і кількісного економіко-статистичного аналізу, графічний метод. Серед методів економіко-математичного моделювання використано кореляційний аналіз, тренд-аналіз, та кореляційно-регресійний аналіз. Встановлено, що дослідження інвестиційного клімату країн ЄС та України в контексті реалізації «зеленої» економіки базується на об'єктивних міжнародних рейтингах, які мають прозору методологію розрахунку. Ці міжнародні рейтинги постійно оновлюються і охоплюють більшість країн світу. Отже, запропонована методика дає змогу провести аналіз інвестиційного клімату та «екологічності» економіки країни за світовими індексами, визначити, які країни відносяться до лідерів, а які до аутсайдерів за обраними індексами та показниками, дослідити місце України за цими показниками та проведено тренд-аналіз, змодельовати ступінь тісноти взаємозв'язку між індексами та факторами інвестиційного клімату на основі кореляційного аналізу, а також розробити рекомендації щодо покращення інвестиційного клімату країн ЄС і України в умовах реалізації «зеленої» економіки

**Ключові слова:** інвестиційна привабливість, Європейський Зелений Курс, конкурентоспроможність, міжнародні індекси, кореляційно-регресійна модель



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**Demin Zhong<sup>1,2\*</sup>, Iryna Zvarych<sup>1</sup>, Oksana Brodovska<sup>1</sup>**

<sup>1</sup>West Ukrainian National University  
46020, 11 Lvivska Str., Ternopil, Ukraine

<sup>2</sup>Xinyu University  
338000, Xinyu, China

## Analysis on The Business Model of Waste Market-Oriented Operation and Management in China's JX Region Based on the Perspective of Circular Economy

**Abstract.** Since 2000, China's JX region has been actively promoting pilot work on waste separation and treatment. Although some goals have been achieved, progress is slow and generally unsatisfactory. A new waste classification and disposal method that is suitable for a commercial marketing operation in the JX region of China is the problem to be solved in this paper. The purpose of the study is to analyze the business model of market-oriented activities and waste management based on the cyclical perspective of the economy in the JX region of China. In this work, the characteristics, current situation and strategic environment of the functioning of the waste market were investigated and analyzed using the method of system analysis. The application of the theory of joint management and the theory of circular economy, waste classification, ways of waste disposal, waste collection, processing, analysis of the difficulties of waste management in China's JX region, found that the waste management industry in this region (JX) is facing a market situation that is not optimistic. It is in the short-term perspective that the scale of the problem, the lack of funding and technical support, and the quality of practitioners must be improved. According to the existing problems, the practical value of this article is to provide a list of measures from the successful experience of managing the operation of the waste market in advanced countries and developed regions of China, as well as to suggest reasonable countermeasures

**Keywords:** sustainable development, waste management, classified collection, comprehensive utilization, analysis and countermeasures

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### INTRODUCTION

American scholar K.N. Townsend put forward the concept of "circular economy" in the 1960s. Balding advocated the establishment of a circular economy that would neither deplete resources nor cause environmental pollution and ecological damage. Thus, circular economy will replace the single-program economy of the past. The circular economy proposed by him is an economic model that operates in accordance with the natural ecological material circulation. It requires following the laws of ecology, rationally utilizing natural resources and environmental capacity, and developing the economy on the basis of continuous

recycling of materials, so that the economic system can function in a harmonic way. It is incorporated into the material circulation process of the natural ecosystem to realize the ecologicalization of economic activities [1]. Practically, the circular economy follows the "3R" principle, that is, the principle of reduction, reuse, and recycling. Among them, the principle of recycling requires that the produced products can be turned into usable resources instead of irrecoverable garbage after completing their functions.

Therefore, cyclic economy advocates a model of economic development in harmony with the environment, the

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\*Corresponding author

whole process of processing mode, reduce the amount of material into the production process, in order to achieve repeated use some items in different ways and waste recycling purpose, achieve from “eliminate waste” to “purify waste” to “using waste” process, so that all the material, energy in this sustainable cycle can be reasonable and sustainable utilization, so as to achieve as small as possible resource consumption and environmental costs, to obtain as large as possible economic, environmental and social benefits. All countries in the world are discussing the recycling of garbage, especially the comprehensive utilization of household garbage. China’s environmental protection theorists have also been exploring the development mode of domestic waste management and recycling in line with the national conditions. This paper only takes the development of waste management and recycling disposal industry in JX region of China as an example to analyze and discuss. Therefore, the aim of this article is the strict analysis on the business model of waste market-oriented operation and management in China’s JX Region based on the perspective of circular economy.

## LITERATURE REVIEW

At present, there are not many articles about waste management in foreign countries, but a few articles about solid waste can be seen in some environmental philosophy literature. American scholar B. Commoner had realized the importance of garbage sorting a long time ago. According to him, garbage is not waste, because if used in the right way, it can become a source of prosperity [2]. B. Piatt, C. Doherty, A.C. Broughton and D. Morris believe that the producers of environmental pollution are human beings, who are driven by goals and interests, but their attitude is indifferent [3]. C.E. Murphy studied garbage, “flood” is their metaphor for garbage, to make people realize the seriousness of the garbage problem. C.E. Murphy, who came up with the “Ten Commandments”, still insists that the root of the garbage problem is sorting [4]. M. Liikanen, O. Sahimaa, M. Hupponen, J. Havukainen, J. Sorvari and M. Horttanainen proposed that the use of mandatory ways to ask people to conduct garbage classification is helpful to improve the effect of garbage classification [5].

Compared with China, the international academic circle has paid attention to the research of waste management for a long time. In early 1960s, some scholars began to study the market-oriented operation of waste. Through the literature research on the established topic, the current study is divided into the following elements:

1. *Research on garbage classification.* When people think of garbage classification, the first country that comes to mind is Japan, whose waste classification has reached an extreme level of refinement. This kind of extreme garbage sorting makes the streets of Japanese cities clean, and the presence of garbage is minimal. Some cities in developed countries, based on the actual situation, wisely plan garbage classification, and the literature on this particular topic in the international academia mainly includes the following types:

First, study the methods of garbage classification. The authors of work [4] took solid waste as the main research object, and they divided the waste into six categories, namely wood, plastic, waste paper, food, textile and rubber. However, through the experiment, it was found that

garbage classification should not be limited to these six categories, but also should have more detailed classification standards. M. Liikanen, O. Sahimaa et al. also believe that waste classification standards should be refined to avoid the waste of resources [5].

Second, study the factors that affect garbage classification. M. Liikanen, O. Sahimaa believe that the classification of garbage is closely related to the generation of garbage, which is positively tied to the level of urbanization and the density of population [5]. The authors of work [6] show that garbage mixing is the main cause of pollution. Therefore, a systematic method of garbage classification is needed to avoid mixing garbage.

In general, the international community provides a solid amount of researches in the sphere of garbage classification. There is no clear definition of specific standards for garbage classification in academic circles.

2. *Study on waste marketization operation.* On the analysis of waste marketization operation management business model based on the perspective of circular economy, in the past 10 years the authors of work [1; 7] and other scientists and experts conducted research on the development of this process and the market-oriented operation and management of waste, the regional and general situation in China. In general, in terms of the research on waste marketization operation, almost all of the works written by these scholars pay attention to the development trend of waste marketization operation management business model from the perspective of circular economy, and believe that the main source of this major problem is related to the beginning of the global integration path.

3. *Research on garbage disposal.* The literature on waste disposal is mainly technical. Incineration, as opposed to landfilling, which became popular in the United States in 1904, developed in the middle and late stages of waste disposal [1]. Nowadays, the world is in a period of rapid development, and has entered the electronic era, the technology is increasingly mature, incineration based waste disposal is gradually popular. Composting technology developed in the late stage, although it appeared later, but its development momentum cannot be underestimated. Some scholars argue that to control garbage, one must start from the source, such as preventing excessive packaging, reducing the use of disposable packaging and so on.

In some developed countries, energy and land resources are scarce, and waste incineration requires a large amount of land resources. Most of the agricultural developing countries still use compost as the main method, and landfill is the final disposal method of waste, which always accounts for a large proportion in the waste disposal method [8]. Some developed countries have also introduced relevant laws and regulations. For example, European and American developed countries are good at using financial means to improve environmental problems. In the mid-1990s, Germany implemented the Law on the Disposal of Waste to Promote the Closed Cycle Management of Waste and Ensure Environmental Compatibility, which indicates the reduction, recycling and harmlessness of waste [1; 2]. This law promotes the recycling of waste.

4. *Research on waste management strategies.* Waste management has been a subject of current academic research, for example, N. Reznikova, I. Zvarych, A. Kryso-

vaty, [9-11] and other scholars, in terms of how to overcome the global waste in global circulation chain, the development of the circular economy globalization, inclusive circulation economy analysis research on the impact of globalization, the economic environment as the prerequisite of the development of international development under the background of the tax environment, increase the green taxes and subsidies to phase out harmful to the environment, and fiscal incentives, VAT reductions and tax relief measures to provide the perfect conditions for the transition to a circular economy [11; 12]. Thus, promoting a circular economy in the context of the formation of circular electronic chains as a solution to overcome global waste. Dialysis out will be the new alternative models of the world economy as a new stage of economic transformation process, guiding demand more attention in the future according to the division of global waste composition and global waste, one of the key focuses on material recycling, and through service and intelligent solution to create additional value, this makes the circular economy of a kind of new economic model.

5. *Research review.* To sum up, developed countries strictly control waste management through the system and deeply understand the details of waste classification. For example, cities in the United States, Japan and Germany have clear rules and regulations on waste classification, and each city has a relatively detailed waste classification standard. Compared with China, especially in JX region of China, the main reasons for the remarkable effect of waste management in developed countries are their higher level of economic development, greater government investment and corresponding policy support. Although there have been many researches on the economic optimization of municipal waste disposal in China, there are few literatures on the waste management of some economically underdeveloped provincial capitals (such as JX region in China).

## MATERIALS AND METHODS

1. *System analysis method.* This paper studies and analyzes the characteristics, current situation and strategic environment of the waste market operation management business model in JX region of China by means of systematic analysis and combining theoretical elaboration with realistic analysis. Next, from theory to reality, a basic research idea of this paper is: on the premise of China's current laws and systems, combined with the actual situation of China's JX region and the theory of circular economy, through risk analysis and evaluation, put forward a theory suitable for the waste market operation management business model in China's JX region. Through the study of the specific operation scheme, this paper describes the market-oriented waste operation management policy that can be implemented in JX region of China at the present stage, and tries to evaluate and analyze its feasibility. At the end of this paper, the paper suggests the operation ideas of the market-oriented business model of waste management and the development countermeasures of recycling in JX region of China [13; 14].

2. *Use of technology.* Quantitative and qualitative techniques are combined. For management science, qualitative research is a common method for raising, analyzing and solving problems. However, if the lack of quantitative analysis and research on the problem, it will often lead to the phenomenon of only theoretical explanation but lack

of practical application, especially authors cannot reveal the root of the problem. In this article, therefore, based on the complex adaptive system theory point of view of import controls on the basis of qualitative research, quantitative research using a variety of technologies, such as fuzzy comprehensive evaluation method, grey forecasting method, technology, life cycle methods of input-output model, to study the various problems in the process of put forward the concrete scheme of qualitative research, It provides a scientific basis for revealing the root of the problem and combining theoretical research with practice better.

3. *Technical route studied in this paper.* Develop detailed research outline → data collection → theoretical research → key research → empirical research → first draft → perfection and finalization of the paper.

## RESULTS AND DISCUSSION

### Core Concepts

1. *Recycling.* Recycling refers to the recycling of resources. As early as the 1960s, some scholars put forward the hypothesis of "spaceship theory", which compares the world people live in to a spaceship. In order to maintain sustainable economic development, people living in the spaceship must ensure that the environment is not polluted, and the leftovers after consumption must be recycled to realize the recycling of resources.

There are three basic principles in the recycling of resources, namely reduction, reuse and recycling [15; 16]. Among them, reduction refers to the reduction of waste production in the process of survival; reuse means that the goods that have been used can be reused after being processed by technology; resourcing means to maximize the use of resources, that is, to make full use of resources and avoid unnecessary waste [12; 17; 18].

In this paper, recycling refers to the classification of life and other wastes, the recyclables are recovered, and then reproduced by relevant enterprises, so that the recyclables in the garbage can play their residual value and fully realize the full utilization of resources.

2. *Garbage (waste) treatment.* In the academic circle, there is no unified definition of garbage (waste) management. When discussing the problem of garbage (waste) management, scholars have interpreted it. With the aggravation of the phenomenon of "garbage (waste) siege", the role of governance theory in guiding the garbage (waste) problem is prominent, and the term garbage (waste) governance comes into being. Garbage (waste) management is mainly a combination of government and society, as far as possible to reduce garbage (waste), resources, reuse the direction of development. In general, the process of garbage (waste) treatment is extremely complex, involving not only the treatment of the source, but also cleaning, recycling, processing and other links. Garbage (waste) treatment mainly refers to urban garbage (waste) treatment and rural life garbage (waste) treatment. The purpose of garbage (waste) management is to avoid waste and effectively maximize the use of resources. The research on garbage (waste) treatment is not only helpful to recycle old materials, but also can promote the sustainable development of economy, motivate the development of regional industries, and more conducive to mobilizing the enthusiasm of multiple subjects to participate in the creation of a beautiful home. The

treatment of household garbage (waste) is mainly the treatment of all kinds of waste, including recycling, utilization, reprocessing, etc., and the ultimate goal is to achieve the harmless treatment of garbage, and to explore the “treasure” from garbage (waste) as far as possible [6; 19]. Garbage (waste) management and garbage (waste) treatment is a word difference, but the connotation is very different, such as their focus is not the same. Garbage (waste) treatment mainly deals with garbage from the technical level, while garbage (waste) treatment focuses on management [20].

The garbage (waste) management in this paper focuses on management, mainly taking the government as the leader, and guiding multiple social organizations to participate in the activities such as the source reduction and classification of household garbage (waste). Finally, with the efforts of various groups, harmless disposal of garbage (waste) is achieved.

#### Basic Theory

1. Collaborative governance theory. In the process of promoting the improvement of national governance capacity, there is no doubt that government departments are the top priority of the governance system. The unipolar model of government can no longer deal with the chaos of public affairs. In this kind of environment, the theory of collaborative governance comes into play and becomes a hot research topic of Chinese scholars. Therefore, promoting and studying the cooperative governance theory of socialism with Chinese characteristics not only meets the realistic needs, but also has important value of The Times.

In the early 1990s, the theory of collaborative governance gradually rose and became the choice of many countries for reform. So far, Chinese scholars have not unified the definition of collaborative governance. They generally refer to collaborative governance as “cooperative governance”. In general, collaborative governance requires policy coordination among various parties, such as governments at all levels, various types of enterprises and social organizations. Each body represents a certain group interest, but also has various parts of the supporters. The organizational logic of different systems is different, so it is difficult to coordinate. If all parties involved in collaboration use independent and incompatible information communi-

cation systems, information asymmetry will be aggravated, and the effect of collaborative governance can be imagined.

2. Circular economy theory. In the 1960s, some scholars put forward the theory of circular economy. Originally, the circular economy was mainly aimed at the efficient disposal of waste as an idea. In the middle and late period, sustainable development strategy became a household term, “environmental protection”, “green” and other words have also become people’s word of mouth, circular economy emerged from this. The “3R” principle is the main principle in circular economy, namely reduction, reuse and recycling.

Basically, circular economy is a form of ecological economy, so it is also adapted to ecological laws, and to guide people’s life. Circular economy is different from traditional economy, which is mainly a linear economy characterized by “two high and one low”, that is, high emission, low utilization and high exploitation. This kind of economic emission is extensive, easy to form pollution to the environment. The difference is that the circular economy advocates the concept of sustainable development, characterized by “two low and one high”, that is, low emissions, high utilization and low exploitation. Circular economy has a circular process, namely resource – product – renewable resources. In this economic circulation system, all substances must be reasonably and fully used in order to reduce the adverse impact on the natural environment [21].

**Status Quo of Waste Management in JX Region of China.** The way waste is classified and recycled has a profound impact on the utilization rate of various types of waste. Those treatment methods that do not undergo strict screening of waste classification and recycling, such as landfill and waste incineration, are still the main methods of waste and garbage disposal in China’s JX region. This not only has a negative impact on the environment, but also leads to inefficiencies in the reuse of recyclable resources. In addition, the recovery rate of major renewable resources in China is less than 60%, which is still a significant gap with developed countries [22]. China pays special attention to waste management and utilization, especially in waste classification and recycling. From the central government to local governments, many policies on waste classification and recycling have been issued. See Table 1 and Table 2.

**Table 1.** List of relevant policies promulgated by the central government of China

Promulgation time	Promulgating unit	Announce policy
March 18, 2017	State Department	“Notice on Forwarding the Implementation Plan of the Domestic Waste Classification System of the National Development and Reform Commission and the Ministry of Housing and Urban-Rural Development” [23]
March 30, 2017	National Development and Reform Commission and Ministry of Housing and Urban-Rural Development	“Implementation Plan of Domestic Waste Classification System” [24]
October 18, 2017	State Organ Affairs Administration, Ministry of Housing and Urban-Rural Development, National Development and Reform Commission, Central Propaganda Department, Central Administration	“Notice on Promoting Domestic Waste Classification in Party and Government Organs and Other Public Institutions” [25]
December 20, 2017	Ministry of Housing and Urban-Rural Development	“Notice on Accelerating the Promotion of Domestic Waste Classification in Some Key Cities” [26]

Source: completed by authors



**Table 2.** List of relevant policies promulgated by local governments in China

Local government	Promulgation time	Announce policy
Southern China (e.g., Guangdong Province)	September 25, 2015	“Guangdong Province Urban and Rural Domestic Waste Disposal Regulations” [16]
	March 29, 2017	“Guidelines for the Classification and Treatment of Rural Domestic Waste in Guangdong Province” [16]
China (e.g., Chongqing)	November 3, 2017	“Notice on Printing and Distributing the Implementation Plan of Chongqing Municipal Solid Waste Classification System” [16]
Northeast China (e.g., Liaoning Province)	August 25, 2017	“Notice on the Implementation Plan of the Four-Year Rolling Plan for the Classification of Urban and Rural Domestic Waste in Liaoning Province (2017-2020)” [16]
North China (e.g., Beijing)	October 30, 2017	“Opinions on Accelerating the Promotion of Domestic Waste Classification” [16]
East China (e.g., Shanghai)	April 10, 2014	“Measures of Shanghai Municipality for Promoting the Classification and Reduction of Domestic Waste” [16]

**Source:** completed by authors

The central government and local governments have focused on the classification and recycling of waste and garbage, and the policy scope covers a wide range. From the perspectives of the government, public institutions and citizens, the classification and recycling of various types of waste and garbage has been clearly stipulated. For example, in the municipal solid waste management system, the government undertakes the important functions of construction, operation, maintenance and supervision, and plays the role of decision-making and guidance. Also, the government provides economic incentives in the source classification of domestic waste, and provides extensive publicity in the recycling and utilization of resources. With the emergence of the three principles of “reduction”, “recycling” and “harmless” in garbage recycling and disposal, China has gradually built a relatively complete basic framework for garbage classification and recycling. China introduced the PPP model (“Public-Private Partnership”), namely “public-private partnership”. The government uses the 3P model to provide waste treatment projects for waste recycling and processing enterprises. With the help of the advanced technology and management experience of the enterprises, it not only relieves the financial pressure of the government, but also provides a profit point for the waste processing enterprises. Due to the gradual saturation of the industry market in China’s JX region, small and medium-sized enterprises are gradually eliminated by the market, leading to the lack of market vitality of enterprises and industries in China’s JX region. Therefore, it is imperative to find a more appropriate market-oriented business model if more enterprises and funds are to enter the waste sorting and recycling industry and stimulate the market vitality.

**Analysis of the operation mode of waste sorting and recycling companies in developed countries.** Many developed countries have established a complete recycling and processing mechanism in waste classification and treatment. In Japan, the recycling rate of plastic waste has reached more than 60%; the United States has strict rules and regulations for waste sorting and recycling, and the supporting facilities for waste sorting are very well specified.

1. US industry situation. There is a complete set of disposal methods for waste in the United States. Including collection, recycling and disposal, processing and sale. American municipal waste is collected and sorted by a company specializing in waste collection. Garbage collection

companies basically set up two trash cans at each recycling point: one for recyclables and one for non-recyclables. Some garbage collection companies transport non-recyclable waste to a nearby landfill for direct disposal. Specifically, the income of garbage disposal companies generally has two parts: one part comes from the garbage disposal fees handed in by residents, and the other part comes from the recycling and sales profits of waste products. Residents hand over the waste disposal fee to the municipal management department, and the municipal department signs an agreement with the relevant waste recycling company. Garbage disposal companies can collect landfill fees from other companies from time to time, and profit from the sale of recycled items such as paper, metal, and glass.

2. American Waste Management Corporation WM business. WM is the largest waste management company in the United States. It has the entire industrial chain of solid waste from collection to treatment, and has implemented a large-scale business layout of garbage collection, recycling and treatment. Garbage collection business is the core business of the company, accounting for more than 50%, mainly by signing agreements with customers or municipal departments to collect and transport waste and recyclable materials to the disposal site for fees. Landfilling is the company’s main method of disposing of waste, and the business also brings in a substantial amount of revenue. Other main businesses of the company include transshipment, recycling of recyclable materials, etc. The company’s business model: The company was founded in 1971, and after that, it continued to carry out large and small mergers and acquisitions to promote the company’s rapid development and consolidate its market position. The company is committed to increasing profits rather than increasing the scale of waste treatment. By stripping off unprofitable peripheral industries, consolidating core businesses and maximizing profits. For example, in 2014, the company sold part of its European overseas business and part of the stake in China’s Shanghai Environment Group. At the same time, by stripping marginal industries, optimizing the industrial structure, and retaining high-quality industries, the number of employees can be reduced, thereby reducing labor costs. The high-quality operating capacity and the way of share repurchase drive the stock price to rise, thus ensuring the company’s ability to acquire mergers and acquisitions and forming a positive cycle.

3. Japanese waste disposal. Due to the scarcity of natural resources in Japan caused by geographical factors, Japan gives importance to the reuse of renewable resources. Effective garbage classification in Japan is an important prerequisite for the recycling of waste recycling management [23]. In Japan, household waste is mainly divided into four parts: combustible waste, reusable waste, ceramic waste, and large discarded household appliances. The municipal departments are mainly responsible for the collection of household garbage, and the recyclable garbage is uniformly handed over to the recycling company for disposal. At a certain time, the staff of the municipal department will collect the garbage from each recycling station in a unified manner. Thus, the municipal department will not charge a fee for a small amount of daily household waste, but when discarding large devices, an application to the municipal department should be submitted and handed in the disposal fee, and the staff of the municipal department will collect it at the appointed time. Meanwhile, the government will impose severe penalties on those who illegally dump garbage in accordance with the law. Domestic waste disposal methods in Japan include landfill, recycling, and waste incineration. Due to the reduction of available land in Japan, the country mainly uses waste incineration to dispose of waste, accounting for as high as 75%. In order to reduce the serious air pollution caused by the incineration of waste, Japan is constantly improving the waste classification method, introducing advanced technology from Germany, and transporting the solid combustion waste from villages and towns to large incineration plants in nearby cities for unified incineration. The heat generated by incineration can be used to supply heat or generate electricity to nearby public places. Landfill treatment accounts for a small proportion of the total waste treatment in Japan. Combustible incineration residues and some items that are not suitable for incineration are directly landfilled. The effective classification of various types of garbage in Japan is for better reuse, which not only reduces the burden on the environment, but also saves resources to achieve the maximum utilization of resources. Commonly, the ash after waste incineration is used as an auxiliary material for new cement, and some food waste is used as a raw material for fertilizer or feed. The use of waste incineration plants to generate electricity is also a new type of high-efficiency generation method, which not only reduces the use of coal, but also reasonably solves the heat waste of waste incineration.

**Analysis of the existing business models of market-oriented waste sorting and recycling in China's JX region.** For the existing market-oriented business models of waste sorting and recycling in China's JX region, the business models of existing companies in the market that can be summarized as the model of Internet + garbage sorting and recycling are reviewed. The Internet + waste sorting and recycling model is developed based on the currently available mobile network. The waste recycling company first creates its own garbage sorting and recycling APP or establishes a similar network platform, and attracts a large number of users through some incentives and garbage sorting and recycling reward mechanisms to achieve the purpose of sorting and recycling garbage. Garbage sorting and recycling companies then recycle these wastes to make profits.

At present, in China's waste sorting and recycling industry, there are two main types of front-end collection of waste: one is to rely on smart devices to enable users to independently classify and put waste, such as smart waste recycling cabinets, and companies generally can only recycle waste. The cabinet is placed in the residential area, and the user only needs to follow the instructions to classify the waste and put it in. The other is to rely on the on-site recycling of the staff. Users can book on-site services online according to their needs, and the online workers will directly pack and transport them back to the waste disposal station for waste sorting and recycling. In order to attract users, in addition to the promotion of copywriting advertisements, major platforms will also use incentives such as exchange of points and credit for money, allowing users to recycle accumulated points or credit through waste sorting in exchange for some daily necessities or cash red envelopes.

In recent years, the industry situation of waste sorting and recycling companies in the market is not optimistic. The waste classification and recycling industry generally needs to achieve a certain scale in order to bring profit. The domestic waste separation and recycling industry is still in its infancy, so it is difficult to reach the scale in a short period of time. In the early stage, the company needs a lot of material resources. Without financial support from the government or large enterprises, it is hard for the company to develop. Secondly, in the waste classification and recycling market, the problem of industry homogeneity is serious. The main focus is on the waste classification and recycling process, in a relatively simple form, mainly in the form of intelligent recycling bins. Category on waste recycling, almost all the rubbish classification recycling companies in the industry are mainly recycled plastic bottles and waste paper recycling in kind, due to its high efficiency waste garbage for, mining solid waste, industrial waste, kitchen waste, etc., often neglected, because interest on one hand, on the other hand is also restricted by technology.

In addition, the whole online-to-offline business model (Online to Offline, abbreviated as O2O) has problems in waste recycling that cannot be ignored. The most important existing problems are the low qualification of staff and poor efficiency, these two factors deeply limit the development of O2O waste recycling. Part of the qualification of staff is related to the nature of the industry, some high-quality talent can produce because of its industry related to scrap into the line resistance, and a part of its professional knowledge related to sight, O2O waste recycling is a complex process involving various aspects, requires a wide range of knowledge, and also needs a certain degree of knowledge accuracy beyond general competence. The main reason for low efficiency is that in the process of waste recycling, mechanization and automation need huge financial support and maintenance, which may fail to achieve comprehensive mechanization and automation, so it is limited by certain efficiency. In addition, O2O waste recycling related enterprises need certain financing requirements to grow bigger and stronger.

**Thoughts on the operation of the market-oriented business model of waste management in China's JX region and the development countermeasures for recycling.**

1. *Operational ideas of waste management market-oriented business model in China's JX region.* In the past five

years (2017-2022), China's JX region has introduced and implemented some waste management measures, gradually bringing waste management into the track of legal management. For example, in 2018, JX Provincial Department of Housing and Construction and Provincial Development and Reform Commission jointly issued the "Notice on Accelerating the Work of Household Garbage Classification in the Province". According to the implementation opinions, JX Province plans to establish a garbage sorting and recycling system, accelerate the construction of a system for the removal and transportation of household garbage and the recycling and utilization of renewable resources, promote the standardized and professional treatment of renewable resources, and promote recycling. Draw lessons from the advanced countries and regions, combined with China's national conditions, China's marketization of JX region waste management business model and two perfect a train of thought, that is: first, should perfect the management system, from produce to the disposal of the whole process of management mechanism, to achieve waste reduction, harmless, industrialization of recycling of the goal. Secondly, the introduction of foreign advanced technology, according to different specific characteristics, the development of suitable for local hazardous waste treatment and disposal of practical technology and equipment, promote the development of hazardous waste management, treatment, disposal of alternative technology. Thirdly, people should accelerate the improvement of the hazardous waste exchange market, reform the operation mechanism of waste disposal, promote the industrialization of hazardous waste recycling, formulate relevant economic policies to introduce competition mechanism, and use a variety of channels to establish regional centralized waste recycling facilities, so as to achieve scale efficiency.

*2. Development Countermeasures of Waste Management and Recycling in China's JX Region.* According to the three principles of recycling economy resource utilization, reduction and reuse, strengthening the comprehensive utilization of waste products is an important support for the development of circular economy. Circular economy is a solid manifestation of the development path of green economy. Through the combination and supplement of different products and industries, it promotes the rational adjustment and optimization of the structure, makes full use of resources and energy, and minimizes the generation and discharge of pollutants. It is important to implement the whole process control, reduce the social and economic costs of economic development and environmental protection, and achieve a "win-win" environment and economic development [27; 28].

2.1. Improve the infrastructure. To do so, the effective implementation of each procedure of front-end correct classification, mid-end sorting and collection, and terminal recycling and processing of garbage classification should be promoted, and the existing small mixed waste transfer system to connect with the waste sorting and collection system should be upgraded. The first is to build 2-3 medium-sized waste transfer stations in each area, with perishable waste inlets and one other waste outlet, perishable garbage and other garbage storage pools; the next is to promote the construction of the garbage classification and transfer center project. The terminal treatment of garbage classification can be introduced to achieve harmless treatment of gar-

bage and maximize the benefits of garbage recycling. In line with the garbage classification policy, the terminal disposal system of garbage classification should also be updated, for instance, building a new type of garbage treatment plant to classify and treat the classified garbage is advisable.

2.2. Improve the incentive mechanism for garbage classification. The actual results also prove that giving certain rewards to garbage sorting behaviors can strengthen residents' garbage sorting behaviors, such as the "green account" incentive mechanism created by Shanghai, and cities such as Hangzhou, Xiamen, Ningbo etc. are also exploring this kind of garbage sorting. Economic incentives in exchange for points and items. At present, Nanchang City, Jiangxi Province has also implemented a similar incentive policy. In order to stimulate the enthusiasm of residents for garbage collection, the staff of Taoyuan Community, Xihu District, Nanchang City, Jiangxi Province issued corresponding IC cards for each household in the community, and put them in the smart recycling box. Residents can automatically add 50 points to the IC card for every 1000g of the input and then the residents will be provided with gifts according to the points, and the value of 50 points is about 0.5 yuan. When setting incentive policies in Nanchang City, Jiangxi Province, it is necessary to consider the intensity of incentives, and to formulate some incentive measures that can attract residents. In addition to economic incentives such as small gifts and shopping certificates, incentives can also be considered public incentives, such as giving Publicly commend and set up a special commendation column on the publicity column to give information about the residents who have done well.

2.3. Improve legislation and strengthen waste supervision. First of all, it is necessary to clarify the responsibilities of the government. The government of China's JX region can formulate corresponding rules and regulations according to the general policy of the country, according to the residents' awareness of garbage classification in the region, and the lack of action. Secondly, the law must clarify the responsibilities of enterprises, formulate laws and regulations, rules and regulations to constrain the behavior of enterprises, and play a role in the supervision and restraint of laws, so that garbage classification has laws to abide by. The last is to clarify the behavior of garbage classification - the responsibilities and obligations of residents. Clarifying the responsibilities of residents through legislation can stimulate residents' consciousness and enthusiasm in garbage sorting and recycling [15]. Legislation should stipulate the obligations of residents: they are obliged to preliminarily classify and dispose of garbage, to pay garbage disposal fees, and to pay fines when disposing of garbage in violation of regulations. In short, only by clarifying the rights and responsibilities of each subject through legislation, the waste classification work can be effectively implemented. In addition to these measures, the JX region government can also strengthen the propaganda education, establish relevant government staff appraisal mechanism, under the government leading, form the combination of universal participation, social collaboration garbage classification collection mode, give full play to the Chinese government army "rubbish" JX region in the role of garbage classification collection, Through this series of means to promote the classification and collection of urban solid waste.



2.4. Use modern information management methods to improve management level. At present, some advanced cities outside the JX region of China have established information platforms for waste exchange and utilization, and have carried out real-time tracking of the whole process of waste generation, transfer and disposal. For example, in Guangzhou, China, the use of commercial platforms to supervise the transfer of hazardous wastes not only saves more than 50% of the cost compared to traditional methods, but also conducts real-time monitoring by the management department of enterprises that generate, transport and dispose of hazardous wastes, effectively improving government, The two-level safety supervision efficiency of enterprises for the transfer and transportation of hazardous wastes provides inquiry and emergency auxiliary decision-making for sudden pollution incidents [28]. China's JX region should build a waste registration and exchange center and an emergency treatment system as soon as possible. The completed registration and exchange center should have the following functions: First, the solid waste, especially the waste generating units, transportation enterprises, resource utilization enterprises, and processing and disposal enterprises, conduct online transfer and transaction management, to further improve the immediate management ability of waste flow; second, have command and coordination ability, through the construction of substations in relevant regions, form waste transportation and storage capacity in the region, and play a role in the emergency response of waste environmental accidents.

2.5. Regulate the waste management market and support the development of enterprises. To achieve the harmless recycling of waste, a complete system must be established and improved. The establishment and improvement of this system can rely neither solely on the government's administrative orders, nor just on the spontaneous formation of the market. A complete system must fully take into account the role of government departments in macro planning, policy support, supervision and management, and market mechanisms. The Circular Economy Promotion Law of the People's Republic of China came into effect in January 2009, The Act elaborates on remanufacturing six times in Articles 2, 40 and 56, indicating that remanufacturing has entered the national law [12]. With the development of circular economy, social funds continue to pour into the waste recycling industry, hoping to maximize profits. Especially in the hazardous waste industry, more and more enterprises and individuals hope to obtain waste management qualifications due to the high recycling value and more operational value than ordinary waste. In view of the particularity of waste, to establish a sound waste recycling system, the government must give full play to its due role to ensure the safe disposal of waste.

2.6. Accelerate the promotion of the commercial operation model of waste recycling in China's JX region

2.6.1. Accelerate the construction of a supporting system for the classification of domestic waste in cities. The first is to standardize the classification and delivery of domestic waste. In accordance with the principles of convenience, speed and safety, set up fixed recycling points or special containers for hazardous waste and store them independently. Residents are encouraged to hand over recyclables to renewable resource recycling enterprises for

recycling and disposal, establish and improve a system of reward points for the classification of domestic waste, and give full play to its incentive and guiding role. The second is to standardize the classification and collection of domestic waste. Support the construction of facilities and equipment for the classification and collection of domestic waste, optimize and improve the layout of the classification and collection and transfer sites of domestic waste, and realize the functions of classification, collection, measurement, and transfer of recyclables and various other wastes. Where conditions permit, regular and fixed-point vehicle-to-door classification collection methods can be adopted to reduce fixed trash cans and secondary pollution. The third is to standardize the classification and transportation of domestic waste. Establish a visual identification system for the classification and transportation of domestic waste, clarify vehicle painting requirements, and unify vehicle identification to facilitate social supervision. Encourage the use of government-purchased services and other methods to guide professional sanitation enterprises to extend to residential areas, and gradually replace small, scattered, and poor informal garbage collection and expenditure teams. Strict law enforcement inspections to avoid mixed transportation. Fourth, strengthen the terminal processing capacity building. Formulate plans for the construction of domestic waste classification and treatment facilities, speed up the construction of kitchen waste treatment facilities and incineration generation treatment facilities, encourage the construction of domestic waste treatment industrial parks, and coordinate various types of waste treatment. If the existing treatment facilities and process levels do not meet the standards, upgrading and transformation should be implemented as soon as possible to meet the needs of classified treatment. The construction of a recycling and utilization system for renewable resources must be accelerated, and the standardized, professional, and clean treatment and utilization of renewable resources should be promoted.

2.6.2. Actively explore and establish an operation mechanism for the classified collection and treatment of rural domestic waste in rural areas, continuously improve the level of reduction, recycling and harmless, further increase the rate of classified collection and comprehensive utilization of rural domestic waste, and promote a resource-saving society.

First, concerning garbage: through the classification, collection, and transfer of rural domestic garbage, perishable garbage is processed in domestic garbage reduction and recycling facilities; the classification and disposal of recyclables is linked to the urban renewable resource recycling system, a recycling catalogue of recyclables should be formulated; hazardous wastes such as medical waste and hazardous waste should be collected and processed in accordance with industry management requirements; other household wastes should be transported to County (city) domestic waste harmless treatment facilities for disposal.

Second, in the construction of sanitation facilities: each pilot county (city) can scientifically determine the reduction and recycling of perishable waste according to factors such as topography, village size, traffic location, and in accordance with the requirements of overall planning, on-site disposal, and local conditions. The technology and scale of the treatment facilities can be built in one village

or a combination of multiple villages. Each administrative village shall set up at least one sorting and stacking place for recyclables, and each natural village group shall be reasonably equipped with sorting garbage bins (buckets).

Third, in the construction of the recycling system: improve the recycling and utilization network of renewable resources, rationally distribute points, improve construction standards, clean up and ban illegal sites that illegally occupy roads, build privately and arbitrarily, and do not meet the requirements of environmental sanitation. Explore the establishment of an information platform for the recycling and utilization of renewable resources, and provide information such as recycling types, transaction prices, and recycling methods.

Fourth, in the construction of cleaning teams: according to the working methods of sorting, collecting, transporting and disposing of domestic waste, all localities should allocate cleaning staff according to the standard of 3 per 1,000 permanent residents, who also serve as sorting of recyclables and perishable waste. Transport work. Recyclable garbage shall be consigned by rural cleaners from natural villages (groups) to the recyclable domestic garbage classification and stacking place in administrative villages, and perishable garbage shall be removed and transported to domestic garbage reduction and resource treatment facilities. The purchase price of recyclable waste items can be used as a labor subsidy for rural cleaners.

2.6.3. Build a network channel linking household waste and renewable resources recycling. The combination of waste recycling and O2O marketing mode, and the close connection, recycling personnel or enterprises, will better build a link household waste and renewable resources recycling network channel. From a personal point of view, such a construction mode can achieve mutual benefit and win-win situation. First is to help potential people re-create the value of the household waste generated there; Second, enterprises can provide O2O model to realize the on-site recycling service of waste classification to facilitate the public; Third, O2O waste recycling business model can help people develop and improve the habit of garbage sorting; From the perspective of industry enterprises, it can help enterprises shape standards in the recycling industry, optimize the whole supply chain, improve efficiency and control the flow of recycled materials through automation, mechanization and information technology. So, from this aspect, proposal of waste recycling in China JX commercial operation mode, from the view of encouraging the construction of industrial park, from the standard garbage sorting transport behavior, from cultivating O2O recycling industry collaborative do big Angle actively build new mode "Internet +" resource recycling, get through life recycling and renewable resources recovery network channels.

First, the JX region of China should encourage the construction of waste disposal industrial parks, promote the construction of comprehensive disposal industrial parks that integrate incineration, fly ash landfill, kitchen waste, and hazardous waste disposal to improve the capacity of various types of waste disposal; coordinate the construction of hazardous waste terminals Treatment facilities to ensure the effective disposal of harmful domestic waste collected in a centralized manner; to speed up the construction of bulky waste treatment facilities, in principle, no new domestic waste landfill treatment facilities will be built.

Second, the JX region of China should further standardize the garbage classification and transportation. It is required that the classified domestic garbage must be sorted and transported. During the transportation process, it should not be dumped, discarded, scattered, or dripped. It is planned to strengthen the pollution control during the transportation of hazardous garbage to ensure environmental safety.

Third, China's JX region should actively cultivate the O2O waste recycling industry. With the time passing and with the expansion of scale and the formation of potential customers' personal habits, the scale effect and people's "experience curve" effect will gradually emerge, and the corresponding O2O waste recycling will also cooperate with related industries to generate synergies, such as signing a series of related contracts with the express delivery industry. These effects can accordingly reduce the overall cost of the waste recycling industry under the O2O business model, and achieve a leveraged positive effect, which is reflected in its full use of potentially renewable and recyclable waste to reduce pollution caused by garbage. The degree of environmental damage and resource consumption, thereby leveraging the improvement of the entire society and the national ecological environment and promoting the development of economic quality. For this reason, turning the waste recycling industry into an O2O "Internet +" form in China's JX region is not only a very meaningful innovation, but also a new channel to promote economic development. The O2O waste recycling industry can contribute to the integration of its industrial chain through mergers, strategic cooperation, etc., and take this opportunity to become bigger, stronger and better. It is envisaged that in the near future, driven by China's construction of an innovative society, the recycling model would be updated, the O2O perspective of the Internet would be introduced into the construction of the waste recycling system, and the implementation of "smart recycling" would definitely have huge development advantages.

Author Xin Tong et al. in the paper [29] develop the idea about influence of effort to build an EPR system for waste electrical and electronic equipment (WEEE) in China has created unexpected niches for innovation in business models for post-consumer recycling of e-waste as well as other recyclables in recent years. This study used action research to evaluate the performance of emerging business models for post-consumer recycling in urban China in recent years. The results reveal the dilemmas that each business model faces in balancing among all the elements and highlight the governance challenge of integrating the EPR scheme with the municipal waste management system. In the paper [30] T.A. Kurniawan et al. describe a proper implementation of digitalization-based waste recycling has contributed to an efficient cooperation between the government and private sector, increased job opportunities, and promoted the conservation of resources. It is anticipated that the work [31] not only contributes to the establishment of an integrated MSWM system in China, but also improves local MSWM through digitalization in the framework of a CE. Another case was developed by Corinna Vera Hedwig Schmidt, Bastian Kindermann, Cassian Felix Behlau, Tessa Christina Flatten in the paper [32]. Thus, all these papers developed some moments in our topic moreover we took into account concrete region of China.



## CONCLUSIONS

The high growth of economic development in China's JX region is at the cost of the high increase of resource input, accompanied by the increase of total pollution emission. If the existing economic development model continues, the required resource input and pollution emission in China's JX region will increase synchronously with the economy. According to the requirements of the scientific outlook on development, it is an important and urgent task to accelerate the fundamental transformation of the economic growth mode. From the perspective of resource flow and environmental impact, the traditional growth mode is a single-program economic model, that is, a one-way linear process of "resource-product-waste". The main problems of this economic growth mode are: high input, high consumption, high emission and low circulation. That is, the more resources people consume, the more waste people produce, and the greater the negative impact on resources and environment. The modern growth mode is circular economy model, namely, the closed-loop feedback cycle process of "resource-product-waste-renewable resources", which can more effectively use resources and protect the environment, and obtain as much economic and environmental benefits as possible with as little cost as possible. Therefore, the transformation of economic growth mode in JX region of China at the present stage is to abandon the traditional economic development mode and promote the new development mode of circular economy. Therefore, this paper analyzes the current situation of waste market operation management in China's JX region from the perspective of circular economy, and puts forward the optimization path of waste market operation management in China's JX region.

Efficient waste utilization is the core idea of the circular economy model, and it is also the perfect point to maintain the high-speed economic growth in China's JX region. Today, China's economic development has entered a new stage of strategic adjustment. Due to the different economic development and environmental conditions, there is no universally applicable optimal business model for the development of waste recycling industry, which often requires China's JX region to keep in line with the Chinese central government. JX region of China needs to make corresponding mode selection according to the actual situation of the local, so as to facilitate the development of the local waste management and recycling industry. The development of circular economy is an effective means to transform the extensive economic model to the intensive economic model in JX region of China, and it is also the only way to ensure the stable economic growth in the process of economic model transformation. It is proposed to build based on circular economy under the perspective of JX China waste marketing operation management business model, which is used in various engineering methods and management measures of waste recycling behavior benefit comprehensive performance, the process of recovery from waste a lot of valuable material, is to realize the economic benefit, environmental benefit and social benefit unified effective way. China by way of JX region can follow by "Internet +" development trend, establish in China JX residents expect garbage sorting mechanism, guide the residents and enterprises to form green living and production and social practice to promote China's booming of waste recycling industry in JX, to improve the environment for JX areas of China, building "JX" beautiful China region. It is of great significance to establish China's ecological civilization and sustainable economic development.

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Думін Чжун<sup>1,2</sup>, Ірина Ярославівна Зварич<sup>1</sup>, Оксана Григорівна Бродовська<sup>1</sup>

<sup>1</sup>Західноукраїнський національний університет  
46020, вул. Львівська, 11, м. Тернопіль, Україна

<sup>2</sup>Університет Синью  
338000, Хіну, Китай

## Аналіз бізнес-моделі ринково-орієнтованої діяльності та управління відходами в китаському регіоні JX з позиції засад циркулярної економіки

**Анотація.** З 2000 року китайський регіон JX активно просуває пілотну роботу з розділення та обробки відходів. Хоча деякі цілі були досягнуті, прогрес є повільним і в цілому незадовільним. Новий спосіб класифікації та утилізації відходів, який придатний для комерційної операції маркетингу в регіоні JX Китаю, є проблемою, яку потрібно вирішити в цій статті. Мета дослідження полягає в аналізі бізнес-моделі ринково-орієнтованої діяльності та управління відходами на основі циклічної перспективи економіки в регіоні JX Китаю. У цій роботі досліджено та проаналізовано характеристики, поточну ситуацію та стратегічне середовище функціонування ринку відходів за допомогою методу системного аналізу. Застосування теорії спільного управління та теорії циркулярної економіки, класифікації сміття, способів утилізації відходів, збору відходів, обробки, аналіз труднощів управління відходами у китайському регіоні JX, виявили, що галузь управління відходами у цьому регіоні (JX), стикається з ринковою ситуацією, яка не є оптимістичною. Саме у короткостроковій перспективі масштабність проблеми, відсутність фінансування та технічної підтримки, якість практиків необхідно підвищити. Відповідно до наявних проблем практична цінність даної статті полягає в тому, щоб надати перелік заходів з успішного досвіду управління функціонуванням ринку відходів у передових країнах і розвинених регіонах Китаю, а також запропонувати розумні контрзаходи

**Ключові слова:** сталий розвиток, управління відходами, сортування, комплексна утилізація, аналіз та протидія, циркулярна економіка

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**Serhii Yushko**

Simon Kuznets Kharkiv National University of Economics  
61166, 9A Nauka Ave., Kharkiv, Ukraine

## Special Taxation Regime for Agricultural Enterprises: Ukrainian Experience

**Abstract.** The problem of building a taxation system for agricultural producers that would take into account the specifics of their activities, would not be too burdensome, would stimulate or, at least, would not become an obstacle to the increase of business entities' activities remains extremely relevant for agrarian Ukraine. The purpose of this study was to analyze the special taxation regime for agricultural producers, to characterize the stages of its formation and development, to determine changes in the level of tax burden on taxpayers in the dynamics, and to substantiate the criteria for the expediency of certain producers to be on the simplified, special taxation system. In order to solve certain tasks, historical, statistical and economic, abstract and logical, and graphical research methods were used in the paper. The paper shows that the most favorable taxation of farmers was in the first 5 years after the introduction of the special taxation regime in 1999. The mandatory payments, the exemption from which was most noticeable for commodity producers, are named. The tax burden on agricultural enterprises is studied, the reasons for changes in its level in the dynamics are substantiated. The advantages and disadvantages of a simplified approach to taxation of agricultural producers based on the area of agricultural land under cultivation are outlined. The author describes the reasons for the introduction of legislative provision on the collection of mandatory payments from agricultural producers at a level not lower than the minimum tax liability, starting from 2022, and determines the consequences of such innovation for an average Ukrainian enterprise, and also draws conclusions concerning the prospects for further taxation of agricultural producers. The practical significance of the research results lies in the possibility of their use, on the one hand, by the legislator to reform the current system of taxation of agricultural producers, and on the other hand, by specific producers, when deciding on the choice of a taxation system that would be more economically beneficial for them

**Keywords:** simplified taxation system, fixed agricultural tax, single tax for group 4 taxpayers, tax burden, minimum tax liability

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### INTRODUCTION

The formation of a reasonable and effective system of taxation of agricultural producers is an extremely important issue for Ukraine, given the place and role of the agricultural sector in the national economy. According to the results of 2020, the share of agriculture, forestry and fisheries in the total gross value added in the country amounted to 10.8%; 8% of employees were employed in the industry, the share of agricultural products and food in the country's total exports amounted to 45% [1]. The situation in the agricultural sector directly affects the situation in related

industries, such as the production of agricultural machinery and equipment, seeds and fertilizers, plant and animal protection products, as well as in entities that process and sell crop and livestock products, such as processing and trading companies. It is no coincidence that the deterioration of the state and performance of the agricultural sector, which was particularly evident in the last decade of the twentieth century and has not been overcome to this day, has had a negative impact on the development of such agricultural-related industries. The need to ensure a special

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\*Corresponding author

approach to the construction of the taxation system for the agricultural sector is also due to the specific features of agricultural production: seasonality, dependence of production on natural conditions and biological processes and slow turnover of advanced funds.

The issue of taxation of agricultural producers has been raised in the scientific works of many scholars. For example, N. Matselukh and M. Skoryk studied the role of special regimes and mechanisms of taxation in Ukraine as components of state support for the agricultural sector of the economy and investigated the role of such mechanisms in enhancing the development of agricultural business [2]. G. Partyn, O. Kurylo, A. Podaryn analyzed the consequences of transformational changes in the taxation of agricultural producers, in particular, in connection with the introduction of a single tax for them, reforming approaches to the collection of value added tax from agricultural enterprises [3]. E. Podakov, O. Odintsov, T. Yevtukhova, E. Vasykonova, V. Kunchenko-Kharchenko studied the state of the tax burden on farmers [4; 5]. D. Semenda, O. Semenda, N. Hvozdiy proposed new approaches to taxation of agricultural producers, which can not only reduce the level of tax burden on these entities but also preserve budget revenues [6]. O. Sarapina and O. Yeremyan identified areas for reforming the taxation system for agricultural producers and provided recommendations for amending the Tax Code of Ukraine [7]. O. Nivyevskiy conducted a statistical analysis of the impact of tax benefits on the growth of overall agricultural productivity [8], and P. Bechko, S. Kolotukha, S. Ptashnyk and Y. Nahorna proposed options for improving the existing system of tax incentives for agricultural entities [9]. D. Dema made proposals for the introduction of new tax payments from agricultural producers (infrastructure agricultural tax on farmland tenants) [10]. J. Średzińska, A. Kozera, A. Standar studied the impact of taxation on the economic and financial condition of farms in the European Union [11], and I. Kov-alchuk considered the harmonization of tax legislation of Ukraine and the EU in the field of agribusiness taxation [12].

The purpose of this study was to analyze the special taxation regime for agricultural producers, which has been allowed to be applied throughout Ukraine since 1999, to characterize the stages of its formation and development, to determine changes in the level of tax burden on taxpayers in the dynamics, and to substantiate the criteria for the expediency of certain producers to be on the simplified, special taxation system. The novelty of the study is the substantiation of changes in the tax burden on agricultural producers – subjects of the simplified taxation system in the dynamics for the entire period of existence of the simplified system (1999-2022) with detailed calculations and explanations of the reasons for the changes that have occurred.

## MATERIALS AND METHODS

The theoretical basis of the research was the fundamental provisions of financial science, the results of scientific developments of Ukrainian and foreign scientists. The work was largely based on the regulatory framework that defines the principles of taxation of agricultural producers established by the current legislation of Ukraine. Given the long period (1999-2022) and the breadth of the study, the calculations were made on the basis of legislative and other normative legal acts that were in effect for the relevant periods of time.

The paper analyzes the indicators of the state of taxation of agricultural producers in the Kharkiv region (in order to demonstrate the level of tax burden on economic entities in the industry in 1992-2002), as well as the state of taxation of agricultural producers throughout the country – those who have chosen the simplified taxation regime (in order to calculate the amount of fixed agricultural tax per 1 ha(ha.) of the relevant type of agricultural land (for 1999-2014) and the single tax for taxpayers of the 4<sup>th</sup> group (for 2015-2022), to explain the reasons for changes in the level of tax burden on payers of the fixed agricultural tax (2004-2010), justification of the advantages and disadvantages of the simplified taxation system compared to the general taxation system (2020).

The following research methods were used to solve certain tasks in the work:

- historical (analysis of the formation of the taxation system for farmers, identification of the stages of development of an alternative, simplified taxation system in the form of a fixed agricultural tax (1999-2014), a single tax for taxpayers of the 4<sup>th</sup> group (2015-2022), characterization of each stage based on the norms of legislation and calculations of the state of taxation of producers);

- statistical and economic (collection, processing and analysis in the dynamics of indicators characterizing the state of taxation of agricultural producers and the level of tax burden on them (in particular, calculation of the amounts of fixed agricultural tax payable by producers (from 2015, the amounts of the single tax for taxpayers of the 4<sup>th</sup> group), amounts of mandatory contributions to state trust funds per 1 ha. of the respective types of agricultural land: arable land, hayfields, pastures and perennial plantations, justification of the reasons for changes in the tax burden on producers over time, demonstrating the disadvantages of using the single tax compared to the general taxation system, calculation of the minimum tax burden on an average Ukrainian agricultural enterprise), providing, based on the results of the study, recommendations on the choice of a taxation system appropriate for a particular agricultural producer);

- abstract and logical (formulation of theoretical generalizations based on the results of the analysis of each stage of the formation of the agricultural taxation system and formulation of conclusions);

- graphical – to visualize the results of the study and increase the level of its perception, the results of calculations of the taxation of agricultural producers and the level of tax burden on them are presented in the form of tables and figures.

## RESULTS AND DISCUSSION

The special taxation regime for agricultural producers introduced as an alternative regime and allowed to use throughout Ukraine since 1999 [13], was a logical reaction of legislators to the state of affairs in the basic agricultural sector of the national economy and was intended to provide it with the necessary support in the difficult economic conditions of the time.

Introduced as a temporary measure, the special taxation regime has remained an affordable option for farmers for 24 years in a row. Since its introduction, the alternative taxation system for farmers has gone through several stages of development [13; 14]:

1) 1999-2014 – a special taxation regime was implemented in the form of a fixed agricultural tax. The choice of this regime required applicants to comply with mandatory conditions, the main of which were the ownership or use of agricultural land or water fund lands (since 2004) and a sufficient share of income (at least 50% before 2004, and at least 75% starting from 2004) received by the applicant company from the sale of its own products or products of their processing in the total gross income of the business entity. Within this period, 2 sub-stages should be distinguished: a) 1999-2004, characterized by the lowest level of tax burden on agricultural producers who chose the special taxation regime; b) 2005-2014, during which the tax burden increases with a gradual return of agricultural producers who chose the special taxation regime to basic, close to general, taxation conditions.

2) 2015-2021 – the special taxation regime provides for taxation of agricultural producers who comply with the es-

tablished requirements (generally, they correspond to those for fixed agricultural taxpayers) under the simplified taxation system with the payment of a single tax for group 4 taxpayers.

3) starting from 2022, the taxation of agricultural producers has been carried out in accordance with the peculiarities of the previous stage, but taking into account the newly introduced minimum tax liability: the amount of taxes and fees paid by business entities according to the list of taxes and fees cannot be less than a certain minimum amount, which is calculated according to the formula approved by the legislator.

In other words, for more than 20 years, Ukrainian agricultural producers have been entitled to use the taxation system specially created for them.

In the first years of the introduction of the alternative special taxation regime for agricultural producers, a significant reduction in their tax burden was achieved (Table 1).

**Table 1.** Tax burden on agricultural enterprises in Kharkiv region by years

Indicators	1992	1995	1996	1998	1999	2001	2002
Direct taxes and tax payments (excluding VAT and excise taxes) in relation to revenue from sales of products (works, services), %.	10.5	13.3	25.5	19.9	5.9	2.6	2.7
Tax payment rate, %.	92.4	44.9	27.6	31.4	57.9	80.7	81.2

Source: [15]

The data in Table 1 indicate at least a threefold decrease in the tax burden in 1999 (for agricultural producers in Kharkiv oblast) compared to 1998, with a simultaneous increase in the level of tax payment.

It should be noted that at the time of the introduction of the special taxation regime (in the form of a fixed agricultural tax), the latter was paid *de jure* instead of 12 mandatory payments [13] (in fact, the number of payments came to 10, as discussed below). The most important of these payments with the most noticeable savings for business entities, were payroll taxes on contributions to state trust funds, including the Pension Fund and social insurance funds. In 1999, the payroll burden in the Ukrainian economy was 37.5% [16; 17]. The exemption from paying social security contributions meant, accordingly, savings for business entities in the amount of UAH 37.50 for every UAH 100 of accrued income for workers employed by such enterprises [16; 17]. Here is another example. The share of labor costs in the structure of the cost of crop and livestock production at agricultural enterprises in Kharkiv region in 1999 was 17.6 and 15.5%, respectively [15]. The exemption of agricultural producers from contributions to social funds ensured, respectively, a decrease in the cost of production of crop and livestock products by 6.6 and 5.8% [15].

During 1999-2000, the subjects of the special taxation regime had savings of 1% of the volume of products (works, services) sold, excluding VAT and excise duty, which was provided by the exemption from paying the fee to the state innovation fund. The savings lasted only for two years, as in 2001 the specified fee was abolished altogether, and therefore, neither agricultural enterprises nor any other companies had to pay it no more [18].

Savings of money for enterprises paying fixed agricultural taxes were also ensured by the exemption from the tax on owners of vehicles and other self-propelled machines and

mechanisms, the tax on construction, reconstruction, repair and maintenance of public roads of Ukraine, the tax on geological exploration carried out at the expense of the state budget, the fee for the acquisition of a trade patent for the carrying out trade activities, the fee for special use of natural resources (for the use of water for the needs of agriculture [13].

However, the logical exemption of fixed agricultural tax payers from paying the CPT did not result in significant savings for such entities: in 1998, 91.9% of Ukrainian agricultural enterprises were unprofitable [1]. And even taking into account the fact that the calculation of the income tax object was based on the rules of tax accounting, with high probability it can be asserted that the vast majority of agricultural enterprises had no income tax liabilities.

The exemption from the land tax did not result in any real savings for agricultural producers paying the fixed agricultural tax: the vast majority of these entities operate on leased land, essentially paying (reimbursing) land tax to landlords as part of the land rent.

In the end, the two mandatory payments specified in the list of those from which the subjects of the special taxation regime were exempted (the communal tax and the fee to the Fund for the Elimination of the Consequences of the Chernobyl Disaster and Social Protection of the Population) did not save a single penny for agricultural enterprises. This is due to the fact that agricultural enterprises were not payers of the communal tax anyway, and the collection of the fee to the Fund for Measures to Eliminate the Consequences of the Chernobyl Disaster and Social Protection of the Population for all its payers was terminated on January 1, 1999 [13; 19; 20].

In addition to all of the above exemptions, during the first two years of the special tax regime (1999-2000), agricultural producers had another concession: the application of a reduction factor (0.7) to the basic tax rates,



which provided such producers with additional savings of their own funds [13].

Gradually, the initially quite obvious undeniable benefits of the special taxation regime for agricultural producers became less clear, and for some entities it could be more profitable to return to the general taxation regime. The reasons for this are both the termination of the collection of certain payments by the state (the fee for the construction, reconstruction, repair and maintenance of public roads of Ukraine in terms of deductions by enterprises and business organizations since November 2003, the fee to the State Innovation Fund since January 1, 2001) and the return of the simplified taxation system to the cohort of payers of certain mandatory payments [13; 18; 21].

Since 2005, the subjects of the special regime have been paying contributions to the Temporary Disability Insurance Fund and the Unemployment Insurance Fund on a general basis and gradually (over five years) return to the general rules of paying contributions to the Pension Fund of Ukraine [13]. In the first two years of the transition peri-

od (2005 and 2006), the payers of the fixed agricultural tax pay 20% of the basic rate of contributions to the Pension Fund, over the next three years the rate increases by 20% annually, and starting from 2010, farmers who have chosen the special taxation regime lose any exemptions and privileges in the formation of the Pension Fund of Ukraine and have a payroll burden similar to the burden on the general taxation system [16].

Subsequently, starting from January 1, 2007, payers of the fixed agricultural tax again pay the vehicle owners' tax, although they are exempt from paying the tax for wheeled tractors, except tractor-trailers and trucks [22].

It should be noted that a kind of compensation for the additional costs of mandatory payments to state trust funds, which have been incurred by payers of the fixed agricultural tax since 2005, was the reduction of the tax rates by 3.33 times since the same date [13].

Let us consider the tax burden on agricultural enterprises under the fixed agricultural tax in different periods of its collection (Table 2) [13; 23].

**Table 2.** Average\* amounts of the fixed agricultural tax from its payers (except for those operating in mountainous areas and Polissya), UAH

Amount of fixed agricultural tax per 1 ha.	1999-2000	2001-2004	2005-2014	For reference: the area for which the calculations were made
<b>of arable land:</b>				
minimal in Ukraine	8.55	12.22	3.67	Zhitomirska
maximum in Ukraine	16.55	23.64	7.09	Cherkassy
average in Ukraine	12.87	18.38	5.51	
<b>of hayfields:</b>				
minimum in Ukraine	2.31	3.30	0.99	Kherson
maximum in Ukraine	10.38	14.83	4.45	Volyn
average in Ukraine	5.29	7.56	2.27	
<b>of pastures:</b>				
minimum in Ukraine	2.1	3.30	0.99	Kherson
maximum in Ukraine	8.33	11.90	3.57	Volyn
maximum in Ukraine	4.13	5.90	1.77	
<b>of perennial plantations:</b>				
minimal in Ukraine	8.51	12.16	3.65	Ternopil
maximum in Ukraine	44,18	63,12	18,94	Vinnytsia
average in Ukraine	23,74	33,91	10,17	

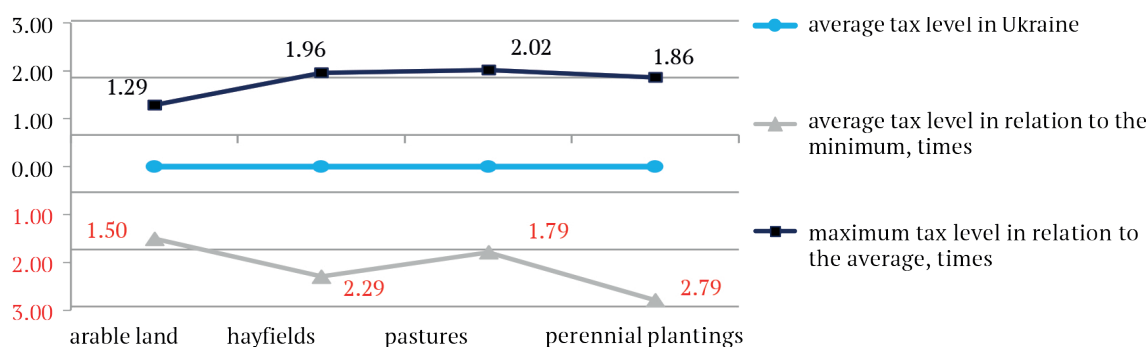
**Note:** \* calculated by the author on the basis of the average value of the normative monetary valuation of agricultural land in the relevant region [23] and the fixed agricultural tax rates in force in the relevant period of time [13; 14]

Table 2 shows that the average amount of the fixed agricultural tax per ha. in Ukraine after the end of the grace period (1999-2000) was UAH 18.38 for arable land, UAH 7.56 for hayfields, UAH 5.90 for pastures, and UAH 33.91 for perennial plantations over the next 4 years. For taxpayers operating in mountainous areas and in the Polissya region, the tax rates are 60% of the above rates for arable land, hayfields and pastures and 33% of the above rates for perennial plantations.

Logically, larger, higher than average amounts of tax were paid by enterprises with better land plot characteristics and more favorable locations, and smaller amounts by those with worse land plot characteristics and worse locations. These characteristics of land plots are reflected in the indicator of their normative monetary value, which is the tax base for the fixed agricultural tax [23]. The existing gap in the amount of fixed agricultural tax payable per ha. of agricultural land of different quality is shown in Figure 1.







**Figure 1.** Comparison of the amounts of fixed agricultural tax payable depending on the normative monetary value of land plots

**Source:** calculated by the author based on the average value of the normative monetary valuation of agricultural land in the respective region [23] and the fixed agricultural tax rates in force in the respective period [13; 14]

One important advantage provided by the rules of calculation of the fixed agricultural tax is the actual invariance of the tax amount per 1 ha of agricultural land in the dynamics, except for the increase in the tax amount since 2001 due to the end of the grace period (with the application of a reduction coefficient (0.7) to the basic tax rates) and the decrease in the tax amount since 2005 due to the downward revision (3.33 times) of the tax rates, as clearly demonstrated in Table 2. The reason for the stability of the tax amounts lies in the internal content of the mandatory payment, which was laid down by the legislator at the time of its introduction – fixing the tax base – the normative

monetary value of land plots (hence the “fixed”... tax) – as of July 1, 1995.

The immutability of the tax amount gave enterprises real grounds for their development and growth: with the improvement of their performance and the growth of profits, the amount of the fixed agricultural tax remained at the same, pre-fixed level.

It should be noted that the reduction in fixed agricultural tax rates since 2005 has only partially mitigated the increase in the tax burden on simplified taxpayers by returning them to the cohort of mandatory contributions to the Pension and Social Funds (Table 3).

**Table 3.** Changes in the tax burden on fixed agricultural tax payers since 2005, UAH per ha. of agricultural land

Years	Amount of the fixed agricultural gift tax*	Amount of contributions to state trust funds**	Savings/losses for enterprises		Increase in the tax burden compared to 2004.
			Savings (+) due to lower tax rate	Losses (-) due to renewed participation in the formation of trust funds	
2004	17.83	0.4	-	-	-
2005	5.36	26.2	+12.47	-25.76	13.33
2006	5.36	31.8	+12.47	-31.22	18.93
2007	5.36	58.5	+12.47	-57.81	45.63
2008	5.36	98.4	+12.47	-97.51	85.53
2009	5.36	128.8	+12.47	-127.94	115.93
2010	5.36	180.5	+12.47	-179.51	167.63

**Note:** \* calculations are based on the average normative monetary value of each type of agricultural land, taking into account the average structure of agricultural land in Ukraine [23]; \*\* calculations are based on the payroll of agricultural enterprises and the rates of contributions to the Pension Fund, Social Insurance Fund, Unemployment Insurance Fund and Social Insurance Fund against industrial accidents and occupational diseases that caused disability in the respective years [1; 15; 16; 24; 25]

Table 3 shows that reduction of fixed agricultural tax rates resulted in savings for agricultural enterprises on this tax by fixed UAH 12.47 per 1 ha of agricultural land for each year of the calculation period, while the restored costs of forming the trust funds were significantly higher – from additional UAH 25.76 in 2005 to UAH 179.76 in 2010. This increase is explained by the influence of two factors: the application of a higher share of the basic rate of agricultural enterprises’ contribution to the Pension Fund of Ukraine in each of the years of the transition period (2005-2010) and the annual growth of the wage fund of employees.

With the entry into force of the Tax Code of Ukraine [14] on January 1, 2011, the basic rules for the fixed

agricultural tax have not changed significantly, although due to the reformatting of the taxation system and the abolition of certain mandatory payments during the last four years of this tax’s existence (2011-2014), its payers were exempt from the need to accrue and pay only 4 mandatory payments: corporate income tax, land tax (except for land tax for land plots not used for agricultural production), fee for special use of water, fee for certain types of business activities (in terms of trading) [14].

The exclusion of the fixed agricultural tax from the list of taxes levied in Ukraine in 2015 did not mean the end of the special taxation regime for agricultural producers. It was extended within the framework of the simplified

taxation system for single tax payers of the 4th group (the beginning of the 2<sup>nd</sup> stage of the special regime). The rules that allow agricultural producers to operate under the simplified taxation system and the basic principles of calculation and payment of the newly introduced single tax remained largely unchanged, as they were for the fixed agricultural tax [14]. It is no coincidence that at the stage of transition to the new tax, in the absence of approved tax return forms, the tax authorities recommended that taxpayers report using the tax return form for the fixed agricultural tax.

Nevertheless, the new tax brought some important changes. First, due to the abolition of the fee for certain types of business activities, the number of mandatory payments from which legal entities paying the single tax are exempt has been reduced to three (corporate income tax,

except for mandatory payments under this tax directly defined by the Tax Code of Ukraine; land tax for land plots used for agricultural production and rent for special use of water) Second, it is the abandonment of the use of a fixed tax base. From now on, the tax base is the normative monetary value of 1 ha. of agricultural land, taking into account the indexation coefficient determined as of January 1 of the base tax (reporting) year. The third important aspect of the newly introduced tax was a significant increase in tax rates.

It was made calculations and have visual information on how the tax burden on agricultural enterprises subject to the special taxation regime has changed after the transition to the single tax under Group 4 of the simplified taxation system (Table 4).

To better understand the situation, we refer to Table 5 which shows the levels of tax growth over time.

**Table 4.** Average\* amounts of the fixed agricultural tax\*\* and the single tax for taxpayers of the 4<sup>th</sup> tax group\*\*\* (except for those operating in mountainous areas and in the Polissya territories), UAH

Years	Tax amount per 1 ha.			
	arable land	hayfields	pastures	perennial plantings
2005-2014	5.51	2.27	1.77	10.17
2015	115.98	27.15	21.25	121.19
2016	208.76	48.87	38.25	219.93
2017-2018	275.21	64.42	50.43	287.57
2019-2022	261.25	63.71	47.37	288.03

**Note:** \* based on the average value of the normative monetary valuation of agricultural land in Ukraine; \*\* in 2005-2014; \*\*\* since 2015

**Source:** [1; 13; 14; 23]

**Table 5.** Changes in the tax burden on agricultural producers of the special taxation regime\* in relation to its payers (except for those operating in mountainous areas and in the Polissya region)

Change in indicators by years	Change in the tax burden per 1 ha.			
	arable land	hayfields	pastures	perennial plantings
<b>2015 compared to 2014, times – total</b>	<b>21.04</b>	<b>11.97</b>	<b>12.00</b>	<b>11.91</b>
including: by increasing the tax rate	3.0	3.0	3.0	3.0
by increasing the tax base	7.0	4.0	4.0	4.0
<b>2016 compared to 2015, times – total</b>	<b>1.80</b>	<b>1.80</b>	<b>1.80</b>	<b>1.81</b>
including: by increasing the tax rate	1.80	1.80	1.80	1.81
<b>2017-2018 compared to 2016, times – total</b>	<b>1.32</b>	<b>1.32</b>	<b>1.32</b>	<b>1.31</b>
including: by increasing the tax rate	1.17	1.17	1.17	1.16
by increasing the tax base	1.124	1.124	1.124	1.124
<b>2019-2022 compared to 2017-2018, times – total</b>	<b>0.95</b>	<b>0.99</b>	<b>0.94</b>	<b>1.00</b>
including by changing the tax base	0.95	0.99	0.94	1.00
<b>Total tax increase, times since 2005</b>	<b>47.4</b>	<b>28.1</b>	<b>26.8</b>	<b>28.3</b>
including: due to an increase in the tax rate	6.3	6.3	6.3	6.3
by changing the tax base	7.5	4.4	4.2	4.5

**Note:** \* in terms of single tax accruals for Group 4 taxpayers

**Source:** [1; 13; 14; 23]

The data in Table 5 show a significant increase in the dynamics of the amount of the single tax for Group 4 taxpayers. The largest increase occurred in 2015, the year of the transition from the fixed agricultural tax, and amounted to 21 times for arable land and about 12 times for other agricultural land (arable land, hayfields, and perennial plantations). At the same time, due to the indexation of the tax base – the normative monetary valuation of farmland –

the burden on producers in 2015 increased by 7 times for arable land and 4 times for other land compared to 2014. The rest of the effect of the tax burden increase was provided by a threefold increase in tax rates.

The legislator revised (upward) tax rates for two more years in a row – in 2017 and 2018. As of 2022, their total increase compared to the level of 2014 was 6.3 times. At the same time, despite the introduction of the regime of

indexation of the monetary valuation of agricultural land, it was actually implemented only once (in 2017), due to the fact that the Tax Code requires that the consumer price index be taken at the level of 100.0 when calculating the indexation coefficient of the normative monetary valuation of agricultural land in 2015 and 2017-2022 to determine the amount of the single tax for agricultural producers, in other words, the normative monetary valuation of land in these years should not be indexed. Finally, a certain adjustment of the tax base for agricultural land took place in 2019 due to the entry into force of the national (all-Ukrainian) normative monetary valuation of agricultural land. The revision of the normative monetary valuation resulted in a slight decrease in the tax base of the single tax for agricultural producers, and therefore in the amount of the tax itself, for the national average.

As a result of all these changes, the overall increase in the amount of the single tax for agricultural producers in 2022 compared to 2014 reached 47.4 times for arable land and 26.8 to 28.3 times for hayfields, pastures and perennial plantations. In other words, while in 2014, agricultural producers (except for those operating in mountainous areas and Polissya) paid, for example, an average of UAH 5.51 of fixed agricultural tax per 1 ha. of arable land, in 2022 they will pay UAH 261.25 of the single tax.

It should be noted that the special taxation regime was introduced as a temporary measure (for the period 1999-2003) and was intended to provide support to farmers and help stabilize agricultural production. Nevertheless, starting from 2004, the regime was extended for another 6 years. Eventually, this tax found its place in the adopted Tax Code of Ukraine, and since 2015, the special taxation regime for agricultural producers has been implemented through the introduction of a single tax for them, within the 4<sup>th</sup> group of taxpayers of this tax. Since 2011, any mention of the temporary period of existence of the special taxation regime for farmers has disappeared from the legislation.

It should be noted that the introduction of this approach to taxation of farmers – by taxing their land plots – has not only advantages (almost complete absence of opportunities for tax evasion, which is the basis of the special taxation regime for farmers; removal of differential rents through this tax, which provides all taxpayers with equal opportunities for business and competition; promotion of efficient and rational use of the main natural wealth by commodity producers, as tax rules force taxpayers to receive income from land; implementation of the principle of social justice, given that everyone pays according to the natural potential they have; incentives to increase production volumes and profitability; consideration of the specifics of agricultural production when setting the tax payment deadlines (20% in the first half of the year and 80% in the second half of the year), as the main return on investment is received by agricultural enterprises in the second half of the year), implementation of the principle of social justice, given that everyone pays according to the natural potential they have; incentives to increase production volumes and profitability; consideration of the specifics of agricultural production when setting the tax payment deadlines (20% in the first half of the year and 80% in the second half of the year), as the main return on investment is received by agricultural enterprises in the second half of the year), but also disadvantages: the financial results of enterprises are not taken into account, which violates the principle of fairness of taxation; producers of profitable products, in particular, grain and sunflower, receive significant unjustified advantages; there is a redistribution of the tax burden on crop production enterprises due to the existing object of taxation (agricultural land), while livestock enterprises are actually exempt from this tax.

The existing shortcomings in the use of the single tax can be seen by demonstrating the performance indicators of production and sales of certain crops by Ukrainian enterprises (Table 6).

**Table 6.** Estimated amounts of income tax and single tax for Group 4 taxpayers\* on the example of certain types of crop production activities in 2020

Indicators	Cereals and pulses	Sunflower seeds	Factory sugar beet	Potatoes
Yield, c/ha	46.4	21.4	421	229.4
Profit from product sales, UAH/ha	3 707	6 236	-5 502	11 685
Potential amount of income tax, UAH/ha	667	1 122	-990	2 103
Single tax for taxpayers of the 4 <sup>th</sup> group, UAH/ha**	261.25	261.25	261.25	261.25

**Note:** \* operating outside the mountainous areas and Polissya territories; \*\*based on the average normative monetary value of agricultural land in Ukraine

**Source:** [1; 14;]

Despite the different efficiency of activities for the production of individual crops, the amount of the single tax is the same in each case. It is clear that all of the above crops can be simultaneously represented in the structure of the sown areas of agricultural enterprises, but preference will probably be given to those that provide producers with more profit. The already logical conclusion about the

rules of forming the production program of an agricultural enterprise is reinforced by the established rules and peculiarities of taxation of agricultural producers. According to the State Statistics Service, in the period 1999-2021, for example, sunflower production increased by 2.29 times, cereals and legumes – by 21.6%, and sugar beet production decreased by 77.8% [23].

These calculations also provide general understanding of which of producers should choose the simplified taxation system and which of them may find the general taxation system more profitable. Provided that the final financial result of the enterprise per 1 ha of agricultural land is lower than the average amount of the single tax per 1 ha, such enterprises should probably consider switching to the general taxation system. At the same time, the estimated amounts of other taxes from which single tax payers are exempt but which will have to be paid when the taxation system changes (land tax for land plots used for agricultural production and rent for special use of water) should be taken into account. It is also necessary to take into account the existing scope of activities: producers with annual net income of up to UAH 40 million are entitled to apply the annual tax period with payment of income tax once a year within 70 days after its end. Instead, producers with higher revenues have to pay income tax based on the results of the respective quarter within 50 days after its end, which may be a difficult task for them [14].

It should also be understood that the financial result of companies' activities calculated on the basis of accounting data for tax accounting purposes is adjusted for tax differences approved by the legislator, which is likely to increase the taxable object for income tax. Tax differences in determining the taxable entity are mandatory for business entities with revenues exceeding UAH 40 million and are only optional for those with lower revenues. Ambiguous, insufficiently transparent legislative provisions that increase the likelihood of errors in the calculation of income tax liabilities and thus threaten with appropriate sanctions from the tax authorities and the associated washout of business entities' funds do not contribute to the choice in favor of the general taxation system [14].

The final choice in favor of the taxation system for a particular agricultural enterprise starting from 2022 should be made taking into account the amount of potential additional costs due to the introduction of the minimum tax liability for farmers, as discussed below. At the same time, it should be understood that in case of abandonment of the simplified taxation system and transition to general taxation conditions, the legislator allows re-entering the cohort of single tax payers no earlier than in 2 calendar years [14].

In 2022, a new stage in the development of the simplified taxation regime for agricultural producers began. Based on the results of this and each of the following years, legal entities will compare the amount of mandatory payments they have made for the respective year according to the list with the amount of the minimum tax liability, and if the minimum liability is higher than the amount of payments made according to the list, the companies will have to pay the difference to the budget, thereby reaching the minimum amount of liabilities approved by the legislator.

The list of mandatory payments against which the amount of the minimum tax liability for legal entities subject to the special taxation regime will be compared includes a single tax; income tax and military duty withheld from individuals who are in labor or civil law relations with the taxpayer; income tax and military duty under lease, sublease, and emphyteusis agreements for agricultural land plots from individual landlords; 20% of the rent for agricultural land leased by taxpayers from legal entities and/or leased state or municipal property [14].

For entities that switched from the general taxation system to the simplified taxation system in the reporting tax year, the list of mandatory payments also includes income tax, land tax for land plots classified as agricultural land, and rent for special use of water.

The minimum tax liability for the transitional two-year period (2022 and 2023) is set at 4% of the normative monetary value of land plots, and will be 5% thereafter. This innovation is intended to address a number of issues: to help bring farmland leases out of the shadows (according to various estimates, the area of such land outside the official lease market is between 8 and 12 million ha.s), and to reduce the amount of envelope payments of income to agricultural employees: there is no point in entering into fictitious lease agreements and concealing the income of employees if there are no real savings in the end. As a result of the introduction of the minimum tax liability, not only budget revenues but also the revenues of targeted social funds are expected to increase due to the expected removal of the income of employees from the shadow economy.

The authors' calculations for an average Ukrainian agricultural enterprise showed that the amount of mandatory payments paid by such an enterprise, which are taken into account for comparison with the minimum tax liability, approximately corresponds to such minimum liability, and therefore, the specified enterprise will not have to pay anything extra to the budget.

The real consequences of this innovation will be seen after the first year of its implementation (2022). However, certain drawbacks of this mechanism are already evident. In particular, the calculation of the minimum liability ignores the tax exemptions initially granted to single taxpayers operating in mountainous areas and in the Polissya region: the single tax rates for them are 60% (for arable land, hayfields and pastures) and 33% (for perennial plantations) of the rates for other taxpayers, while the minimum liability is calculated on a general basis. The introduced innovation does not take into account the fact that lower labor costs per ha. of agricultural land, which are likely to require additional payments to the minimum tax liability, are not necessarily related to the concealment of part of the income of employees from taxation, but may be explained by the objectively lower labor intensity of production of certain crops. A lower level of labor intensity is also demonstrated by enterprises that are more widely introducing automation of production processes and using the most modern models of equipment. It is illogical to impose an additional tax burden on entities that implement investment projects at their own expense. The introduction of the minimum tax liability will further increase the relevance of the issue of the production program and activities of each business entity with a focus exclusively on highly profitable crops, which may negatively affect the food security of our country.

The issues raised in the article are not entirely new. They are in the area of attention of many scientists. In the works of other authors, as well as in the prepared work, the advantages and disadvantages of a special taxation regime for agricultural producers were investigated [2; 3], the level of tax burden on the specified entities was clarified [4; 5], the impact of the taxation system on the financial condition of farmers was studied [8; 11], directions for improving



approaches to taxation of producers of agricultural products were proposed [6; 7; 9]. The main positions on which this article differs from existing developments are as follows: covering the entire period (1999-2022) of the existence of a simplified taxation regime for agricultural producers within the framework of the study; submission of detailed calculations of the levels of tax burden on agricultural producers for the entire period of the study, performed on the basis of a thorough analysis of the legislation that regulated the issue of taxation of agrarians in the relevant periods of time; providing up-to-date recommendations to agricultural producers in choosing a taxation system, based on the calculations made and proceeding from the existing nuances of the current legislation.

However, the prepared article did not consider the issues raised in other works of scientists, in particular, the introduction of tax benefits for agricultural producers [8], the introduction of forms of tax legislation in the area of taxation of agrarians in the conditions of Ukraine's movement to the European Community to the requirements of European legislation [12], analysis of the results of the introduction of new tax payments from agricultural producers [10], etc.

N.P. Matselukh, M.O. Skoryk in his work [2] characterized the introduced simplified taxation regime for farmers as a kind of tax preference for them. In our opinion, it is more expedient to consider simplified taxation in the context of the equalization of taxation conditions for industry producers, which allows at least partially to take into account the existing nuances of conducting agrarian business. At the same time, we fully agree with the conclusion of the authors regarding the important role of instruments of state regulation of the agrarian sector in the further activation and development of agrarian business [2].

G.O. Partyn, O.B. Kurylo, A.R. Podaryn drew attention to the instability of the taxation system for agricultural producers, which required the aforementioned subjects to constantly adapt to the innovations being introduced. The authors rightly focused on the need to introduce differentiated taxation of agricultural producers depending on the volume of their income and the number of employed workers in the context of, on the one hand, increasing the effectiveness of support for small business entities, and on the other hand, increasing the role of the agricultural sector in the formation of tax revenues of the budget [3]. The authors also insisted on the expediency of differentiated taxation of agricultural producers [6]. At the same time, along with quite clear and easy-to-verify criteria by which it was proposed to provide support to producers (in particular, the area of agricultural land, production volumes and the number of employees per 100 ha.s), it was recommended to take into account criteria that are not unambiguous in the valuation (in particular, improving the quality of manufactured products, improving the quality of soils, financing the development of rural infrastructure, etc.). The implementation of this proposal may result in corresponding difficulties and increase the influence of the subjective factor in the selection of applicants for special taxation conditions.

E.S. Podakov drew attention to the fact that the introduction of special taxation regimes for agricultural producers was taking place in a number of countries of the modern world. At the same time, the author of this work,

like some previous researchers, supported the expediency of differentiated taxation – the establishment of single tax rates for business entities, based on the level of profitability. The researcher called their subsidies an alternative to the special regime for farmers in Ukraine, although he emphasized the narrow point of this proposal – the high probability of non-transparent distribution of state support funds [4]. This proposal is debatable and it requires additional calculations and justifications of the possible consequences of its implementation.

The methodical approach to determining the optimal level of tax burden proposed by the group of authors [5] deserves special attention. The result of the optimization will be the release of an additional resource for the growth of agricultural production while simultaneously increasing the amount of tax revenues to the budget.

O. Nivyevskiy in his research took care of the problem of identifying the real beneficiaries from the introduction of special regimes and preferential tax programs for agricultural producers, rightly noting that to a large extent the financial benefits are redistributed in favor of suppliers of means of production and landowners [8], which requires further research and improvement approaches to taxation of agrarians.

The work of the authors of the article [11] is useful and practically significant: they presented the classification of the countries of the European Union according to the level of taxation of farmers, presented the amounts of taxes paid based on: 1 ha. of agricultural land, the annual volume of hourly costs for the payment of workers, 1 euro of the value of assets for according to the classification of four levels of taxation of farmers (from low to high). The results obtained in the article can be used to compare the conditions of taxation of agricultural producers in Ukraine compared to European countries in order to further improve the system of taxation of Ukrainian producers.

## CONCLUSIONS

According to the results of the research, it was found that the special taxation regime for agricultural producers, introduced as an alternative to the general taxation regime in 1999 in order to support the basic – agricultural – branch of the national economy, is still chosen by the majority of enterprises, despite the fact that the conditions and taxation rules, and most importantly, the benefits and advantages of choosing such a regime by business entities have significantly decreased. A significant reduction in the list of mandatory payments from which subjects of a special taxation regime are exempted, a several-fold increase in tax rates, a transition to taxation of land plots based on an indexed (current) monetary base, and a transition in addition to this from 2022 to taxation of agrarians on a level not lower than the minimum calculated value in connection with the introduction of the minimum tax liability has already led to an increase in the level of the tax burden on agricultural producers.

In this regard, the level of taxation of agricultural enterprises that have chosen a simplified taxation system compared to subjects on the general system remains lower today only for highly profitable enterprises. For business entities that show low profits or even losses in certain periods of their activity, it may be more appropriate to work on a general taxation system.



With the formation of transparent, unambiguous and clear rules for calculating the amount of the tax object according to the income tax, the transition to taking into account the specific features of the agricultural industry when calculating the amount of taxable income, in particular, the existing gap between the time of advancing funds and receiving a return from them, the terms of receiving such a return, revision by the legislator of the composition of tax differences, to which the object of taxation is adjusted, by creating prerequisites for the unhindered valuation

of non-current assets, etc., is more expedient from the standpoint of the state, which is interested in filling the budget with funds, and from the point of view of producers who seek to equalize the conditions and rules of taxation, the formation of a tax system will be based on the elements of income and land taxation.

Taking into account the course of Ukraine to join the European Community, in further studies it is planned to study the experience of the participating countries of this economic and political union in the taxation of agricultural producers.

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## Сергій Васильович Юшко

Харківський національний економічний університет імені Семена Кузнеця  
61166, пр. Науки, 9А, м. Харків, Україна

### Спеціальний режим оподаткування сільськогосподарських підприємств: український досвід

**Анотація.** Проблема побудови системи оподаткування для виробників сільськогосподарської продукції, яка б враховувала специфіку їхньої діяльності, не була занадто обтяжливою, стимулювала або принаймні не ставала перешкодою до нарощування суб'єктами господарювання обсягів їхньої діяльності, лишається надзвичайно актуальною для аграрної України. Метою даного дослідження був аналіз спеціального режиму оподаткування сільгоспвиробників, характеристика етапів його становлення та розвитку, визначення змін у рівні податкового навантаження на суб'єктів оподаткування в динаміці, обґрунтування критеріїв доцільності перебування окремих товаровиробників на спрощеній, особливій системі оподаткування. Для вирішення окремих завдань в роботі використано історичний, статистико-економічний, абстрактно-логічний та графічний методи дослідження. В роботі показано, що найбільш пільговим оподаткування аграріїв було у перші 5 років від запровадження (1999 рік) особливого режиму їх оподаткування. Названо обов'язкові платежі, звільнення від сплати яких стало найбільш помітним для товаровиробників. Досліджено податкове навантаження на сільськогосподарські підприємства, обґрунтовано причини зміни його рівня у динаміці. Названо переваги та недоліки спрощеного підходу до оподаткування сільгоспвиробників, базуючись на площі наявних у них в обробітку сільськогосподарських угідь. Описано причини запровадження з 2022 р. законодавчої норми щодо стягнення з сільгоспвиробників обов'язкових платежів на рівні, не нижчому від мінімального податкового зобов'язання та визначено наслідки такого нововведення для середньостатистичного українського підприємства, Зроблено висновок про перспективи подальшого оподаткування агровиробників. Практичне значення результатів дослідження полягає у можливості їх використання, з одного боку, законодавцем з метою реформування чинної системи оподаткування сільськогосподарських товаровиробників, а з іншого – конкретними товаровиробниками при ухваленні рішення про обрання системи оподаткування, яка б була для них економічно вигіднішою

**Ключові слова:** спрощена система оподаткування, фіксований сільськогосподарський податок, єдиний податок для платників податку 4 групи, податкове навантаження, мінімальне податкове зобов'язання

**Halyna Nazarova\*, Victoria Rudenko, Rustam Urdukhanov, Petro Khomenko**

Simon Kuznets Kharkiv National University of Economics  
61166, 9A Nauka Ave., Kharkiv, Ukraine

## Transformation of Personnel Management Principles in Modern Management

**Abstract.** The influence of the development of digital technologies in the field of management determines the relevance of research on the transformation of personnel management principles. The purpose of the study was to substantiate the change in the principles of personnel management in the digital economy, which in the future will lead to changes in the models of personnel management in the modern management system. Complex analysis, methods of synthesis, induction, deduction, expert research using information and communication technologies are used as methodical tools to achieve the goal. Actual tasks determining the directions of transformation of modern management in the conditions of the digital economy have been identified and formulated. The available approaches to the classification of personnel management principles are analyzed, which makes it possible to identify groups of the most effective modern management principles. The principles on which the personnel management system is based require transformation, constant updating and refinement, as the market environment in which national enterprises operate and the system of modern management are constantly changing. Aspects of the transformation of personnel management in the system of modern management have been determined, which will allow to obtain information about the change in the system of practical principled approaches to the formation of the personnel management mechanism in specific conditions. The principles of personnel management were formed, taking into account their transformation, based on the determination of the impact of digitalization of the economy on the system of modern management. The outlined set of personnel management principles most fully reflects the content and tasks of the digital transformation process and fully describes the key requirements for building a modern digital management system. Practical significance of the research lies in the development of the principles of personnel management, which will be determined based on the impact of digitalization of the economy on the modern management system, taking into account their transformation, which allows to most fully reflect the content and tasks of the digitalization process and fully describes the key requirements for building a modern digital management system

**Keywords:** principles of management, human resource management, modern management system, digitalization, digital economy

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### INTRODUCTION

The evolution of the modern management system under the influence of digital technologies has led to the reformatting of the life cycle of companies. In the long term, competitive advantages of business entities are achieved through the development of innovative formats. Modern management is characterized by an increase in the amount of investments of transnational corporations in segments of technological chains with "mass demand". Electronic commerce, centers for storage and processing of information and analytical databases form the priority areas of management

development. Intellectual capital, collection, storage, and processing speed of an array of statistical data have become a necessary condition for progressive economic growth.

The transformation of organizational forms of traditional business models has influenced the evolution of the role of companies that become a component part of the digital ecosystem, since the ownership and processing of information and analytical data allow to ensure competitive advantages and obtain the effect achieved by optimizing the network interaction of business entities [1].

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\*Corresponding author

The reformatting of management took place as a result of the development of new organizational forms of business for the creation of values within the ecosystem, which, using flexible and innovative forms of interaction of business entities, reduced the consequences of external and internal risks of the world market [2]. In the digital economy, the high adaptability of network coordination and cross-industry interaction in innovation processes, taking into account collective intellectual property, has increased the effectiveness of management.

The current situation and directions of economic development must be radically changed, the direction and latest trends in research and practical application of modern management theory based on knowledge and innovation must be improved in order to contribute to the achievement of set goals, determine the implementation of management decisions and create a direction of sustainable competitive advantage. To carry out effective economic activities, managers, owners must manage with a strategic approach based on knowledge and innovation [3]. The success of companies and businesses that have already embarked on the path of forming an effective culture gives every reason to expect that the competencies recommended in the article will become a reliable beacon for Ukrainian business leaders.

The purpose of the study was to justify the transformation of the principles of personnel management in the context of digitalization of the economy, which lead to the reformatting of personnel management models in the system of modern management in the long term. Therefore, it is worth paying attention to determine trends in the theoretical aspect and practical application of modern management theory based on knowledge and innovation in order to contribute to the achievement of set management goals, determine the implementation of management decisions and create sustainable competitive advantage.

The scientific novelty of the work consists in the formation of the principles of personnel management, taking into account their transformation, based on the determination of the impact of digitalization of the economy on modern management.

## ANALYSIS OF PREVIOUS STUDIES ON THE TOPIC

A lot of Ukrainian and foreign scientists devoted their scientific works to the study of theoretical and practical aspects and the latest trends of modern management, problems of personnel management and its practical implementation. P. Drucker [3] substantiated that the traditional basic principles in the field of personnel management significantly contradict reality and are unproductive, in addition, there is only one correct principle of personnel management – the use of differentiated approaches and management styles for different groups of employees and even individual employees in different situations.

H. Emerson formed the main principles of personnel management and described them in the book “Twelve Principles of Productivity” [4]. However, A. Fayol [5] expressed the opinion that the number of management principles is not limited. In the studies of L. Zakharova [6], regarding the transformation of modern personnel management, it was said that the transformation of personnel management is not so much a difficulty as an opportunity for the development

of personnel in the future, since an employee of any organization ceases to be an ordinary performer of labor functions, which is focused only on achieving the company’s goals, but becomes the main link of the entire management system.

R. Abdusaitovich understands the principle of management as the purposeful activity of individuals aimed at ensuring compliance with stable procedures and rules used in the management of processes based on objective laws [7]. From here it is possible to define the principle of personnel management: the purposeful activity of those who follow established procedures and rules used in the process of managing personnel activities, based on objective laws.

A. Koquenova’s research concerned the philosophy of dealing with “human capital” adopted by organizations, expressed in the optimization of its structure, costs and development, and management systems to build the necessary workforce determine the principles used as the basis. All organizations are not static systems. It is in constant development. And the degree of sustainability of this development depends on the flexibility of the company, its mobility in dealing with resources [8].

S. Gorbachenko and M. Makedonskaya think that one of the basic principles of modern management is the principle of competence. This principle is based on the horizontal division of labor. Its use implies that each manager and manager possess both practical skills of a specialist in his field and directly managerial qualities. In addition, personal professional skills of managers, their ability to lead and ability to establish internal and external communications are important [9].

S. Kaczmarek viewed the implementation of digitalization and a framework to support management in implementation as a holistic task that takes into account innovation and the integration of digital information, as well as business organization and human resource management [10]. Human roles represent strategic HR planning and competency management processes related to HR management tasks, from goal development, planning, decision-making, and implementation to monitoring within the digital transformation process.

G. Zapsha substantiated modern management as a symbiosis of tools, mechanisms and theoretical concepts not only with regard to the practical implementation of management decisions, but also with regard to achieving the maximum socio-economic effect from the choice of certain alternative management options [11]. Therefore, it is worth recognizing that the main task of modern managerial work is to maintain an optimal balance between the management of business processes and the fulfillment of social tasks, which is a difficult challenge for the current domestic business space.

In research by L. Filipova and D. Galenko it is about the modern concept of personnel management consists in increasing the role of the employee’s personality, in the need to take into account his motivational attitudes, to be able to direct them to solve the company’s tasks [12].

A. Vdovichen, V. Chychun and H. Polianko in the course of the study established that today the main obstacle, due to which it is not possible to effectively apply modern management principles at enterprises, lies primarily in the uncertainty and vagueness of the development strategy, which provides for the long-term planning of the activities of enterprises [13].



Studies prove that the application of modern principles of personnel management at enterprises contributes to the growth of economic results of activities and increase of their competitiveness. Nevertheless, the topic of developing the principles of personnel management does not lose its relevance.

### ASPECTS OF PERSONNEL MANAGEMENT TRANSFORMATION IN THE MODERN MANAGEMENT SYSTEM

In modern conditions, when applied management practices are decisive for the successful functioning and implementation of the development strategy of corporations, organizations and firms, the problems of identifying and analyzing characteristic trends in the field of building modern management systems become extremely relevant. Ignoring such trends in the long term can lead to a significant weakening of competitive and reputational positions. At the same time, the timely development of models of the personnel management system, the development of management mechanisms taking into account the requirements of the time allows to increase the efficiency of the functioning of corporations, enterprises, organizations and firms and adequately respond to modern challenges. The paradigm features that offered in the management of personal in modern enterprises are the following: the systematic approach to the personal management in enterprises provides a unified approach, principles, objectives, functions and organizational structure, the systematic approach to the personal management [14].

In the philosophy of management, in its original understanding, the human resource, its components, which, in turn, are contained in each employee of the organization, are presented in the form of a certain asset or capital of the enterprise. It is to such a resource that it is necessary to treat it carefully and to increase it, which allows to achieve strategically important and priority economic goals. Thus, such a resource contributes to the proper functioning of any organization, helps to strengthen its position on the market. In this regard, personnel management is the main basis of a proper management system. Without a rationally functioning personnel policy system, it is impossible to exist in the labor market, to achieve the tasks set by the management of the organization.

Taking into account the above, it should be noted that there is an urgent need to develop innovative approaches to personnel management, since modern realities dictate new needs in the management environment. In addition, despite close attention to the problem of personnel management, it can be argued that the methods and tools of the personnel management system developed in domestic and Western literature are insufficient, since most of them are developed without taking into account modern requirements, which include the complete modernization of all spheres of life. humanity At the same time, it is worth paying attention to the fact that the current market uncertainty in the world contributes to the formation of new approaches to personnel policy in general. In addition, the fundamental works of theoretical scientists, which were devoted to the ideas of personnel management, eventually become old and less significant in terms of applied value [6].

Along with this, it is noted that modern personnel management and the entire personnel policy as a whole has

a significant improvement, has fundamental and applied principles, continues to dynamically change in connection with objective realities, and the vector of development is determined taking into account current global and domestic trends, as well as manifestations of individual, "point" factors of socio-economic, geographical, political significance. It should be noted that the modern transformation of the labor market has a number of features, namely: the modern worker has ceased to be a tool for achieving the goals of organizations or the state; the modern employee is the goal of the organization to achieve well-being, balance, economic and organizational stability in general. In this regard, the human factor is one of the key factors in the economic development of any enterprise, and not a materialistic model that indicates that an employee is a tool.

The authors defined and formulated actual tasks that determine the directions of transformation of modern management in the conditions of the digital economy:

- preservation of organizational culture;
- provision of comfortable services for the use of digital technologies to the staff;
- activation of the involvement of employees in remote work;
- increase of staff loyalty and satisfaction;
- maintaining a favorable atmosphere in the organization;
- formation of new norms and rules of interaction between employees and employers;
- increasing orientation towards the final result;
- application of methods of remote training of employees;
- differentiation of remuneration;
- the need for continuous training;
- use of educational tracks;
- unification of approaches to personnel management;
- use of personnel services system;
- creating a modern personnel policy.

The pandemic and digital transformation are processes with a long-term transformative effect that have led to certain changes in modern management, business culture and work style. The fact that these changes are occurring simultaneously, in all industries, indicates their inevitability and significant potential. Companies forced to look for solutions go through the process of transformation through trial and error [15]. The pandemic has underscored the need for a better understanding of how work situations affect employee behavior and behavior. It exposes the tensions between stakeholders and highlights the need to consider employees, customers, communities, etc. in addition to shareholders [16]. From an HR perspective, digital transformation means attracting employees with digital and analytical skills who can replace the existing workforce. One key challenge for incumbents is to compete for talent with these skills with new digital entrants [17].

The main trends in the transformation of modern management in the personnel management system can be reduced to the following points: the hiring system has changed; remote control methods are increasingly used; the need for mental work increases; the system of "manager-employee" relations is being transformed; incentives and priorities are changing; traditional management methods have been abandoned. This process requires not only technical knowledge, but also an understanding of the fundamental principles of building next-generation assets that can support and develop innovative business models [18].



Attention should be paid to the fact that the transformation of modern management in the conditions of the digital economy does not do without changes in social and labor relations, since they are the main determinant of modern management.

A new feature of social and labor relations includes different levels of decision-making in the management of employees. As a rule, in the modern era, large companies are monopolists in a certain industry, implementing a policy of social protection of their personnel to solve problems, achieve cultural and other values, and establish harmonious relations.

At the same time, the value of moral, ethical and material incentives is increasing, the motivational characteristics of the employee are increasing, the need for effective and high-quality management is increasing, the systems of personnel participation in the management of the enterprise, its capital, and profit are changing. It is necessary to pay attention to the fact that any relationship in the field of work contains a large number of its participants, processes and connections.

Personnel management in the modern management system is one of the most important parts of the system, because in the organizational plan, personnel management covers all employees and all structural units in the organization that are responsible for personnel work. The personnel of any business entity, as an internal factor and internal environment of changes, is actually an internal aspect and an internal source, and its essence is that changes in the business entity's activities are carried out without external influence. Internal factors, the strength and extent of which depend on the level of quality of employees, their role in the overall management system, the possibility of achieving personal and professional competence [19]. The structure of modern management takes into account the interrelationship of all aspects of personnel management, which is reflected in the formulation of final goals, the determination of methods of achieving goals, and the establishment of appropriate management mechanisms.

That is, personnel management in modern management systems is more about practical actions than conceptual procedures and rules. On the basis of the theoretical base of the modern organization management system, a set of methods and procedures of the personnel management process, including the influence of the organization on employees, can be identified for the maximum use of the potential of employees. For this, organizations have

developed a management system, a conceptual set of principles for working with people, and consistent adherence to these principles helps ensure the organization of competitive people, taking into account the interests of employers and employees. A modern management system should be based on the principles of personnel management, which are implemented by defining and performing specific functions and tasks, which are distributed among structural units and individual performers.

The personnel of the enterprise is constantly highly dependent on the conditions and factors of the external environment. Personnel management and personnel policy, industrial labor discipline, employee incentive system and other principles affect the enterprise. Personnel depends on external circumstances: labor market conditions, state regulation, quality of life, level of education and other socio-economic conditions. The principles of management ensure the implementation of the company's management strategy and ensure the adjustment of the goals and tasks of personnel management, taking into account the above changes [20]. The principles of personnel management reflect the requirements of objective and effective economic laws and regularities and are therefore objective, but in any case, personnel management is carried out in accordance with the principles traditionally established in domestic organizations: scientificity, democratic centralism, planning, first-person, unity of management; recruitment and placement of personnel; combinations of single leadership and collegiality, centralization and decentralization; linear, functional and target management [21].

Research on changing the principles of personnel management suggests that they are very diverse and have a multi-level structure. The list of general principles of management, developed by different authors, varies depending on the specific scientific approach determined by the subject, goal and task of the research.

The principles on which the personnel management system is based also need to be transformed, constantly updated and refined, as the market environment in which national enterprises operate and the system of modern management are constantly changing.

Such a situation dictates the existence of various organizational principles of management (Table 1), which are aimed at regulating internal relations between the controlling system and the controlled system, as well as internal relations based on established rules and norms.

**Table 1.** General and organizational principles of management

General management principles		Organizational management principles	
Representative	Management principles	Representative	Management principles
O. Antonyuk [22]	Objectivity (scientific); systematicity; efficiency; optimality; planning; purposefulness; legal protection of management decisions; integrity of the management system.	A. Fayol [5]	Division of labor and power (responsibility); discipline; unified leadership; single leadership; personal interests subordinated to general interests; remuneration of the employee; centralization; scalar chain; command; justice; stability of the employee's workplace; protection of interests; corporate spirit.
G. Osovska [23]	Purposefulness; planning; authority; discipline; stimulation; hierarchy.	O. Antonyuk [22]	Single ownership; hierarchy; compliance of the organization and its employees; specialization; scalar chain; levels of authority; sphere of control; decentralization

Table 1, Continued

General management principles		Organizational management principles	
Representative	Management principles	Representative	Management principles
M. Martynenko [24]	Interdependence; dynamic balance; economy; scientific validity of management practice; efficiency; optimality; constant improvement of management processes and methods; planning; agreement of goals; integrity of the management system; flexibility of the organizational structure.	F. Khmil [25]	Functional definition; scalarness; level of authority; single leadership; parity of powers and responsibilities; delegation of authority; control range; direct management; compliance of tasks.

The general principles of personnel management are universal and affect all areas of management.

The analysis of existing methods of classification of personnel management principles allows to identify the most effective groups of modern management principles. The first group includes the principles of engineering management [26]:

- the principle of purposefulness (distribution of responsibility or collective responsibility; reward for achieving goals; clarity of goals and objectives);
- principles of activity coordination (reasonable disciplinary requirements; unity of management and cooperation; systematicity and planning; coordination of interests or prioritization of certain interests, for example, the interests of consumers; hierarchy of powers and responsibilities; compliance with codes of conduct; rational communication);
- principles of ensuring the efficiency of activity (optimal division of labor and specialization; economy; optimal combination of centralization and decentralization; professionalism and its constant improvement).

The second group includes the principles of influencing the behavior of employees:

- principles of activity activation (motivation, responsibility, creation of a favorable atmosphere);
- principles of ensuring job satisfaction (fairness, loyalty to employees, honesty and trust in people).

The third group includes the principles of social orientation of management:

- principles of entrepreneurship;
- principles of business ethics;
- the principle of continuous improvement of management (management innovations);
- scientific principles;
- the principle of timely response to changes in the external environment.

Personnel management basically implements the following modern principles [27]:

- principles of scientificity, democratic centralism, planning, priority, unity, management;
- principles of selection, hiring and placement of personnel;
- the principle of combining unitary leadership with cooperation, centralization and decentralization;
- principles of linear, functional and target management;
- principles of control over the implementation of decisions, etc.;
- the principle of delegation of authority and responsibility;
- trust in employees combined with performance review.

Each of these principles should be ensured when implementing a personnel management system in terms of examining the nature of each generation's behavior and aspirations. The formation of corporate culture principles

occurs at the intersection of the concepts of “business” and “ethics”, and finding a balance or equivalence between these concepts provides employee motivation for productive work as well as the performance of companies, institutions and organizations. [28].

The use of these principles as a complex determines the full use of modern personnel technologies in a real situation. Principles, thus, are a means of adapting theoretical constructions to the specific characteristics of certain activities of the firm. The principles, thus, are a means of adapting theoretical constructions to the specific characteristics of the specific activity of a specific enterprise.

However, it is worth adding that the above principles of personnel management should be adjusted and refined, as they cannot be applied in the conditions of a dynamically developing digital economy and society.

### FORMATION OF PERSONNEL MANAGEMENT PRINCIPLES TAKING INTO ACCOUNT THEIR TRANSFORMATION

In the digital economy, a condition for effective human activity is the development of management tools that provide real socio-economic returns [29].

Digitization of personnel management today is an important factor in the effectiveness of almost every organization. Along with this, it should be noted that although digitization in any field contributes to cost reduction, optimization of business processes, aggregation of a large database, which are indisputable advantages, but there are some areas in HR that cannot be fully automated. First of all, these are the psychological aspects of work: the formation of organizational culture and the formation of the morale of personnel in the work team [30].

The transformation of the principles of personnel management should be understood as a qualitative change in the practical principles and systems of methods that form the mechanism of personnel management in specific conditions.

It should be noted that the transformation of personnel management principles primarily consists in changing conceptual approaches as such. In this aspect, the following approaches are gradually applied: economic, organic and humanistic. The economic approach gives rise to the concept of the use of labor resources. In this approach, the technical training of business personnel, rather than management training, takes the leading place. The organic approach marks a new perspective on personnel management, going beyond traditional labor organization and payroll functions.

The transformation of the principles of personnel management consists in changing the attitude towards a person as a subject of labor activity. Therefore, within the

framework of the transformation of principles, a person should be considered from two points of view:

- as a resource of the production system (labour, human, human) – an important element of the production and management process;
- as a person, with needs, motives, values, relationships, which is the main subject of management.

In modern management, where the contribution of physical assets to creating and maintaining competitive advantage is steadily declining, the ability of human capital to initiate, implement, perceive, and use new technologies is critical to a company’s competitive advantage [31]. As a result, the importance of knowledge technology, which is a component of technology itself, is increasing. Note that the ability of a company’s management system to learn faster than others from the experience of change becomes a strategic direction for creating competitive advantage.

Due to the peculiarities of the modern business environment, predictability is limited. However, the loss of forecasting and planning skills can be compensated for by adaptability. New technologies bring a certain amount of flexibility and new possibilities to workplace design. Technology is becoming an organizational element itself, influencing the nature of work and how it is implemented [32]. At the basic level of human resource management, techniques formalized by organizational and technical internal normative documents form the necessary state of objects and management processes, thereby providing opportunities for implementing system monitoring of objects and processes. produces Technology ensures the orderliness and

stability of processes and forms the capacity for high-quality processes and work performance [33]. A tool for improving management efficiency based on the transformation of operational business models to digital technologies due to: optimization of business processes and cost reduction at all levels; rational use of available opportunities and infrastructure; digitization and modernization of the entire value chain for digital technologies and modernization.

However, in order to effectively use the digitalization of modern management, the subject must constantly implement new technologies, test them and use the results obtained for better adaptation and preparation for future tasks. Although introducing new technologies is riskier than using already familiar systems and equipment, the potential opportunities and rewards will be greater [34].

For the successful transformation of personnel management in the modern management system, corporate functions that are consistently aimed at digital changes and interact synergistically in this regard are needed. Human resource management is also problematic and must critically evaluate its own products, services, processes and structures and use new technologies to further develop them. Personnel management performs an important function for the entire transformation process by (co)initiating and purposefully managing the change in corporate culture [35].

Based on the determination of the impact of digitalization of the economy on the modern management system, the authors formed the following principles of personnel management in companies and business structures, taking into account their transformation (Fig. 1).



Figure 1. A set of basic and additional principles of personnel management

Source: compiled by the authors

The given set of basic and additional principles of personnel management, taking into account the transformation of modern management, fully reflects the content and tasks of the digital transformation process, and also fully illustrates the key requirements for building a modern digital management system.

The principles considered above are, of course, general, so in each specific case it is advisable to supplement them with certain details, based on the operational subtleties of the functioning of a separate organization. The significance and importance of the transformation of personnel management principles depends on the characteristics of the independent modern management system and the state of the external environment, which tends to change over time.

## CONCLUSIONS

Studying modern aspects of the transformation of the principles of personnel management and modern approaches to the formation of organizational structures of modern personnel management, it can be concluded that in the modern science and practice of personnel management there is a process of constant improvement, renewal and search for new methods, approaches and ideas in the field of personnel management as a key and strategic resource of business organizations, companies, enterprises and business structures. The prospects of the digital economy certainly require the use

of improved principles of personnel management. The key to success is the formation of an appropriate human resource.

The outlined set of basic and additional principles of personnel management, taking into account the transformation in modern management, which most fully reflects the content and tasks of the digital transformation process, as well as fully describes the key requirements for building a modern digital management system, can become the basis for the formation of effective models of the modern management system.

Theoretical significance of the research lies in the proposal of the principles of personnel management, which are determined on the basis of the impact of digitalization of the economy on the modern management system, taking into account their transformation, which makes it possible to most fully reflect the content and tasks of the digitalization process and fully describes the key requirements for building a modern digital management system. The directions of the transformation of modern management in the conditions of the digital economy are outlined and the circumstances that led to changes in modern management, business culture and work style are determined.

As part of future research, it is worth investigating the issue of introducing transformed principles of personnel management into the organizational process of enterprises and organizations.

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**Галина Валентинівна Назарова, Вікторія Олександрівна Руденко,  
Рустам Ібрагімович Урдуханов, Петро Петрович Хоменко**

Харківський національний економічний університет імені Семена Кузнеця  
61166, пр. Науки, 9А, м. Харків, Україна

## **Трансформація принципів управління персоналом в сучасному менеджменті**

**Анотація.** Вплив розвитку цифрових технологій у сфері менеджменту визначає актуальність дослідження трансформації принципів управління персоналом. Метою дослідження було обґрунтування зміни принципів управління персоналом в умовах цифрової економіки, що в перспективі призведе до зміни моделей управління персоналом в сучасній системі менеджменту. Як методичні засоби досягнення мети використовуються комплексний аналіз, методи синтезу, індукції, дедукції, експертне дослідження з використанням інформаційно-комунікаційних технологій. Визначено та сформульовано актуальні завдання, що визначають напрями трансформації сучасного менеджменту в умовах цифрової економіки. Проаналізовано наявні підходи до класифікації принципів управління персоналом, що дає змогу виділити групи найбільш ефективних сучасних принципів управління. Принципи, на яких базується система управління персоналом, вимагають трансформації, постійного оновлення та вдосконалення, оскільки ринкове середовище, в якому працюють національні підприємства, і система сучасного менеджменту постійно змінюються. Визначено аспекти трансформації управління персоналом у системі сучасного менеджменту, що дозволить отримати інформацію про зміну системи практичних принципових підходів до формування механізму управління персоналом у конкретних умовах. Сформовано принципи управління персоналом з урахуванням їх трансформації на основі визначення впливу цифровізації економіки на систему сучасного менеджменту. Окреслений набір принципів управління персоналом найбільш повно відображає зміст і завдання процесу цифрової трансформації та повно описує ключові вимоги до побудови сучасної цифрової системи управління. Практичне значення дослідження полягає в розробці принципів управління персоналом, які будуть визначені на основі впливу цифровізації економіки на сучасну систему управління з урахуванням їх трансформації, що дозволяє найбільш повно відобразити зміст і завдання процесу цифровізації та повністю описує ключові вимоги до побудови сучасної цифрової системи управління

**Ключові слова:** принципи менеджменту, управління людськими ресурсами, система сучасного менеджменту, цифровізація, цифрова економіка

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E-mail: [info@ecdev.com.ua](mailto:info@ecdev.com.ua)  
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