

“A game-theoretical model for investment in inclusive recreation and wellness in Ukraine: the regional context”

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A GAME-THEORETICAL MODEL FOR INVESTMENT IN INCLUSIVE RECREATION AND WELLNESS IN UKRAINE: THE REGIONAL CONTEXT

Abstract

Investing in recreation and wellness in transitional economies requires updating an inclusive approach and adjusting national regional policies. The article aims to provide the game and theoretical decision-making modeling regarding the direction of capital investment in the development of inclusive wellness and recreation in the regions of Ukraine. Considering this, a comparative analysis of relevant indicators, above all, the self-assessment level of population health, has been conducted. The "game against nature" method allows formalizing the social and market contradictions of regional development of wellness and recreation. Using Ukraine as an example, the analysis of the pay-off matrix by decision-making criteria such as the Bayes-Laplace's criterion, the Savage's criterion, the Wald's criterion and the Hurwitz's criteria, establishes the priority areas for investment: the maximum investment amount is for the middle-income regions and the minimum – for the high-income regions. However, there is a significant disparity in investment in health and recreation across regions. The situation requires a transformation of the target function: from providing social subsidies to maximizing person's well-being in the physical, mental, social and financial aspects. In the absence of inclusive economic institutions, it is proposed to equalize the weight of the "investment in health" and "investment in recreation" factors and redistribute the total volume of capital investment in regions with relatively low solvency and population health indicators.

Keywords recreation, wellness, capital investment, inclusive approach, game against nature

JEL Classification C72, I38, H54, L83

INTRODUCTION

The social and economic development of a country depends on investment: not only on their volume, but also on how exactly they are directed and allocated in different economic sectors and social sphere of the regions. Developing countries require permanent investment support, which in practice is not received by all regions or the distribution of financial resources between them is uneven. For the transitional economies, the role of investment policy is particularly important: a significant positive external influence is required for a country in transition to finally emerge from the crisis. At the same time, it is also important to simultaneously support social, environmental, cultural and other developments in the context of the Global Sustainable Development Goals, in particular for Ukraine (Ministry of Economic Development and Trade of Ukraine, 2017, p.83) – Target 11.6 "Ensure the development ... aimed at economic growth, job creation, tourism, recreation." Therefore, priority is given to those areas of investment that have a comprehensive impact and, accordingly, are directed to the spheres of life in society that have both social and economic aspects.

The division of the wellness and recreation areas into economic and social aspects is artificial. Recreation (Simmons & Moore, 2016; Reimers, 1990, p. 449), and, above all, the wellness and recreation sphere (The Verkhovna Rada of Ukraine, 2002), which is at the same time related to the recreation and healthcare sectors, is a social sector in its nature, where people renew their energy and strength to work productively again. In economic terms, it is about reproducing human capital in the structure of the country's economy. That is, wellness and recreation are socio-economic processes. Moreover, in low-income or lower-middle-income countries, the processes that focus on human development, particularly in the context of investment, are predominantly inclusive (World Bank, 2013, pp. 40-41). In other words, the recreational activities that relate to the mass participation of the population and the possibility of each individual participation, irrespective of their solvency, social and any other status, are principally supported.

In Ukraine and other post-Soviet states, this article's subject traditionally relates to the definitions of "wellness recreation" (in the English scientific literature, "wellness and recreation") and "recreational tourism". Global statistics typically use the integral definition of "wellness tourism" (Global Wellness Institute, 2019). The Global Wellness Institute predicted the development of wellness tourism in the world for the period 2017–2022, which is an average of 7.5% per year. Meanwhile, the analysis of national programs and documents has shown that not all countries have a strategy or investment program to promote wellness tourism. Armenia, Kazakhstan, Kyrgyzstan, and Turkmenistan (Global Wellness Institute, 2018, pp. 30, 70-71) are among the least economically developed countries in Europe, where wellness tourism is not a priority target of investing. In Ukraine (Organization for Economic Cooperation and Development, 2016), the investment policy situation is complex and aimed primarily at eliminating negative internal factors such as corruption.

1. LITERATURE REVIEW

Comprehensive studies of economic, social, environmental and other aspects of human life that require investment at both country and regional levels are primarily related to financing the implementation of the 2030 Global Sustainable Development Goals (United Nations, 2019). Wellness and recreation is one of the areas that have all these aspects, so it is an attribute of the sustainability of society development and, therefore, a priority investment target.

The inclusiveness of wellness and recreation requires a social focus of investment. It is about social investment (Wilson, 2014, p. 7) as a new approach to private investment in projects that contribute to society. Preference is given to projects that combine social orientation and the protection factor of the recreation environment, if they are more effective compared with similar projects without the environmental component.

Public health agencies play an important role in enhancing partnerships with social investors (Care & De Lisa, 2019, pp. 8-10). The public health

field combines the features of healthcare, an inclusive approach and wellness (on the indication of disease prevention). Investment in public health (Richardson, 2012) has great prospects because the economic effectiveness of preventing disease is higher than the effectiveness of treatment, despite mental and political barriers. The amount of investment in public health will increase significantly, taking into account the social effect in terms of value.

When researching and resolving socio-economic and other contradictions (e. g., economic and environmental conflicts, Petrushenko, 2013), in particular, in the field of recreation, turn to the game theory as a model of decision-making between players, who can be both competitors and partners. Heywood (1993) explored the possibilities for cooperation and coordination in the field of outdoor recreation through game-theoretical approaches, including the prisoner's dilemma game. Sobhee, Ramessurb, and Bhukuth (2017) analyzed the conflict situation in a marine park using a game-theoretic model to prove the need for joint decision-making based on sustainability and consensus.

Altaibayeva, Nurmukhanova, and Alimkhanova (2018) analyzed the consequences of the investment policy for the recreational area of Kazakhstan. In the absence of a market for tourism and wellness services, investment activity mainly depends on state support. Creating investment climate is a matter of state guarantees and the development of favorable conditions for private business. The structure of capital investment in the development of wellness tourism in Kazakhstan is similar to the structure in Ukraine: the state is the major investor. However, there is an understanding that private investment can address the problems in environmental and social development of recreational areas. The difficulty is that investors have no motivation for long-term scenarios of gradual increase in profits. The main role of the state is to initiate the search for ways to attract responsible investors to the recreational sphere.

Mandic, Mrnjavac, and Kordic (2018) consider the traditional concept, in which tourism infrastructure and recreational facilities are factors of tourism development in Croatia. Recreational facilities are mostly social projects, which the private investor is not interested in. However, demand for tourism services is steadily growing, which changes the view on the role of recreation in attracting investment. The links between recreation and tourism are complex. When developing the projects, attention is drawn to cooperation with non-governmental organizations, to the need of protection not only natural but also historical and cultural facilities, and to technical aspects of infrastructure development.

Practically speaking (Complete Controller, 2019), investing in recreational facilities increases the level of factors such as property value, public health, environmental quality, tourism development, social capital, and government initiatives. Accordingly, the recreation development provides physical, emotional, mental, environmental, and communal goods. Conversely, without recreational facilities in the region, the problems in healthcare, environment pollution can occur, which in turn will cause a negative impact on tourism, social development and other aspects of human life. Therefore, investing in recreational facilities is a critical requirement for all regions.

On the other hand, at the global and national levels, at least in most countries, the area of wellness and recreation has already reached a stage of evolution that is objectively ready to accept investment (Patni, 2019). In India, the wellness market is rapidly developing and expanding and needs to become more inclusive and accessible. The main tendency for its further progress is the differentiation of services that cover most of the population and create new connections with other economy sectors and social life spheres.

The most progressive trend of wellness tourism development relates to the experience economy (Pine II& Gilmore, 1998). The main thesis is about the highest level of prices for experience compared to prices for products and services, as well as about the socio-psychological context of the consumption process (experience, impressions, feelings, and emotions). Healthcare, recreation and tourism are some of the few areas where this concept applies. Despite the fact that in the scientific sense, the criticism has significantly suspended the work in this direction, it is necessary to recognize the direct connection of the wellness ideology with the ideas of the experience economy. It is about the complexity and interconnectedness of mental and physical health of humans, their motivation for impressions and new experiences. According to the Constitution of the World Health Organization (World Health Organization, 2006, p. 1), health is a state of complete physical, mental and social well-being. The enjoyment of the highest attainable standard of health is one of the fundamental rights for every human being without distinction of race, religion, political belief, economic or social condition. Understanding the value of health and wellness enhances the significance of the experience economy to seek the additional benefits of the wellness recreation area and attract investment in inclusive development.

Therefore, the problem of the study is that in economies that cannot support the minimum social standards on their own, particularly in Ukraine, investment in socio-economic sectors, such as wellness and recreation, is insufficient and uneven across regions. The hypothesis is to test the extent to which this disparity is crucial; also a comparative and structural analysis of investment by region is carried out using a two-fac-

tor game-theoretical model (the “investment in recreation” and “investment in health” factors) (Papadimitriou, 1985; Ermon, Conrad, Gomes, & Selman, 2010; Petrushenko, 2012). This will allow formulating proposals for the investment policy equalization in healthcare (taking into account social assistance, in accordance with an inclusive approach) and recreation (along with sport and culture) in the regional structure of the economy of Ukraine.

2. AIMS

According to the above, the objectives of the study are as follows:

- to consider world trends for determining the situation with investment in wellness and recreation in Ukraine; the focus is placed on the ratio of capital expenditure on healthcare and recreation in the regional context;
- to substantiate the feasibility of using the theoretical-game model in inclusive wellness and recreation based on the conceptual form of the model; and
- to analyze the distribution of investment in recreation and healthcare by region and to balance the situation based on it.

3. DATA AND METHODOLOGY

The research method is based on the contradictions between the two parties of wellness and recreation as an investment goal, and its development as a result of these contradictions:

- wellness and recreation from the experience economy perspective (the market aspect of contradiction);
- wellness and recreation as an inclusive socially oriented area (the social aspect of contradiction); and
- socio-economic development (the state creates rules of the game for business and investors in wellness and recreation).

To analyze these contradictions, the “game against nature” method is applied, that is, a game-theoretical method in which one-player game (model) is considered, namely the population of the regions are consumers of recreational services that create demand for recreational services (the solvency level). “Nature” is a reflection of the comprehensive action of regional policy on the welfare of the population (the health level). The function of the game is to use the investments in the development of recreation and healthcare of the population in the region. In the payoff matrix (Table 1) of the game against nature, the winnings (IR investments) of player R (with R_i strategies) are not the losings (IW) of nature W (W_i – the states of nature).

Table 1. Payoff matrix of the game against nature

$R_i \backslash W_j$	W_1	W_2	...	W_{n-1}	W_n
R_1	–	–	...	–	–
R_2	–	–	...	–	–
...
R_{m-1}	–	–	...	–	–
R_m	–	–	...	–	–

The interval of equal distribution of rows (horizontal $x = \{R_1 \dots R_i \dots R_m\}$ and vertical $x = \{W_1 \dots W_j \dots W_n\}$) is chosen according to the Sturges rule (Sturges, 1926):

$$i = \frac{X_{\max} - X_{\min}}{1 + 3.32 \lg N}, \quad (1)$$

where X_{\max} , X_{\min} – respectively the maximum and minimum values of the x , N is the number of regions.

Criteria for decision-making and for the choice of a strategy in the game (formulas (2), (3) – (Laplace); (4) – (Savage); (5) – (Wald); and (6)-(11) – (Hurwicz, 1951a, 1951b)), taking into account considering comparative assessment of indicators (Pataki, 1996), are as follows:

Bayes-Laplace's criterion, BL

$$BL = \arg \max_{1 \leq i \leq m} \left\{ \sum_{j=1}^n I_j^R (R_i) \cdot w_j^W \right\}, \quad (2)$$

where I_j^R – volume of investments according to the strategy R_i and state of nature j , w_j^W – the weight of investment according to the state of nature W_j (relevantly the population proportion in regions that are considered in the state of nature j).

Bayes-Laplace's risk criterion, BL

$$BL^r = \arg \min_{1 \leq i \leq m} \left\{ \sum_{j=1}^n \tilde{I}_j^R(R_i) \cdot w_j^W \right\}, \quad (3)$$

where \tilde{I}_j^R – volume of investments (in risk matrix) according to the strategy R_i and state of nature j .

Savage's minimax regret criterion, Sa

$$Sa = \arg \min_{1 \leq i \leq m} \left\{ \max_{1 \leq j \leq n} \left[\max_{1 \leq i \leq m} \tilde{I}_j^R(R_i) - \tilde{I}_j^R(R_i) \right] \right\} \quad (4)$$

Wald's maximin, Wa

$$Wa = \arg \max_{1 \leq i \leq m} \left\{ \min_{1 \leq j \leq n} I_j^R(R_i) \right\} \quad (5)$$

Maximax criterion, Ma

$$Ma = \arg \max_{1 \leq i \leq m} \left\{ \max_{1 \leq j \leq n} I_j^R(R_i) \right\} \quad (6)$$

Hurwicz's pessimistic criterion, Hu^P

$$Hu^P = \arg \max_{1 \leq i \leq m} \left\{ \frac{\min_{1 \leq j \leq n} I_j^\Sigma}{\max_{1 \leq j \leq n} I_j^\Sigma + \min_{1 \leq j \leq n} I_j^\Sigma} \cdot \max_{1 \leq j \leq n} I_j^R(R_i) + \left(1 - \frac{\min_{1 \leq j \leq n} I_j^\Sigma}{\max_{1 \leq j \leq n} I_j^\Sigma + \min_{1 \leq j \leq n} I_j^\Sigma} \right) \cdot \min_{1 \leq j \leq n} I_j^R(R_i) \right\} \quad (7)$$

where I_j^Σ – total investment in the state of nature j .

Hurwicz's optimistic criterion, Hu^O

$$Hu^O = \arg \max_{1 \leq i \leq m} \left\{ \frac{\max_{1 \leq j \leq n} I_j^\Sigma}{\max_{1 \leq j \leq n} I_j^\Sigma + \min_{1 \leq j \leq n} I_j^\Sigma} \cdot \max_{1 \leq j \leq n} I_j^R(R_i) + \left(1 - \frac{\max_{1 \leq j \leq n} I_j^\Sigma}{\max_{1 \leq j \leq n} I_j^\Sigma + \min_{1 \leq j \leq n} I_j^\Sigma} \right) \cdot \min_{1 \leq j \leq n} I_j^R(R_i) \right\} \quad (8)$$

Hurwicz's realistic criterion, Hu^R

$$Hu^R = \arg \max_{1 \leq i \leq m} \left\{ \frac{1}{2} \cdot \max_{1 \leq j \leq n} I_j^R(R_i) + \frac{1}{2} \cdot \min_{1 \leq j \leq n} I_j^R(R_i) \right\} \quad (9)$$

Hurwicz's threats criterion, Hu^T

$$Hu^T = \arg \max_{1 \leq i \leq m} \left\{ \frac{I_{n-j+1}^\Sigma}{\sum_{j=1}^n I_j^\Sigma} \cdot \max_{1 \leq j \leq n} I_j^R(R_i) + \left(1 - \frac{I_{n-j+1}^\Sigma}{\sum_{j=1}^n I_j^\Sigma} \right) \cdot \min_{1 \leq j \leq n} I_j^R(R_i) \right\} \quad (10)$$

Hurwicz's security criterion, Hu^{Se}

$$Hu^{Se} = \arg \max_{1 \leq i \leq m} \left\{ \frac{I_j^\Sigma}{\sum_{j=1}^n I_j^\Sigma} \cdot \max_{1 \leq j \leq n} I_j^R(R_i) + \left(1 - \frac{I_j^\Sigma}{\sum_{j=1}^n I_j^\Sigma} \right) \cdot \min_{1 \leq j \leq n} I_j^R(R_i) \right\} \quad (11)$$

For the study, data on the regions of Ukraine for the year 2017 was used, namely:

- socio-economic indicators (Table A1; State Statistics Service of Ukraine, 2018a). Data relevant to the “nature” of the game-theoretical model results from the population’s self-perceived health status by region (the number of population who rated their health status as good and satisfactory, % of the total population participated in the survey within the framework of the European program EuroHIS) (State Statistics Service of Ukraine, 2018b, pp. 50-51). The data corresponding to player strategies are the results of households in Ukraine that perceive their income

Table 2. Wellness tourism expenditure, USD bln, 2017 and forecast 2022

Source: Compiled by the authors according to the Global Wellness Institute (2018) data.

	2017	2022	Countries where wellness tourism is a goal to promote the current national investment
North America	241.7	311.3	–
Europe	210.8	275.0	Azerbaijan, Bulgaria, Croatia, Estonia, Finland, Georgia, Hungary, Lithuania, Montenegro, Poland, Romania, Serbia, Slovakia, Slovenia, Switzerland, Turkey
Asia-Pacific	136.7	251.6	Bhutan, China, Fiji, India, Malaysia, Maldives, New Zealand, Philippines, Taiwan
Latin America- Caribbean	34.8	54.7	Colombia, Costa Rica, Dominica, Guatemala, Jamaica, Uruguay
Middle East-North Africa	10.7	18.7	Algeria, Iran, Jordan, Morocco, Qatar, Saudi Arabia, Tunisia
Sub-Saharan Africa	4.8	8.1	Ethiopia, Kenya, Namibia, Rwanda
Total	639.4	919.4	–

(the number of households that rated income for the year as sufficient, %) (State Statistics Service of Ukraine, 2017, pp. 54-56);

- indicators of capital investment in healthcare and recreation (Table A2; State Statistics Service of Ukraine, 2018c) (Information on direct investment in most regions of Ukraine is unavailable).

The city of Kyiv has significant advantages over any other region of Ukraine in terms of investment in economic or social activities (Table A2); also, the capital distributes grants between regions. Therefore, the role of Kyiv, which has an objectively leading investment strategy, is considered outside the scope of the proposed game-theoretical model.

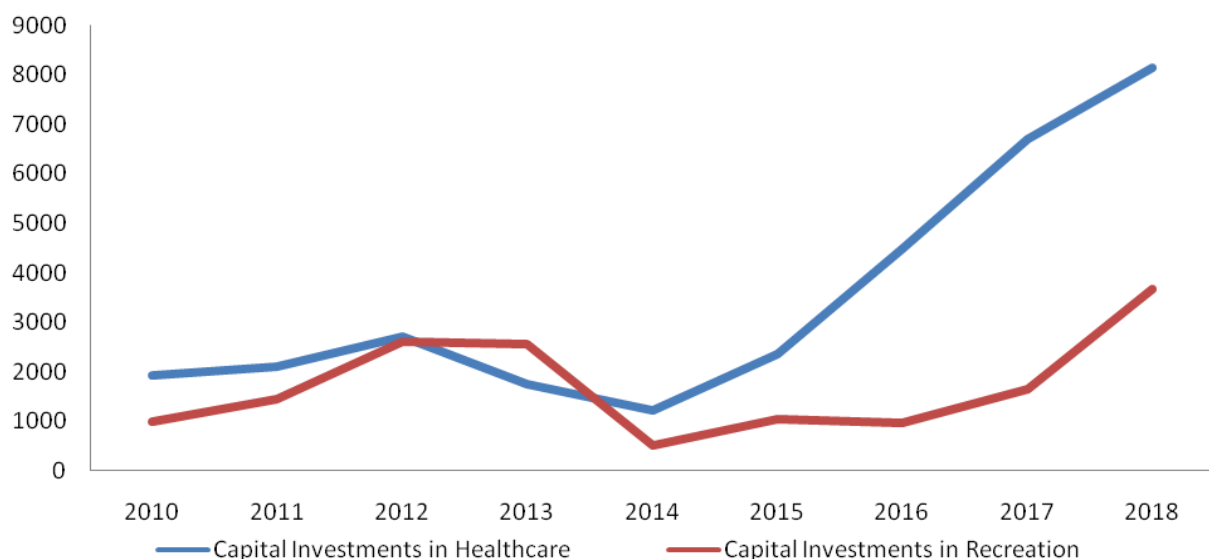
4. RESULTS

Provided that investment in wellness and recreation and tourism is prioritized, as they exist in neighboring countries, such as Hungary, Poland, Romania, and Slovakia, Ukraine will join the global trend of rapid growth in this field of research (Table 2).

During 2014–2018 (Figure 1) there was a steady increase in the volume of capital investment in Ukraine, especially in healthcare. However, the increase in investment (about UAH 2,000 million per year) is insignificant.

The volume of capital investment per capita (Table A2), for example, in the Odesa Oblast for 2017, is 17,543.42 UAH. Of these, investment in recreation

Source: Constructed by authors according to the State Statistics Service of Ukraine (2019) data.

**Figure 1.** Capital investment in recreation and healthcare in Ukraine, UAH mln

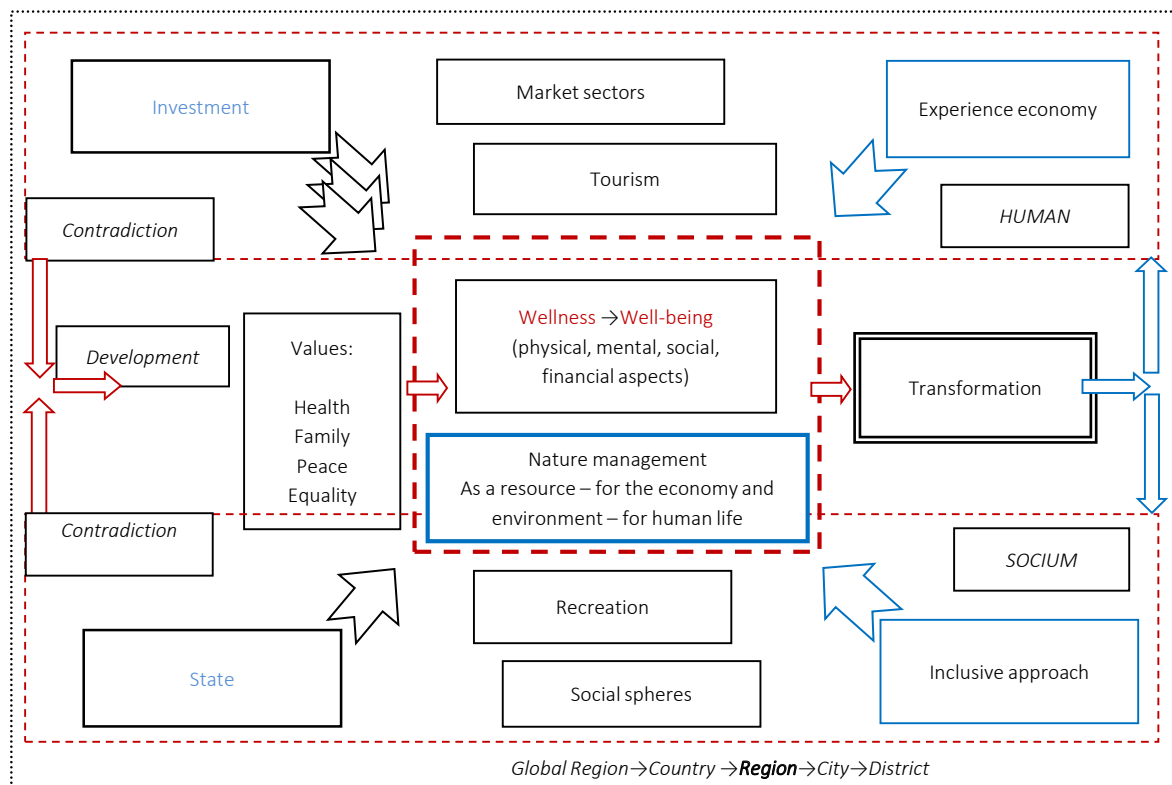


Figure 2. Conceptual scheme for long-term attraction of investment in inclusive wellness and recreation

(as well as sports, art and entertainment) amounts to 8.21 UAH; in healthcare (and social assistance) – 168.52 UAH. In essence, this is an inclusive approach, which, however, still requires considerable development.

Modeling of complex processes of recreation requires to make a conceptual vision of the problem (Figure 2).

Inclusive investment will generate inclusive income in the future (Yamey, Beyeler, Wadge, & Jamison, 2016, p. 14), which is a simple formula, namely, the sum of GDP growth and the economic value of increased health life expectancy.

Transformation means a new dimension of well-being that includes physical, mental, social and financial health (Optum, Ink, 2017, p. 2).

The basic idea is that socio-economic contradictions are a source of development and positive transformation of human and society well-being. In order for such a transition to take place, an ad-

equated government support, a clean environment and long-term investment are required. Wellness and recreation is a sphere whose impact on the well-being is maximized, and the effect is immediately reflected not only in social but also in economic aspects. All the elements shown in Figure 2 are closely linked to each other in real life conditions. Transformations are already taking place in Ukraine’s political life. They may become a prerequisite for rapid changes in the economic and social development of the country and its regions.

The game-theoretical model in the matrix form is presented in Tables 3-6.

Based on a comparative analysis of investment, the regions are grouped into nine “windows” based on two continuums: “low – high level of income” (the solvency of the population as an indicator of demand generation in the market of services in the region is a defining feature of the region competitiveness, which is reflected in its development strategy), “low – high level of health” (an indicator of the “nature”, that is, external factors that shape

Table 3. Payoff matrix by region

Income	Health	Low sufficient level		Medium sufficient level		High sufficient level	
		83,0-85,0	85,1-87,0	87,1-89,0	89,1-91,0	91,1-93,0	93,1-95,0
Low level	3,0-19,0	Sumy Oblast 137,35	–	Vinnitsia Oblast 372,91 Zakarpattia Oblast 75,71	–	Ivano-Frankivsk Oblast 153,78	–
	19,1-35,0	–	–	–	Kherson Oblast 87,41	Ternopil Oblast 89,79	–
Medium level	35,1-51,0	Chernihiv Oblast 158,86	–	Zaporizhzhia Oblast 134,74 Kharkiv Oblast 236,40	–	Mykolaiv Oblast 161,29 Rivne Oblast 108,00	–
	51,1-67,0	–	Cherkasy Oblast 231,29	Donetsk Oblast 61,41 Khmelnytskyi Oblast 136,34	Volyn Oblast 90,99 Dnipropetrovsk Oblast 83,64	Odesa Oblast 176,73 Poltava Oblast 205,98 Chernivtsi Oblast 101,82	–
High level	67,1-83,0	–	Zhytomyr Oblast 122,38 Luhansk Oblast 153,47	–	–	–	Kirovohrad Oblast 138,04
	83,1-95,0	–	–	–	–	–	Kyiv Oblast 144,27 Lviv Oblast 119,95

the perception of the health of the region's population). The highest levels on both attributes are in Kyiv and Lviv regions; the lowest is in Sumy region (Table 3).

In the transition from Table 3 to Table 4, the cells are grouped into an enlarged 3×3 matrix (in each of the nine “windows” with four cells 2×2). If in one of the cells data are given for two or more regions at once, then the weighted aver-

age of winning rate is calculated on this cell (by the number of population in these regions compared to the population in all regions specified in the matrix). Multi-criteria assessment allows taking into account greater number of factors that can influence making decisions about investment in inclusive wellness and recreation. In particular, as to the risk factor, the payoff matrix (Table 4) is transformed into a risk matrix (Table 6).

Table 4. Payoff matrix: Bayes-Laplace's criterion, Wald's criterion, Maximax criterion

Income	Health	83,0-85,0	85,1-87,0	87,1-89,0	89,1-91,0	91,1-93,0	93,1-95,0	BL_i	Wa_i	Mx_i			
3,0-19,0		137,35	–	240,97	–	153,78	–	121,90	155,16	137,35	224,76	240,97	330,76
19,1-35,0		–	–	–	87,41	89,79	–	33,26	–	87,41	–	89,79	–
35,1-51,0		158,86	–	196,73	–	134,42	–	104,14	209,10	134,42	213,27	196,73	428,02
51,1-67,0		–	231,29	78,85	85,43	171,06	–	104,96	–	78,85	–	231,29	–
67,1-83,0		–	142,20	–	–	–	138,04	34,97	52,22	138,04	267,96	142,20	272,12
83,1-95,0		–	–	–	–	–	129,92	17,25	–	129,92	–	129,92	–
$Max I_j$		158,86	231,29	240,97	87,41	171,06	138,04	–	–	–	–	–	–
I_j^2		296,21	373,49	516,55	172,84	549,05	267,96	–	–	–	–	–	–
k^T		0,17	0,14	0,12	0,25	0,08	0,24	–	–	–	–	–	–
k^{Se}		0,14	0,17	0,24	0,08	0,25	0,12	–	–	–	–	–	–
$w_j, \%$		5,35	11,70	32,26	13,47	23,94	13,28	–	–	–	–	–	–

Table 5. Payoff matrix: Hurwitz criteria

Income \ Health	Hu_i^P	Hu_i^O	Hu_i^R	Hu_i^T	Hu_i^S					
3,0-19,0	162,22	250,20	216,10	305,32	189,16	277,76	52,27	81,31	115,51	144,95
19,1-35,0	87,98	–	89,22	–	88,60	–	29,04	–	29,44	–
35,1-51,0	149,37	264,81	181,78	376,48	165,58	320,65	61,37	138,26	103,06	210,90
51,1-67,0	115,44	–	194,70	–	155,07	–	76,89	–	107,84	–
67,1-83,0	139,04	170,22	141,20	239,94	140,12	205,08	53,04	84,22	40,74	56,33
83,1-95,0	31,18	–	98,74	–	64,96	–	31,18	–	15,59	–

Table 6. Risk matrix: Bayes-Laplace's risk criterion and Savage's criterion

Income \ Health	83,0-85,0	85,1-87,0	87,1-89,0	89,1-91,0	91,1-93,0	93,1-95,0	BL'	Sa		
3,0-19,0	21,51	–	0,00	–	17,28	–	5,29	24,75	21,51	102,78
19,1-35,0	–	–	–	0,00	81,27	–	19,46	–	81,27	–
35,1-51,0	0,00	–	44,24	–	36,64	–	23,04	75,61	44,24	206,36
51,1-67,0	–	0,00	162,12	1,98	0,00	–	52,57	–	162,12	–
67,1-83,0	–	89,09	–	–	–	0,00	10,42	11,52	89,09	97,21
83,1-95,0	–	–	–	–	–	8,12	1,08	–	8,12	–
Total	21,51	89,09	206,36	1,98	135,19	8,12	–	–	–	–
$w_j, \%$	5,35	11,70	32,26	13,47	23,94	13,28	–	–	–	–

5. DISCUSSION

The development of inclusive wellness and recreation does not lose its significance in terms of socially oriented market relations. For transition economies, it is important to take into account the fact that the gradual increase in solvency does not solve the issue of equality and inclusiveness of the population in the context of its wellness and organized recreation. In the context of diversification of regional strategies, government support for inclu-

sive activities in the context of capital allocation needs greater justification. Increasing the volume of social investment and, at the same time, reducing their share in the overall investment structure can lead to a disproportionate development of recreational infrastructure. Under these conditions, it is important to systematically regulate the market of recreational services and monitor inclusive policies. Given the above factors, the game-theoretical approach to modeling investment decision-making requires appropriate modifications.

CONCLUSION

Ukraine underestimates the importance of wellness and recreation and tourism. And the ratio of health and recreation expenditures by region and investment per capita indicates that the state is applying an inclusive 2017 approach, but given the lack of funds, it is a rather limited subsidized approach. The hypothesis is partially confirmed, since the distribution of investment by region is fully consistent with the equality principle: in the 3×3 matrix, by most decision-making criteria, investment should be di-

rected to middle-income regions, as happens in practice (more than half – 13 regions, in particular, Dnipropetrovsk, Zaporizhzhia, Kharkiv regions, etc.); the principle of inclusion: relatively significant amounts are directed to the regions whose population has the lowest income levels (Sumy and Ivano-Frankivsk oblasts); the principle of reliability: investing in the highest-income regions (Kyiv and Lviv oblasts) is less risky (by Bayes-Laplace based on risk factor and Savage criteria).

However, in some regions, the situation is contradictory. For example, Vinnytsia and Zakarpattia regions, are in the “low income” cell (with the middle value of sufficient level of population health), but the discrepancy in investment volume in these regions is about 500%. This is despite the fact the Zakarpattia region is traditionally an object for capital investment in the development of recreational infrastructure. Even more paradoxically, in almost all regions of Ukraine, 83% and above of the population perceive their health to be at least sufficient with an overall low income level. Obviously, to understand such contradictions, a more detailed analysis of other factors, first of all, institutional ones, which influence the policy of investment distribution and general socio-economic development of the Ukrainian regions, is needed. Therefore, further research should be devoted to the development of inclusive economic institutions as a basis for eliminating imbalances and positive shifts in the social sphere of the regions.

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REFERENCES

- Altaibayeva, Z., Nurmukhanova, G., & Alimkhanova, R. (2018). Intensive investment activity for the development of recreational areas. *European Research Studies Journal*, XXI(2), 244-255. Retrieved from <https://www.ersj.eu/journal/999>
- Care, R., & De Lisa, R. (2019). Social Impact bonds a sustainable welfare state: the role of enabling factors. *Sustainability*, 11(10), 2884. <https://doi.org/10.3390/su11102884>
- Complete Controller. (2019). *Why investing in recreation facilities is a good idea*. Retrieved from <https://www.completecontroller.com/why-investing-in-recreational-facilities-is-a-good-idea/>
- Ermon, S., Conrad, J., Gomes, C., & Selman, B. (2010). Playing games against nature: optimal policies for renewable resource allocation. In P. Grünwald & P. Spirtes (Eds.), *Proceedings of the 26th Conference on Uncertainty in Artificial Intelligence*. Catalina Island, California: AUA Press. Retrieved from http://www.cs.cornell.edu/gomes/papers/UAI2010_ermon-et-al.pdf
- Global Wellness Institute. (2018). *Global wellness tourism economy*. Retrieved from https://global-wellnessinstitute.org/wp-content/uploads/2018/11/GWI_GlobalWellnessTourismEconomyReport.pdf
- Global Wellness Institute. (2019). *What is wellness tourism?* Retrieved from <https://globalwellnessinstitute.org/what-is-wellness/what-is-wellness-tourism/>
- Heywood, J. L. (1993). Game theory: A basis for analyzing emerging norms and conventions in outdoor recreation. *Leisure Sciences*, 15(1), 37-48. <https://doi.org/10.1080/01490409309513185>
- Hurwicz, L. (1951a). The generalized Bayes minimax principle: A criterion for decision making under uncertainty. *Cowles commission discussion paper: Statistics*, 355. Retrieved from <https://cowles.yale.edu/sites/default/files/files/pub/cdp/s-0355.pdf>
- Hurwicz, L. (1951b). Optimality criteria for decision: Making under ignorance. *Cowles commission discussion paper: Statistics*, 370. Retrieved from <https://cowles.yale.edu/sites/default/files/files/pub/cdp/s-0370.pdf>
- Laplace, Marquis de, P. S. (1820). *Théorie analytique de probabilités* (edition troisième). Courcier, Paris. The introduction (Essai philosophique sur les probabilités). Is available in English in *A Philosophical Essay on Probabilities* (1951). New York: Dover Publications. Retrieved from https://bayes.wustl.edu/Manual/laplace_A_philosophical_essay_on_probabilities.pdf
- Mandic, A., Mrnjavac, Z., & Kordic, L. (2018). Tourism infrastructure, Recreational Facilities and Tourism Development. *Tourism and Hospitality Management*, 24(1), 41-62. <https://doi.org/10.20867/thm.24.1.12>
- Ministry of Economic Development and Trade of Ukraine. (2017). *Sustainable Development Goals: Ukraine. National Baseline Report*. Retrieved from https://mfa.gov.ua/mediafiles/sites/poland/files/Sustainable_Development_Goals_Ukraine.pdf

13. Optum, Ink. (2017). *Wellness transformation*. Retrieved from https://www.optum.com/content/dam/optum3/optum/en/resources/white-papers/WF407087_Wellness_Transform_Serxner_WP_V10.pdf
14. Organization for Economic Co-operation and Development. (2016). *OECD Investment Policy Reviews: Ukraine 2016*. Paris: OECD Publishing. <https://doi.org/10.1787/9789264257368-en>
15. Papadimitriou, C. H. (1985). Games against nature. *Journal of Computer and System Sciences*, 31(2), 288-301. [https://doi.org/10.1016/0022-0000\(85\)90045-5](https://doi.org/10.1016/0022-0000(85)90045-5)
16. Pataki, B. (1996). A critique of some classical theories of decisions under uncertainty. *Periodica polytechnica, social and management sciences*, 1(4), 79-92. Retrieved from <https://pp.bme.hu/so/article/view/6518/5623>
17. Patni, A. (2019). *Why the wellness economy is ripe for investments*. Retrieved from <https://www.linkedin.com/pulse/why-wellness-economy-ripe-investments-arhant-patni>
18. Petrusenko, M. (2012). Economic games against nature: the potential environmental conflicts in Ukraine. Proceedings of *The XXIII International scientific and practical conference. Modern trends of scientific thought development* (pp. 118-121). London: IASHE. Retrieved from <http://gisap.eu/ru/node/6788>
19. Petrusenko, M. M., & Shevchenko, H. M. (2013). Management of ecological-economic conflicts in the context of the optimal mechanisms theory for the resources allocation. *Actual Problems of Economics*, 3, 186-192. Retrieved from https://www.researchgate.net/publication/287596604_Management_of_ecological-economical_conflicts_within_the_framework_of_the_theory_of_optimal_mechanisms_for_resource_distribution
20. Pine, B. J. II, & Gilmore, J. (1998). Welcome to the Experience Economy. *Harvard Business Review, July-August*, 97-105. Retrieved from <https://hbr.org/1998/07/welcome-to-the-experience-economy>
21. Reimers, N. F. (1990). *Prirodopolzovaniye: slovar-spravochnik [Natural Resources Management: Dictionary-Reference]* (p. 639). Moscow: Mysl'.
22. Richardson, A. K. (2012). Investing in public health: barriers and possible solutions. *Journal of Public Health*, 34(3), 322-327. <https://doi.org/10.1093/pubmed/fds039>
23. Savage, L. J. (1951). The theory of statistical decision. *Journal of the American Statistical Association*, 46, 55-67. <https://doi.org/10.1080/01621459.1951.10500768>
24. Simmons, D., & Moore, K. (2016). Recreation. In J. Jafari & H. Xiao (Eds.), *Encyclopedia of Tourism* (p. 777). Zurich: Springer. <https://doi.org/10.1007/978-3-319-01384-8>
25. Sobhee, S. K., Ramessurb, R., & Bhukuth, A. (2017). A game theory approach to fishers' strategic behavior vis-à-vis hotel-based water sports operators – The case of the Balaclava Marine Park project in Mauritius. *Ocean & Coastal Management*, 149, 210-216. <https://doi.org/10.1016/j.ocecoaman.2017.06.009>
26. State Statistics Service of Ukraine. (2019). *Kapitalni investytsii za vydamy aktyviv za 2010–2018 [Capital investment by type of assets for the years 2010–2018]*. Retrieved from <http://www.ukrstat.gov.ua/>
27. State Statistics Service of Ukraine. (2017). *Ukraine households self-perceived of their income*. Retrieved from <http://www.ukrstat.gov.ua/>
28. State Statistics Service of Ukraine. (2018a). *Regions of Ukraine* (p. 315). Retrieved from http://www.ukrstat.gov.ua/druk/publicat/kat_u/2018/zb/11/zb_ru1ch2018.pdf
29. State Statistics Service of Ukraine. (2018b). *Population's self-perceived of health status and availability of selected types of medical aid*. Retrieved from <http://www.ukrstat.gov.ua/>
30. State Statistics Service of Ukraine. (2018c). *Sotsialno-ekonomichne stanovyshche rehionu (po kozhnomu rehionu okremo) [The socio-economic situation of the region (for each region separately)]*. Retrieved from <http://www.ukrstat.gov.ua/>
31. Sturges, H. A. (1926). The choice of a class interval. *Journal of the American Statistical Association*, 21(153), 65-66. <https://doi.org/10.1080/01621459.1926.10502161>
32. The Verkhovna Rada of Ukraine. (2002). *Zemelnii kodeks Ukrainy [The Land Code of Ukraine]*. Retrieved from <https://zakon.rada.gov.ua/laws/show/2768-14/print>
33. United Nations (2019a). *The Sustainable Development Goals Report*. Retrieved from <https://unstats.un.org/sdgs/report/2019/The-Sustainable-Development-Goals-Report-2019.pdf>
34. United Nations. (2019b). *UN secretary-general's Roadmap for financing the 2030 Agenda for sustainable development 2019-2021*. Retrieved from https://www.un.org/sustainabledevelopment/wp-content/uploads/2019/07/EXEC.SUM_SG-Roadmap-Financing-SDGs-July-2019.pdf
35. Wald, A. (1945). Statistical decision functions which minimize the maximum risk. *The Annals of Mathematics*, 46(2), 265-280. Retrieved from <https://www.jstor.org/stable/1969022?seq=1>
36. Wilson, K. (2014). *New Investment Approaches for Addressing Social and Economic Challenges* (OECD Science, Technology and Industry Policy Papers, No. 15). Paris: OECD Publishing. <https://doi.org/10.1787/5jz2bz8g00jj-en>
37. World Bank. (2013). *Inclusion matters. The foundation for shared prosperity. New Frontiers of Social Policy*. Retrieved from http://siteresources.worldbank.org/EXTSOCIALDEVELOPMENT/Resources/244362-1265-299949041/6766328-13299437-29735/8460924-1381272444276/InclusionMatters_AdvanceEdition.pdf
38. World Health Organization. (2006). *Constitution of the World Health Organization*. Retrieved from https://www.who.int/governance/eb/who_constitution_en.pdf
39. Yamey, G., Beyeler, N., Wadge, H., & Jamison, D. (2016). *Investing in health: The economic case*. Doha, Qatar: World Innovation Summit for Health. Retrieved from https://www.wish.org.qa/wp-content/uploads/2018/01/IMPJ4495_WISH_Investing_in_Health_WEB.pdf

APPENDIX A

Table A1. Absolute and relative income and health indicators, by regions of Ukraine, 2017

Source: Calculated by the authors on the basis of data of State Statistics Service of Ukraine from site ukrstat.gov.ua

Region	Population, ths.	Population.% (to the total population)	All disease cases, per 100,000 persons	Disposable personal income, UAH	Satisfactory income level, %	Satisfactory health, %
Autonomous Republic of Crimea	–	–	–	–	–	–
Vinnitsia	1575,808	3.99	64774	45436,2	16.7	87.7
Volyn	1038,457	2.63	68439	38514,0	64.2	90.0
Dnipropetrovsk	3231,140	8.19	89078	57332,5	54.9	89.2
Donetsk	4200,461	10.65	60407*	25278,4	46.1	87.6
Zhytomyr	1231,239	3.12	63872	42683,9	75.1	86.4
Zakarpattia	1258,155	3.19	58744	33891,1	5.9	87.8
Zaporizhzhia	1723,171	4.37	58462	54261,0	44.6	88.1
Ivano-Frankivsk	1377,496	3.49	84711	40579,5	3.6	91.3
Kyiv	1754,284	4.45	77297	50664,4	85.3	93.1
Kirovohrad	956,250	2.42	63815	42226,8	80.4	93.6
Luhansk	2167,802	5.49	53859*	16416,4	69.0	85.9
Lviv	2529,608	6.41	76943	44981,0	84.7	94.3
Mykolaiv	1141,324	2.89	66072	45355,7	43.0	91.2
Odesa	2383,075	6.04	68196	50111,1	60.0	91.7
Poltava	1413,829	3.58	54425	48663,0	67.0	92.1
Rivne	1160,647	2.94	75218	40325,4	50.5	93.0
Sumy	1094,284	2.77	52914	45852,3	14.6	83.5
Ternopil	1052,312	2.67	68489	36203,8	21.3	92.0
Kharkiv	2694,007	6.83	66265	48370,4	47.0	88.9
Kherson	1046,981	2.65	53909	41695,0	29.0	90.2
Khmelnitskiy	1274,409	3.23	63631	43638,1	59.3	88.1
Cherkasy	1220,363	3.09	64815	41853,5	54.8	85.8
Chernivtsi	906,701	2.30	63265	36214,5	65.8	92.1
Chernihiv	1020,078	2.58	72565	42501,2	35.6	84.4
The city of Kyiv	2934,522	-	85761	118207,6	64.8	93.6
Sevastopol agglomeration	–	–	–	–	–	–
Ukraine	42386,400	100.00	39451,878	–	–	–

Note: * means data at the 2013 level, ** data unavailable.

Table A2. Investment in recreation and wellness by regions of Ukraine

Source: Calculated by the authors based on the State Statistics Service of Ukraine data.

Region	Total investment, ths. UAH	Investment per capita, UAH	Investment in arts, sport, entertainment and recreation, ths. UAH	Investment per capita, UAH	Investment in human health and social work activities, ths. UAH	Investment per capita, UAH	Investment in recreation, health and all other activities per capita, UAH
Autonomous Republic of Crimea	–	–	–	–	–	–	–
Vinnitsia	11080258	7031,48	16631	10,55	571007	362,36	372,91
Volyn	6521652	6280,14	7558	7,28	86933	83,71	90,99
Dnipropetrovsk	40274431	12464,46	51224	15,85	219023	67,79	83,64
Donetsk	15644646	3724,51	23854	5,68	234109	55,73	61,41
Zhytomyr	6926940	5625,99	27280	22,16	123392	100,22	122,38
Zakarpattia	5256509	4177,95	5417	4,31	89832	71,40	75,71
Zaporizhzhia	15069600	8745,27	25779	14,96	206409	119,78	134,74
Ivano-Frankivsk	8972551	6513,67	3475	2,52	208354	151,26	153,78
Kyiv	31019902	17682,37	5447	3,10	247653	141,17	144,27
Kirovohrad	6689544	6995,60	13295	13,90	118706	124,14	138,04
Luhansk	3044550	1404,44	7895	3,64	324791	149,83	153,47
Lviv	22330523	8827,66	120387	47,59	183048	72,36	119,95
Mykolaiv	10137804	8882,49	43174	37,83	140913	123,46	161,29
Odesa	20022721	17543,42	19555	8,21	401597	168,52	176,73
Poltava	15125231	10698,06	8037	5,68	283187	200,30	205,98
Rivne	5713726	4922,88	9019	7,77	116335	100,23	108,00
Sumy	6183660	5650,87	2136	1,95	148168	135,40	137,35
Ternopil	6538504	6213,47	17858	16,97	76629	72,82	89,79
Kharkiv	17968201	6669,69	182904	67,89	453958	168,51	236,40
Kherson	6850024	6542,64	6906	6,60	84603	80,81	87,41
Khmelnytskyi	10139119	7955,94	16728	13,13	157024	123,21	136,34
Cherkasy	7462265	6114,79	16534	13,55	265724	217,74	231,29
Chernivtsi	2836242	3128,09	5154	5,68	87166	96,14	101,82
Chernihiv	6829417	6694,99	14613	14,32	147443	144,54	158,86
The city of Kyiv	124174705	42315,14	814488	277,55	1404685	478,68	756,23
Sevastopol agglomeration	–	–	–	–	–	–	–
Ukraine	412812725	–	1465348	–	6380689	–	–