

FACTORS AND DETERMINANTS OF THE DEVELOPMENT OF HUMAN CAPITAL IN RURAL AREAS IN THE CONDITIONS OF GLOBAL CHALLENGES

**Oleksandr Demchenko¹, Nataliya Basiurkina¹, Nazariy Popadynets², Sofia Minenko³,
Kateryna Sokoliuk¹**

Received 10.03.2023

Sent to review 23.03.2023.

Accepted 05.09.2023.

Original article



¹ Odesa National University of Technology, Odesa, Ukraine

² Lviv Polytechnic National University, Lviv, Ukraine

³ State Biotechnology University, Kharkiv, Ukraine

Corresponding Author:
Sofia Minenko

Email: minenko.sofi@gmail.com

JEL Classification: E24, J24, R51

Doi: 10.2478/eoik-2023-0026

UDK: 005.936.43:631.1(4-664)

ABSTRACT

The development of rural areas is a complex and dynamic phenomenon, the effectiveness of which depends on food security and the economic activity of the population. The urgency of these issues is exacerbated by unprecedented challenges for Ukraine and the transformation of the legal field under martial law. The study aims to determine the factors and determinants of the development of human capital in rural areas in Ukraine, considering the experience of the EU countries in the conditions of global challenges. It is substantiated that the policy adopted in the state to ensure the development of rural areas based on the principles of inclusiveness should be based on balanced instruments, methods, and levers capable of minimizing external and internal threats to agribusiness. Essentially, people's opportunities and abilities for economic and social activities, as well as for their own development, are critical. It has been proven that the determining factor in this process should be human capital. The motivation for economic activity in the village is singled out from personal factors. In its absence, all prerequisites for urbanization are formed. In this context, the upward dynamics of the indicator of the share of the urban population in the EU countries, which can become an obstacle to the development of business in rural areas, was analyzed and revealed. Attention is paid to the prospects of small businesses in rural areas. The relationship between the urbanization indicator and the human development index in Ukraine and the EU countries was studied.

Keywords: *human capital, rural areas, global challenges, inclusive development, determinants of development*

1. INTRODUCTION

Developing rural areas worldwide and Ukrainian practice is becoming a key parameter in state policy. Foreign countries, particularly the EU, are focused on progressive changes in agriculture and its differentiation, the formation of drivers, and sources of investment. In most countries, agriculture has become a strategic branch of the economy, which satisfies the food program, forms the budget, and brings foreign exchange earnings from exports. And although in developed countries, the share of agriculture in GDP is not significant (up to 3%), this industry is of strategic importance for developing other industries: chemical, processing, and energy industry, as well as trade, tourism, etc.

Among the main reasons that determine the different levels of development of rural areas are: other trends of economic growth, incomes of rural families; economic inequality; lack of equal and fair access of agricultural producers and residents of rural areas to investments (Calicioglu, et al., 2019).

Modern agriculture is focused on productive manufacturing, as well as on the multifunctional development of rural areas. Regional concepts in different countries have their differences, but, as a rule, they put forward similar goals: environmental protection, socio-economic effects, rural revitalization, employment, cultural heritage, etc.

The vital sphere of ensuring the sustainable development of rural areas under transformational conditions is measured to intensify investment activity. The issue of creating a favorable investment climate in rural areas is a complex one that requires state regulation. Such a policy for developing tools for activating investment processes is closely related to the level of risk and human capital.

Suppose the level of investment risk is determined by the state of the economy and the state's monetary policy. In that case, it is more predictable from the point of view of financial analytics. Evaluating human capital is a rather complex and multifaceted procedure, especially in the context of individual territories (rural territories). Scientists study individual components of human capital and the factors that influence them (Ballatore et al., 2019; Yang et al., 2017), analyze the meaningful features of closely related concepts (labor resources, labor potential, human potential, human capital) and their connection (Fraumeni, 2008; Goldin et al., 2020). During such an analysis, all conclusions converged on the fact that society's educational, intellectual, and creative component is a decisive factor in the region's economic growth and a source of income formation for a specific individual, enterprise, and state. Furthermore, the environment acts as a factor in human potential. In contrast, the same climate is renewed in the form of an increase in the educational, professional, technical, and cultural levels of the population of the rural area. Certain features are imposed on the formation of human capital by the trends towards digitalization of the economy, namely on the process of its intellectualization (Arefieva et al., 2019).

Therefore, human capital is a part of human potential, which turns into an asset because of inclusion in labor activity and allows one to obtain planned economic and social effects. We understand the human capital of rural areas as having the ability to form, renew, develop, and improve, i.e., it is not a constant but a dynamic characteristic. It is a controlled value that changes under the influence of the actions of the state and man, the management of which must be provided, considering specific determinants of development. Human capital has spatial and temporal characteristics, and its size is the result of investment and accumulation. One of the influencing factors is income level, which can be reinvested in further development by acquiring additional knowledge, qualifications, and relevant skills. The story of the country and the quality of life and income of citizens are affected by so many factors that it is often difficult to identify the critical elements among them. The selection of appropriate criteria for analyzing human capital and developing rural areas is also an equally complex process; the quality depends on correctly identifying factors and determinants, considering the global challenges nowadays.

2. LITERATURE REVIEW

Separate issues of analysis of the influence of social and economic factors on the possibilities of ensuring human development in certain countries and their regions have become the object of active scientific discussions in many works of scientists and international institutions.

For a long time, the level of human development has been a primary indicator that forms the basis of identifying problems, fundamental contradictions, and measures to adjust the state policy of the socioeconomic development of the world's countries.

Modern challenges for rural areas are mostly reflected in the decrease in the quality of essential services, the trend of depopulation, increased vulnerability to external shocks (Kachniewska, 2015), the formation of concrete, specific requirements of rural areas (Zavratnik et al., 2019). Accumulating, they exacerbate existing discontent in their communities.

When considering options for ensuring the social and economic development of rural areas, researchers also rely on the concept of an intelligent village (Zavratnik et al., 2019), whereby the presence of internal advantages becomes essential as a guarantee of accelerating the potential development (Nieto et al., 2019) of a particular territory. The applicability of such an approach requires certain digital transformations in the country as a whole and in rural areas. In practice, digital exclusion risks are associated with spatial factors (territories without Internet access, weak connection) and social factors (age, level of education, financial capacity). Anastasiou et al. (2021) confirm that rural areas often suffer from poor network infrastructure, which limits access to information and services aimed at socioeconomic growth. But there are other reasons to suspend the case; when developing the list and content of digital services, local knowledge, and needs should be considered.

Karachyna et al. (2020) see the effectiveness of territorial branding as the source of the development of rural areas, which can be formed primarily through the activities of local self-government bodies of rural communities, public organizations, and universities. Also, the regulatory policy conducted under decentralization becomes essential for such purposes. The study of the relationship between the level of human development and institutional quality is presented in the work of Stryzhak et al. (2022), which proved that most countries with high governance quality also have a high human development index.

In today's conditions, more and more countries are considering further development of the "green" economy (Soderholm et al., 2020) and innovations related to implementing circular economy principles at agricultural enterprises as a priority direction of farming investments.

Some authors, in the results of their research, emphasize the need for human development through knowledge management and programming training (Akimov et al., 2021; Samoliuk et al., 2021), as well as regulation of the employment sphere and provision of fair incomes (Kolluru et al., 2021), which is relevant for many countries of the world, in particular Ukraine, which did not have time to recover from the pandemic and is suffering from military aggression. In such difficult conditions, the problems of urbanization, low digital literacy, and the low image of rural residents became more acute.

No matter what detailed measures are developed in theory, in practice, it is challenging to implement them and achieve the established goals of human development of rural areas without considering the territorial specificity caused by the relevant cultural traditions, climatic conditions, soil conditions, and legislative regulation. The European Union is an exciting and unique example of regional economic integration and standard agricultural policy. The impact of the provisions and features of implementing the Community Agrarian Policy (CAP) on rural development (Spasojević et al., 2017) is under consideration, and it is also emphasized that agriculture has the highest costs to the regional budget. It is distinguished by its focus on developing rural areas and its predominant cooperation with other sectors and politics. Although

agriculture and human development in rural regions constantly interact, this policy is criticized for its territorial approach and subsidies for rural development (Topić et al., 2016).

Ballatore et al. (2019) wrote about the peculiarities of human capital in urban and rural areas (using the example of Italy), citing population mobility as a crucial factor in the gap between these levels of human capital. Youth migration depends on the conditions and availability of offers on the labor market, housing prices, and the availability of human capital in a particular area.

The dependence of human capital development on investments in education, health care, and infrastructure is also observed. Also, among the factors affecting human capital, scientists single out the mechanisms of state policy to correct the differences between the working conditions of women and men and prove the importance of investing in human capital (Mora et al., 2016). The analysis of the nature of the impact of inequality in human capital investment on the urban-rural income gap (Yang et al., 2017) is of scientific interest. In this aspect, there are also inequalities in the involvement of individual territories in innovation and investment development programs initiated by the countries' authorities.

3. AIM OF THE RESEARCH

The study aims to determine the factors and determinants of the development of human capital in rural areas in Ukraine, considering the experience of the EU countries under the conditions of global challenges.

4. METHODS

Theoretical materials for writing the article were data obtained based on generalizations of scientific literature on human capital development. The research information base was supplemented with data from international organizations and specialized expert agencies of Ukraine. Some results of the conducted research, the author's developments, and recommendations are presented using a graphic visualization method. In writing the article, a set of general scientific (analysis and synthesis, abstraction, and systematization) and specific economic research methods (monographic, economic-statistical, economic-mathematical) were also used.

Discriminant analysis was used to substantiate the list of factors and test the hypothesis regarding the degree of their influence on human development. It is a method of economic-mathematical modeling, during which a function or several of them are determined, which can classify a phenomenon considering several discriminating variables and the probability of each typed object belonging to the corresponding group (Tabachnick et al., 1989).

The general description of this function should be presented as follows:

$$y_l = a_{l1}X_1 + \dots + a_{lp}X_p + a_{l0} \quad (1)$$

$$y_m = a_{m1}X_1 + \dots + a_{mp}X_p + a_{m0} \quad (2)$$

The dependent variable y represents specific scores as linear functions of other discriminant variables (x) and several parameters (a).

The specified combinations are designed to determine the most significant difference between groups and to minimize the difference within groups.

Discriminant analysis refers to classification groups with prior training. Unlike, for example, cluster analysis, when preliminary classifications of potential groups within the set are not specified, within the framework of discriminant analysis, it is assumed that the assignment of a specific object to a group that is most often characterized by a qualitative value already exists, based on which the analysis is carried out.

In the general case, the problem of discrimination is presented as follows: let the result of observing objects be the realization of a k -dimensional random vector $x = (x_1, x_2, \dots, x_k)^T$. It is necessary to define a rule according to which, according to the observed value of the vector x , the object belongs to one of the possible sets $\varphi_i, i = 1, 2, \dots, l$.

To construct a discrimination rule, the entire sample space of vector values is divided into areas $R_i, i = 1, 2, \dots, l$ in such a way that with the removal of x from R_i , the object belongs to the set φ_i .

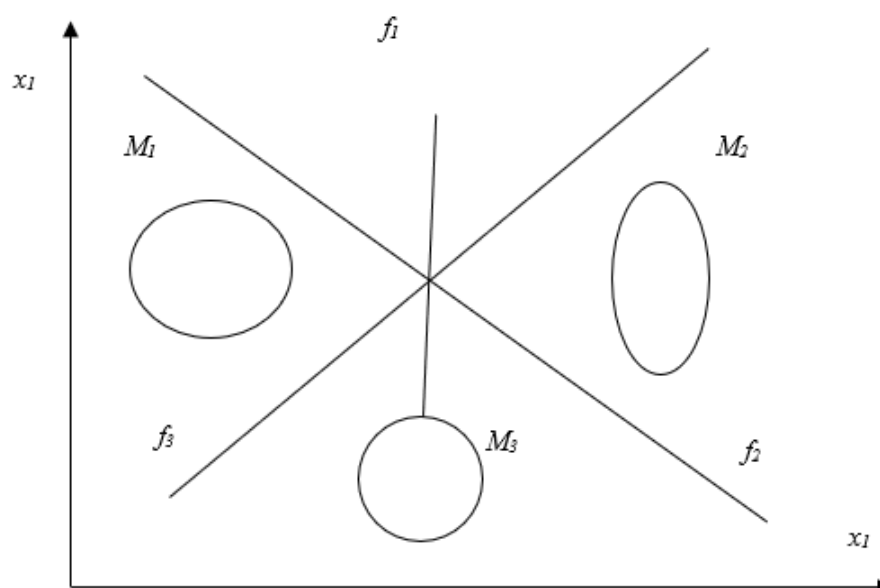
The discrimination rule is chosen according to some principle of optimality based on a priori information. The latter can be presented as information about the functions of the k -dimensional distribution of features in each set and the state of samples from these sets. Prior probabilities may or may not be given (Klebanova, Hur'ianova, Chahovets', Panasenko, Serhiienko, Yatsenko, 2020).

Distribution information is represented by samples. The discrimination problem involves: let $x_1^i, \dots, x_j^i, \dots, x_n^i$ be a sample from the set $\varphi_i, i = 1, 2, \dots, l$, where each j -object is represented by a k -dimensional vector of discriminant variables $x_j^i = (x_{j1}^i, \dots, x_{jq}^i, \dots, x_{jk}^i)^T, x_j^i = x_{j1}^i, \dots, x_{jq}^i, \dots, x_{jk}^i$. (Klebanova, Hur'ianova, Chahovets', Panasenko, Serhiienko, Yatsenko, 2020).

As a result of the analysis based on the definition of the discrimination function, it is possible to assign a new observation to one of the selected groups.

One of the primary tasks of discriminant analysis is determining the number of classification groups. The geometric interpretation of three samples is presented in Fig. 1.

Figure 1. Discriminant functions for three samples



Source: created by the authors

Our study will divide the sample into three groups, so we rely on such a classification. Thus, it is planned to include nine indicators in the analysis; then, we will assume that nine variables characterize each object: $x_1, \dots, x_9$.

The coefficients of the discriminant function are determined in such a way that these functions differ from each other as much as possible so that the three classes have the maximum expression (Soshnykova, Tamashevych, Uebe, Sheffer, 1999):

$$\bar{f}_1(x) - \bar{f}_2(x) = \sum_{i=1}^{n_1} a_1 x_{1i} - \sum_{i=1}^{n_2} a_1 x_{2i} - \sum_{i=1}^{n_3} a_1 x_{3i} \quad (3)$$

then we should write:

$$f_{kt}(x) - \bar{f}_k(x) = a_1(x_{1kt} - \bar{x}_{1k}) + a_2(x_{2kt} - \bar{x}_{2k}) + \dots + a_9(x_{9kt} - \bar{x}_{9k}) \quad (4)$$

where k – is the group number.

It is advisable to use the standardized coefficients of the discriminant function to estimate the contribution of a separate variable to the value of the discriminant function:

$$b_j = a_j \sqrt{\frac{w_{jj}}{p-m}} \quad (5)$$

where, p – is the total number of output variables;

m – is the number of groups;

W_{ij} – is the number of objects in the class.

$$W_{jj} = \sum_{k=1}^m \sum_{i=1}^{n_k} (x_{ikj} - \bar{x}_{kj}) (x_{ikj} - \bar{x}_{kj}) \quad (6)$$

where, i – is the observation number;

j – the variable number;

k – the class number;

n_k – is the number of objects in k -class.

Standardized coefficients are used in cases where it is necessary to determine which of the variables contributes the most to the size of the discriminant function (Soshnykova, Tamashevych, Uebe, Sheffer, 1999).

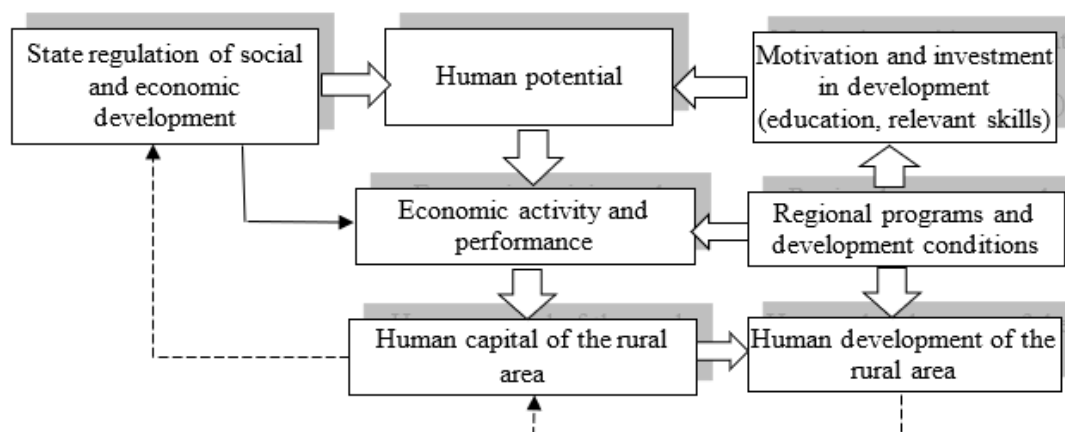
The conclusions of the conducted research were formulated using the methods of abstract specification, generalization, and synthesis of the obtained results.

customer churn modeling Results

Under the conditions of modern global challenges, the development of rural areas should be considered a complex and dynamic phenomenon, the effectiveness of which depends on food security and the population's economic activity. The urgency of these issues is exacerbated by unprecedented challenges for Ukraine and the transformation of the legal field under martial law. Agriculture has become a traditional type of economic activity in the Ukraine countryside, providing employment, income, and agricultural products even under the conditions of the existing military conflict. Due to the development of rural areas, the prerequisites for the formation and restoration of human capital appear, which will contribute to the strengthening of the economic activity of the rural population. Thus, there is a mutually determining relationship between human capital and the development of rural areas, which indicates the similarity of the factors influencing them.

What affects the development of human capital in rural areas? Opportunities and abilities for economic and social activity, as well as for personal growth, are crucial. Favorable conditions for self-development and entrepreneurial training and triggers of the external environment should coincide in the countryside. Such triggers can be state support programs, foreign investments, and economic mechanisms of interest. The process of human capital formation in the rural area is visualized in Fig. 2.

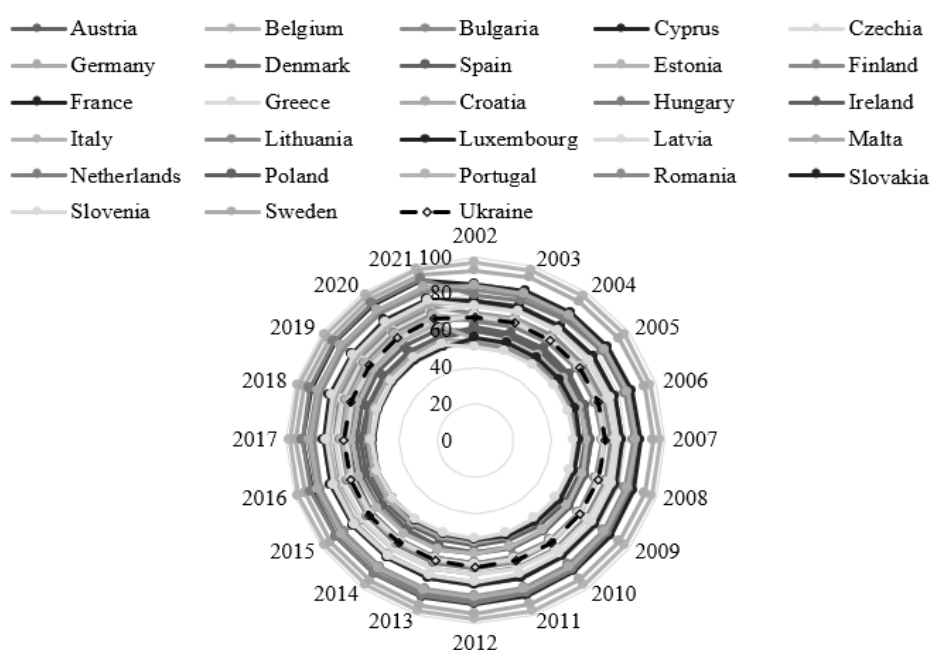
Figure 2. The process of human capital formation in rural areas



Source: created by the authors

As a rule, the state's influence is related to regulating the business environment, educational activities, adjustment of foreign economic policy, and digital transformations. As for the personal, it is people's motivation for economic activity and investments in self-development. If there is no such motivation, then all the prerequisites for urbanization are formed. It is this phenomenon that hinders the development of business in rural areas. The dynamics of the urban population indicator across EU countries (27) for the period 2002-2021 is shown in Fig. 3. also, information about Ukraine is present on the diagram for comparison.

Figure 3. Urban population dynamics in EU countries (% of total population)



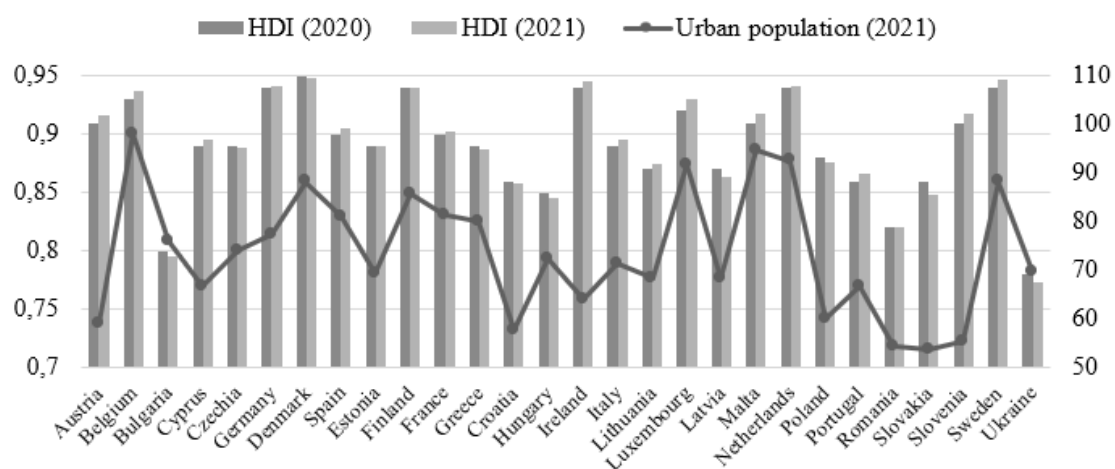
Source: constructed by the authors from the data WORLD Bank

European Union proves that almost all countries either maintain a high level of urbanization for a long time or gradually increase it. The only exceptions were Slovenia and Sweden. Belgium (98%), Malta (95%), the Netherlands (93%), and Luxembourg (92%) have the highest shares of the urban population in 2021. The lowest are Romania (54%), Slovakia (54%), Slovenia (55%), Croatia (58%), and Austria (59%).

When analyzing the significant trends of urbanization, one should also consider the availability of conditions for conducting agriculture and the development of certain types of activities that are characteristic of countries. Thus, in the EU countries, farms are mainly producers of agro-industrial products. Eurostat says the most significant land holdings are in Denmark, France, Sweden, Germany, Italy, Belgium, and Greece. By the way, there is a trend towards an annual reduction in the number of farms in these countries. The biggest problems are costs and changes in climatic conditions, the unfavorable indicators of which reduce the efficiency and predictability of agribusiness. The characteristic feature of the development of farming in these countries is the focus exclusively on meeting food needs. Among the countries of the European Union, an important place in the production of agricultural products (products of animal origin) per capita, according to Eurostat, belongs to Denmark. In total, agricultural land accounts for 40% of all EU land at a time when agriculture has a significant impact on the natural environment in Europe.

As has already been mentioned, the development of rural areas is significantly influenced by human capital. Therefore, it is considered appropriate to overview the human development index achieved in the EU countries and Ukraine (Fig. 4).

Figure 4. The relation between the urbanization indicator and the human development index



Source: constructed by the authors from the data WORLD Bank; Human Development Reports

As shown in Fig. 4, the EU countries have a relatively high human development index (HDI) level. Denmark (0.95), Netherlands (0.94), Sweden (0.94), Germany (0.94), Belgium (0.93), and Malta (0.91) have the highest index. Moreover, in these countries, the indicators of the share of the urban population are also high. The exceptions are Ireland, which has an HDI of 0.94, with 64% of the urban population, and Austria and Slovenia, with high human development (0.91) and a low EU level of urbanization (58% and 55%, respectively).

To assess the level of influence of certain factors of the agricultural business environment on the development of human capital of enterprises in rural areas of Ukraine, available data for 170 countries of the world for 2021 were analyzed (Source: EUROSTAT, WORLD Bank, World Trade Organization, State Statistics Service of Ukraine).

The raw data for the analysis were chosen based on the following reasoning. A person, in the presence of organizational and legal conditions in the country and a separate territory, can form motives and opportunities to invest in one's human capital. The following indicators were taken as initial data:

Urban population (% of the total population).

Human freedom.

Index of social progress to reflect such factors in the model.

Economic activity can be determined through the level of employment (%). The possibilities of access to services and information will be reflected through the rating of digital competitiveness.

For many years, the agricultural business has remained one of the most profitable in rural areas. Therefore, its results will be considered in the simulation. Development prospects and the availability of sales markets will be explored by exporting agricultural products per person. Since the strategic goal of any business is the maximization of added value, it will be interesting to study indicators of added value (% of GDP) in the sphere of production and services. The human development index (HDI) is taken as the dependent indicator.

It is necessary to decide on the grouping of the resulting variable (a priori classification) to determine the impact of the nine considered variables on the degree of distribution of the resulting variable. We chose the value of the human development index as the resulting variable. The type was carried out based on assigning the level of the human capital index of an individual country to the interval value between the minimum and maximum value, divided into three groups. Thus, it was determined that the highest level of group A includes countries with the following values: [0.962; 0.775), the average level is group B: [0.775; 0.587), and the low level is group C: [0.587; 0.400].

The following were recognized as independent variables that, according to the hypothesis, can influence the value of the result: the share of the urban population in the total population, the percentage of export of agricultural products per inhabitant of the country, the index of human freedom, the level of employment, the index of social progress, the rating of digital CSP, the share of services in GDP, the percentage of production in GDP. Model construction was carried out using the STATISTICA 8 software package. For analysis, a discrimination method called "stepwise backward analysis" was used, which involves including all variables in the model and gradually removing from it at each stage those that are insignificant to the model.

The main criterion for the quality of discrimination is the Wilks' lambda coefficient, the interpretation of which is as follows: the closer the specified coefficient is to "0", the better the level of discrimination, the closer to "1", the worse. As part of our calculations, the value of Wilks' lambda was obtained at the level of 0.17299, which indicates qualitative a priori discrimination (Halafian, 2007).

The results of the discriminant analysis on independent variables are presented in Table 1.

Table 1. Results of discriminant analysis

Independent variables	Wilks' lambda	Partial lambda	<i>F</i> -exclusion criterion	<i>p</i> -level of significance of <i>F</i> -criterion	Tolerance
Index of social progress (X_1)	0.560100	0.308857	155.5232	0.000000	0.480204
Index of human freedom (X_2)	0.197750	0.874794	9.9473	0.000092	0.13354
Export of agricultural products per 1 inhabitant (X_3)	0.181933	0.950850	3.5925	0.030115	0.826209
Employment level (X_4)	0.175866	0.983650	1.1552	0.317987	0.989805

Source: constructed by authors based on results of model development

Based on the calculations, four variables were left in the model, but one is statistically insignificant according to the *p*-criterion, the level of employment. The Wilks' lambda index, calculated for each independent variable, reflects the degree of importance of including the specified variable in the model. As we can see, the most critical variable turned out to be the index of social progress, which indicates a strong dependence of the resulting class of the country on its value. The tolerance coefficient reflects the degree of redundancy of the corresponding variable in the model as the average share of the variance explained by the variables of the corresponding subset. So, according to the degree of tolerance, the indicator of export of agricultural products per 1 inhabitant is the most influential.

It is necessary to calculate the roots, which explain how our independent changes divide the studied countries of the world into three groups to determine the number of discrimination functions. As a result of the analysis, two roots were obtained, i.e., two potential discriminant parts, the significance of which is presented in Table 2.

Table 2. Sequential significance criterion for canonical roots

Number of roots	Eigenvalue	Value of canonical correlation	Wilks' lambda	χ^2 -criterion	Degree of freedom	<i>p</i> -level of significance of χ^2 - criterion
1st and 2nd	4.214232	0.899009	0.179076	232.1923	6	0.000000
2nd	0.070956	0.257399	0.933746	9.2544	2	0.009782

Source: constructed by authors based on results of model development

The first line displays the value when both roots are present, and the 2nd line after removing the 1st (Soshnykova, Tamashevych, Uebe, Sheffer, 1999). Despite the level of the *p*-criterion, the influence of the second function is minimal, which is confirmed by the high value of Wilks' lambda (0.934) and the low eigenvalue (0.071).

Analysis of the roots requires the study of the coefficients of the canonical variables (Table 3):

Table 3. Characteristics of the contribution of the studied variables to discrimination

Independent variables	Standardized coefficients of discriminant functions		Factor structure	
	Function 1	Function 2	Function 1	Function 2
Index of social progress (X1)	1.347919	0.499848	0.908659	-0.364903
Index of human freedom (X2)	-0.541493	-0.772278	0.352218	-0.681798
Export of agricultural products per 1 inhabitant (X3)	-0.147079	-0.786355	0.231678	-0.834048
Characteristics of the contribution of each function to discrimination				
Eigenvalue	4.214232	0.070956	-	-
Cumulative share of explained variance	0.983442	1.000000	-	-

Source: constructed by authors based on results of model development

Based on the analysis results, it can be outlined that the index of social progress has the most significant contribution to the discrimination of the first function and the export of agricultural products per 1 inhabitant and the index of human freedom to the second function. According to the value of the cumulative share of variance, the first function covers 98.34% of all explained variance, which indicates its absolute priority and overall “sufficiency” for describing the spread of values between groups.

The provided factorial structure reflects intragroup correlations of variables with the corresponding discriminant functions – structural coefficients. The spread of these values is much smaller than the coefficients of the discriminant functions. Still, the first function also has the highest correlation with the social progress index and the second one with the export of agricultural products per 1 resident.

Calculating average canonical variables allows us to determine which of the selected groups are best classified by the 1st or 2nd function according to the level of the human development index (*see Table 4*).

Table 4. Characteristics of the contribution of the studied variables to discrimination

Groups	Function 1	Function 2
A	1.94913	-0.149178
B	-0.46206	0.363730
C	-3.30432	-0.261543

Source: constructed by authors based on results of model development.

As we can see, the 1st function best classifies group A, countries with the highest level of the resulting characteristics, and group C, with the lowest – accordingly, the 2nd function best ranks group B, countries with an intermediate value.

The graphic interpretation of the conducted discriminant analysis is presented in Figure 5.

As we can see, a precise distribution of observations is observed throughout the first function, which confirms its potent discriminant property, which is not typical for the second function, where we see a significant clustering of observations opposite similar values.

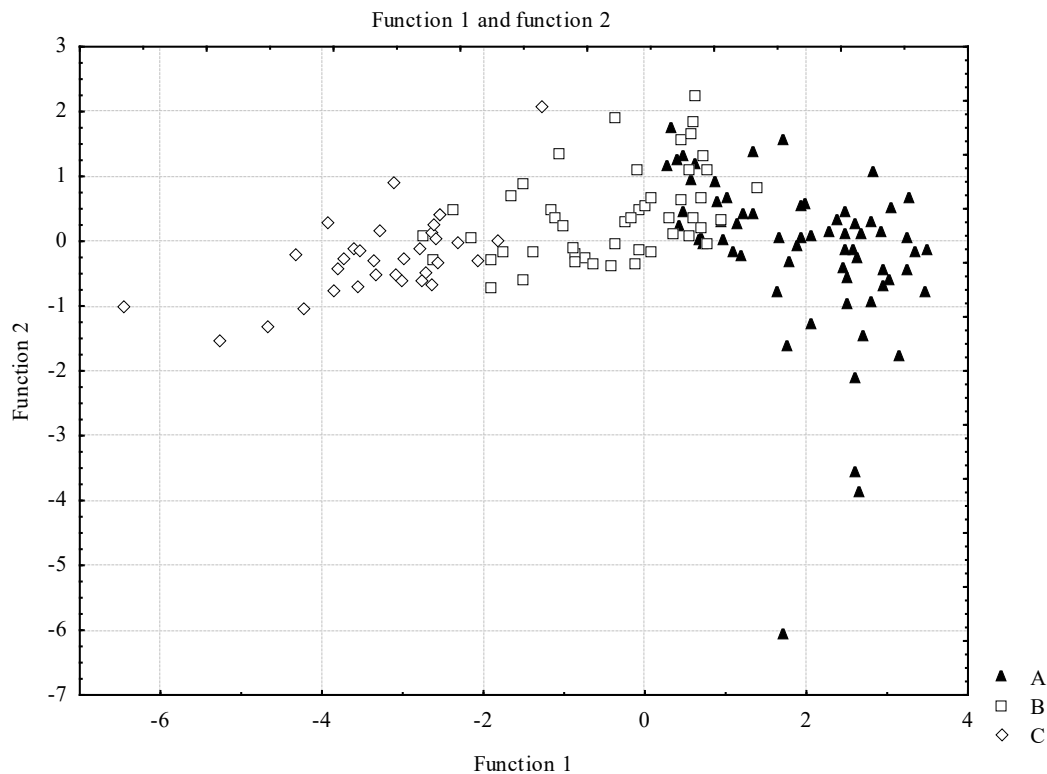
As a result, the classification function assigning each observation to the appropriate group will be as follows:

$$A = 2.1833X_1 + 0.013X_2 - 3.4537X_3 \quad (7)$$

$$B = 1.7248X_1 + 0.9764X_2 - 3.118X_3 \quad (8)$$

$$C = -3.4537X_1 - 3.489X_2 - 2.825X_3 \quad (9)$$

Figure 5. Distribution of values of discriminant functions



Based on the calculations, we determined the parameters of the classification function of the studied objects, grouped by the level of the human development index, depending on the contribution of independent variables to discrimination: the index of social progress (X_2), the index of human freedom (X_2) and the export of agricultural products per 1 inhabitant (X_3). The index of social progress has the most significant influence on the distribution of countries, which allows us to claim that this indicator indirectly affects human development in countries.

The index of human freedom and the export of agricultural products per 1 inhabitant has a much smaller influence – the distribution of these indicators is similar. On the other hand, the highest level of tolerance is observed for the last indicator, which indicates that this indicator explains the largest share of dispersion within the groups – the unevenness of foreign economic activity of agrarians explains the value of the parameters.

5. DISCUSSION

The results of the conducted research leave specific debatable points related to the state policy of developing rural areas based on the principles of inclusiveness. There are the most significant gaps in Ukraine between rural and urban areas of both socio-economic and infrastructural origin. The same holes are also characteristic of individual regions of Ukraine, which ultimately

causes different levels of involvement of areas in economic and social activities. The conducted research made it possible to identify the critical problems of the existing gaps (in income, education, logistics costs, territorial remoteness, etc.), so the issue of implementing the toolkit for regulating rural development programs, taking into account the European integration vector of Ukraine, can become a promising direction. The guideline obtained from the simulation to ensure the growth of human capital development through export and innovative activity of farmers in the current conditions of martial law in Ukraine becomes complicated. It can be fully implemented in the post-war period.

Implementation of models for forecasting the development of human capital in rural areas allows early identification of determinants and gaps in the level of involvement of regions in economic and social activities. In this regard, further studies may contain justifications for appropriate tools for agribusiness regulation, considering relevant factors and global challenges. The authors believe such studies should be based on alternative rural development strategies. The specifics of the connection between agriculture and business entities of other industries as a basis for the development of the rural area also require a separate analysis.

6. CONCLUSIONS

The conducted research showed that the policy adopted in the state to ensure the development of rural areas based on the principles of inclusiveness should be based on balanced tools, methods, and levers capable of minimizing external and internal threats to agribusiness. People's opportunities and abilities for economic and social activities and their development are crucial. The determining factor in this process should be human capital, from which the prerequisites for developing rural areas will be formed. In this context, the upward dynamics of the indicator of the urban share population in the EU countries was analyzed and revealed, which may hinder the development of businesses in rural areas. Emphasis is put on the prospects of small businesses in rural areas, particularly in the post-war period. The authors studied the relationship between the urbanization indicator and the human development index in Ukraine and the EU countries. Based on this, the list of threats and determinants of human development in rural areas is summarized:

- 1) inequality (in income, access to social benefits, and digital technologies);
- 2) infrastructural combination of regions (remoteness, complex and costly logistics);
- 3) uneven placement (predominant urbanization, business relocation, investment programs of territorial development);
- 4) motivation for development (access to education, innovation, exchange of experience, overcoming unemployment through self-employment).

The proposed assumption regarding the composition of factors for the development of human capital in rural areas was also verified based on statistical data from 170 countries of the world. The conducted analysis and built model of discriminant analysis of the influence of the considered independent variables on the grouping of the values of the resulting change - the index of human development - made it possible to reject the hypothesis of the existence of a direct relationship between the level of development of rural areas and human development in general, using generally recognized quantitative indicators. As we can see, most of the primary indicators that quantitatively reflect the level of development of rural areas, such as the share of the urban population, the level of employment, and the percentage of products and services in the GDP structure, were not included in the model at all, which indicates that there is no

connection between the spread of these values and resulting feature. Among the considered indicators, only the level of agricultural export activity affects the human development index due to discrimination, which allows us to assert the existence of dependencies between these indicators, which is mainly related to the introduction of innovations in agricultural activities, the sources of financing of which are often revenues from foreign economic activities. The high level of innovative activity of agrarians affects the organization and way of life of the rural population, ensuring an increase in its level of well-being and, as a result, contributing to the growth of human capital development.

Such scientific results prove the priority of state support for innovative and export agriculture activities in Ukraine, considering the need to ensure the development of the human potential of residents of rural areas. These measures will become the basis of the successful implementation of the strategy of European integration. The similarity of the state policy orientation of leading foreign countries and Ukraine on progressive changes in agriculture, the formation of drivers and sources of investment, which is essential when establishing ties regarding international co-operation, and the implementation of agricultural legislation, is also proven. Therefore, the program supports the innovative activity of business entities, which requires both the improvement of innovative infrastructure in the state and the further improvement of projects to implement innovative ecosystems of the national and interstate levels of support.

REFERENCES

- Akimov O., Karpa M., Parkhomenko-Kutsevil O., Kupriichuk V., Omarov Azad. (2021). Entrepreneurship Education of the Formation of the E-Commerce Managers Professional Qualities. *International Journal of Entrepreneurship*, 25(7), 1-8.
<https://sdbindex.com/documents/00000157/00000-82631>
- Anastasiou E, Manika S, Ragazou K, Katsios I. (2021). Territorial and Human Geography Challenges: How Can Smart Villages Support Rural Development and Population Inclusion? *Social Sciences*, 10(6). <https://doi.org/10.3390/socsci10060193>
- Arefieva O., Polous O., Arefiev V., Kopcha Y. (2019). Intellectualization of Human Capital Development in the Digital Economics: the importance for improvement of economic security of enterprises. *International Journal of Recent Technology and Engineering (IJRTE)*, 8(3), 176-182.
<https://doi.org/10.35940/ijrte.C1030.1183C19>
- Ballatore, Rosario Maria & Mariani Vincenzo, (2019). "Human Capital Differentials Across Urban and Rural Areas in Italy. The Role of Migrations," *Italian Economic Journal: A Continuation of Rivista Italiana degli Economisti and Giornale degli Economisti, Springer; Società Italiana degli Economisti (Italian Economic Association)*, 5(2), 307-324.
<https://doi.org/10.1007/s40797-019-00098-9>
- Calicioglu, O., Flammini, A., Bracco, S., Bellù, L., Sims, R. (2019). The Future Challenges of Food and Agriculture: An Integrated Analysis of Trends and Solutions. *Sustainability*, 11(1).
<https://doi.org/10.3390/su11010222>
- EUROSTAT. <https://ec.europa.eu/eurostat>
- Fraumeni B. M. (2008). Human Capital and Investment in Education: a Streamlined Approach: presentation at a Fondazione Giovanni Agnelli / OECD workshop on human capital accounts. Turin, Italy. <https://www.nber.org/papers/w16895> doi:10.3386/w16895
- Goldin C., Katz L. F. (2020). The Incubator of Human Capital: The NBER and the Rise of the Human Capital Paradigm. Cambridge: National Bureau of Economic Research, Working Paper, №26909, 24. https://www.nber.org/system/files/working_papers/w26909/w26909.pdf
- Halafyan, A. (2007). Statistica 6. Statistical analysis of data: textbook (3rd ed.). Bynom-Press.
<https://djvu.online/file/VM8tuMeSLbnpJ>
- Human Development Reports
<https://hdr.undp.org/data-center/human-development-index#/indiciesHDI>
- Kachniewska, M.A. (2015), «Tourism development as a determinant of quality of life in rural areas», *Worldwide Hospitality and Tourism Themes*, 7 (5), 500-515.
<https://doi.org/10.1108 /WHATT-06-2015-0028>
- Karachyna, N., Vakar, T., Moroz, Y., Semtsov, V. and Vitiuk, A. (2020), "Territorial Branding as an Instrument for Competitiveness of Rural Development", Lawrence, K.D. and Pai, D.R. (Ed.) *Applications of Management Science*, 20, 97-114.
<https://doi.org/10.1108/S0276-897620200000020021>
- Klebanova, T., Hur'ianova, L., Chahovets', L., Panasenko, O., Serhienko, O., Yatsenko, R. (2020). Business analytics of multidimensional processes. KhNEU im. S. Kuznetsia.
<http://repository.hneu.edu.ua/handle/123456789/22020>
- Kolluru, M. ., Hyams-Ssekasi, D. ., & Sudhana Rao, K. . (2021). A study of global recession recovery strategies in highly ranked gdp eu countries. *ECONOMICS - Innovative and Economics Research Journal*, 9(1), 85–106. <https://doi.org/10.2478/eoik-2021-0011>
- Mora, J. J., Herrera, D. Y., Alvarez, J. F., & Arroyo, J. S. (2023). Returns to human capital in a developing country: A pseudo-panel approach for Colombia. *Economics and Sociology*, 16(1), 57-70.

<https://doi.org/10.14254/2071-789X.2023/16-1/4>

- Nieto, E. and Brosei, P. (2019), «The Role of LEADER in Smart Villages: An Opportunity to Reconnect with Rural Communities», Visvizi, A., Lytras, M.D. and Mudri, G. (Ed.) *Smart Villages in the EU and Beyond* (Emerald Studies in Politics and Technology), Emerald Publishing Limited, Bingley, 63-81. <https://doi.org/10.1108/978-1-78769-845-120191006>
- Samoliuk, N., Bilan, Y., & Mishchuk, H. (2021). Vocational training costs and economic benefits: exploring the interactions. *Journal of Business Economics and Management*. 22(6), 1476-1491. <https://doi.org/10.3846/jbem.2021.15571>
- Soderholm, P. (2020). The green economy transition: the challenges of technological change for sustainability. *Sustainable Earth*, 3, 6. <https://doi.org/10.1186/s42055-020-00029-y>
- Soshnykova, L., Tamashevych, V., Uebe, H., Sheffer, M. (1999). Multivariate statistical analysis in economics. YuNYTY-DANA. <https://djvu.online/file/xQofXt7maWWN5>
- Spasojević B. & Đukić A. (2017). Reforms of the community agrarian policy: misconception or new agricultural architecture? *ECONOMICS - Innovative and Economics Research Journal*, 5(2), 125–133. <https://doi.org/10.1515/eoik-2017-0024>
- State Statistics Service of Ukraine. <https://www.ukrstat.gov.ua/>
- Stryzhak, O., Tupa, M., & Rodzik, J. (2022). Relationship between the level of human development and institutional quality. *ECONOMICS - Innovative and Economics Research Journal*, 15(2), 274-295. <https://doi.org/10.14254/2071-789X.2022/15-2/17>
- Tabachnick, B. G., & Fidell, L. S. (1989). *Using Multivariate Statistics*. New York: Harper & Row, Publishers, Inc. <https://www.pearsonhighered.com/assets/preface/0/1/3/4/0134790545.pdf>
- Topić R. & Spasojević B. (2016). Contemporary Aspects of Correlation between Agriculture and Rural Development, *ECONOMICS - Innovative and Economics Research Journal*, 4(2), 95-112. <https://doi.org/10.1515/eoik-2017-0001>
- Transheneratsijna terapiia. (2023). Discriminant Analysis. <https://uk.economy-pedia.com/11040389-discriminant-analysis#menu-1>
- Wahl, P. W. & Kronmal, R. A. (1977) Discriminant functions when covariances are unequal and sample sizes are moderate. *Biometrics*. 33, 479-484. <https://www.jstor.org/stable/2529362>
- WORLD BANK. <https://data.worldbank.org/>
- World Trade Organization. https://www.wto.org/english/tratop_e/tratop_e.htm
- Yang, X. and Huang, W.-c. (2017), “Human Capital Investment Inequality and Rural–Urban Income Gap: Evidence from China”, *Advances in Pacific Basin Business Economics and Finance* (Advances in Pacific Basin Business, Economics and Finance, Vol. 5), Emerald Publishing Limited, Bingley, 151-172. <https://doi.org/10.1108/S2514-465020170000001007>
- Zavratnik, V., Kos, A. and Duh, E.S. (2019), «Smart Villages in Slovenia: Examples of Good Pilot Practices», Visvizi, A., Lytras, M.D. and Mudri, G. (Ed.) *Smart Villages in the EU and Beyond* (Emerald Studies in Politics and Technology), Emerald Publishing Limited, Bingley, 125-138. <https://doi.org/10.1108/978-1-78769-845-120191010>