

REGULATORY POLICY AND OPTIMIZATION OF INVESTMENT RESOURCE ALLOCATION IN THE MODEL OF FUNCTIONING OF RECREATION INDUSTRY*

Hanna SHEVCHENKO¹
Sumy State University, Ukraine

Abstract. *The research objective* is the rationale of the theoretical and methodical approach concerning the improvement of regulatory policy as well as the process of distribution of financial investments using the model of the functioning of a recreational sector of the national economy. *The methodology* of the study includes the use of optimal control theory for the model formation of the functioning of the recreational industry as well as determining the behaviour of regulatory authorities and capabilities to optimize the allocation of investment resources in the recreational sector of the national economy. *Results.* The issue of equilibration of regulatory policy in the recreational sector of the national economy is actualized, including the question of targeted distribution of state and external financial investments. Also, it is proved that regulatory policy should establish the frameworks that on the one hand, do not allow public authorities to exercise extra influence on the economy of recreation, on the other hand, to keep the behaviour of the recreational business entities within the limits of normal socio-economic activity – on the basis of analysis of the continuum “recreation – work” by means of modified Brennan-Buchanan model. It is revealed that even with the condition of the tax reduction, the situation when the population resting less and works more than in the background of a developed economy is observed. However, according to the optimistic forecast, eventually on condition when the economy is emerging from the shade, we will obtain an official mode of the work in which, while maintaining taxes on proposed more advantageous for the population level, ultimately the ratio leisure and work will be established which is corresponding to the principles of sustainable development. *Practical value.* On the basis of methodical principles of the theory of optimal control, the model of the functioning of the recreational industry under the conditions of transitivity of the national economy is developed, particularly includes a component of the management of investment resources. As a part of the proposed model, the peculiarities of the functioning of the recreational sector as a combination of recreational enterprises are explored as well as the factors of a behaviour of relevant regulatory authorities are analysed that can be used in the practical activities of recreational business entities. *Originality.* The paper developed a fundamentally new approach to the analysis of the functioning and management of enterprises in the recreational sector on the basis of economic-mathematical modelling using elements of the optimal control theory. The methodological approach to the rationale of the regulatory policy’s role in establishing optimal points on the continuum “recreation – work” is also improved.

Key words: recreational industry, economic regulatory policy, allocation, investment, model, optimal control theory, Ukraine.

JEL Classification: D72, H76, L83, R53

1. Introduction

The recreational sector of the national economy in Ukraine in conditions of uncertainty and incompleteness of the final stage of formation of the market of recreational services, and the overall impact of socio-political crisis, requires a revision of the state policy towards the industry, particularly in the form of regulative influence, including those regarding the allocation of very limited investment resources. Particularly actual are the issues

of equilibrating the regulatory policy, including the definition of proportions of the state intervention and non-interference in the affairs of the recreational sphere. At the same time, undeniable is a question about the central role of regulatory authorities in determining the directions and objects for the financial investment of the industry, in socially and ecologically oriented directions of sustainable development of the national economy.

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Corresponding author:

¹ Department of Management, Sumy State University.

E-mail: annshev@ukr.net

To the question of recreational activity in its socio-economic aspects devoted are the works of scientists of the Institute for Market Problems and Economic-and-ecological Research under the direction of B. V. Burkynskyi, Council for Ukraine's Productive Forces Studies under the direction of S. I. Dorohuntsov, B. M. Danylyshyn, M. A. Khvesyuk, Institute of Regional Research named after M. I. Dolishniy, V. S. Kravtsiv and so on. Investments in interrelated spheres of recreation, tourism, sports and resort treatment, including their ecological context, are analysed in the works of A. Hadzik, M. Grabara (2014), L. J. Sonter, K. B. Watson, S. A. Wood, and T. H. Ricketts (2016) et al. Regulatory policy issues are explored in the works of I. V. Kolupaev (2013), V. I. Liashenko (2014) and many others. New political economy approaches aimed at forming the rules of the game of economic agents are outlined in the works of A. Breton (1974), G. Brennan, J. M. Buchanan (1980), D. C. Mueller (2002), R. M. Nureev (2005); aimed at the application of the theory of optimal control in studying the features of the social and economic processes – in the works of R. Bellman (1961), N. N. Moses (2003), S. Izmalkov, K. Sonin, and M. Yudkevych (2008) and others. At the same time, questions of modelling the functioning of the recreational industry as well as the behaviour of regulatory authorities concerning the activity of recreational business entities need to be further explored.

Thus, the research objective is a justification of the theoretical and methodical approach concerning the improvement of regulatory policy as well as the process of distribution of financial investments using the model of the functioning of the recreational sector of the national economy. The methodology of the study includes the use of optimal control theory for the model formation of the functioning of the recreational industry as well as determining the behaviour of regulatory authorities and capabilities to optimize the allocation of investment resources in the recreational sector of the national economy. The logic of presentation of research materials as follows: 1) the rationale for an equilibrated approach to regulatory policy in the scope of recreational socio-economic relations; 2) the construction of the model of dynamic of recreational industry in three stages: the functioning of the sector; the determination of behaviour of regulatory authorities; the optimization of investment allocation by the enterprises of the recreational sphere.

2. Regulatory policy of the state in the recreational sector

Economic regulation or government regulation of the economy (primarily fiscal, currency and tax regulation) is caused by the following factors:

- the availability of objective contradictions between public and private forms of ownership and, accordingly, the nature of production and provision of services;

- the availability of public goods, including recreation, and, therefore, the potential of conflict relations for limited resources, by which these benefits are satisfied;
- the inability of the market independently resolve internal problems, generally because of monopolistic tendencies and due to complications of the economic processes with the social and ecological components;
- the necessity to create the prerequisites for a compliance of technical-scientific progress and international competition, etc.

Under the Law of Ukraine “On Principles of Regulatory Policy in Economic Activity” (Zakon, 2004), state regulatory policy in the area of economic activity shall be the direction of state policy aimed at improving legal regulation of commercial relations, as well as administrative relations between regulatory bodies or other state bodies and business entities. The regulatory activity in its turn is seen as an activity aimed at preparing, adopting, monitoring of efficiency and revision of regulatory acts in accordance with the principles of the state regulatory policy (appropriateness, adequacy, effectiveness, balance, predictability, transparency and consideration of public opinion).

In the work (Kolupayeva, 2013), the opinions on the concept and essence of the regulatory policy are generalized, which is examined from the state, legal and economic views. State regulatory policy is defined as “the direction of state policy that envisages the synthesis of legal and economic regulation ... administrative and economic relations between regulatory authorities and other bodies of power and business entities.” It is noted that it is unacceptable to adopt economically inexpedient and inefficient regulatory acts; the main instrument of regulatory policy is tax leverage aimed at stimulating legitimate economic activity.

The known researcher of regulatory processes V. I. Lyashenko (Pershey, 2014: 526) considers a part of the state regulatory policy in small business, in our opinion, the following most complete list of constituents (which certainly are all relevant and on an industry basis, e.g. regarding the recreational entrepreneurship), namely:

- the creation and liquidation of entrepreneurial structures;
- the system of permits on the conduct of certain type of entrepreneurial activities, as well as rules and procedures that govern it;
- the rules and procedures of market entry and exit from it of business entities, its clotting in case of none profitability or inexpediency;
- the mechanisms of regulating the pricing;
- the regulation of employment and use of manpower;
- the modes of taxation of entrepreneurial activity and the mechanisms of control over the payment taxes to the budget;
- the rules on the volumes and procedures for the provision of mandatory statistical, accounting and tax reporting;

- the control on safety and quality of products and services;
- the modes of attraction of loans and investment;
- the modes and mechanisms for stimulating the innovation activity and others.

Generally, the regulatory policy should focus not so much on creation of maximally favourable conditions for economic entities but to establish the equilibrium framework that on the one hand, do not allow public authorities to exercise an extra impact on the economy, on the other hand, hold the behaviour of economic players within the limits of normal socio-economic activity as a prerequisite for long-term development of the national economy.

For the detailed explanation of this approach, we will conduct analyses of continuum “recreation – work” by using a modified model of Brennan-Buchanan (Breton, 1974; Brennan, 1980; McNutt, 2002: 146–148; Mueller, 2002: 380–383; Nureev, 2005: 369–371), Fig. 1.

As of 2017, the “salary” tax in Ukraine is 2 times higher than in European countries; by rating of Paying Taxes Ukraine occupies the 83 place in the world (Zheltukhin, 2016).

Therefore, there is no doubt that the issue of taxation is certainly currently most actual in the context of regulatory policy in our country that directly intersects with the content of the model stated above.

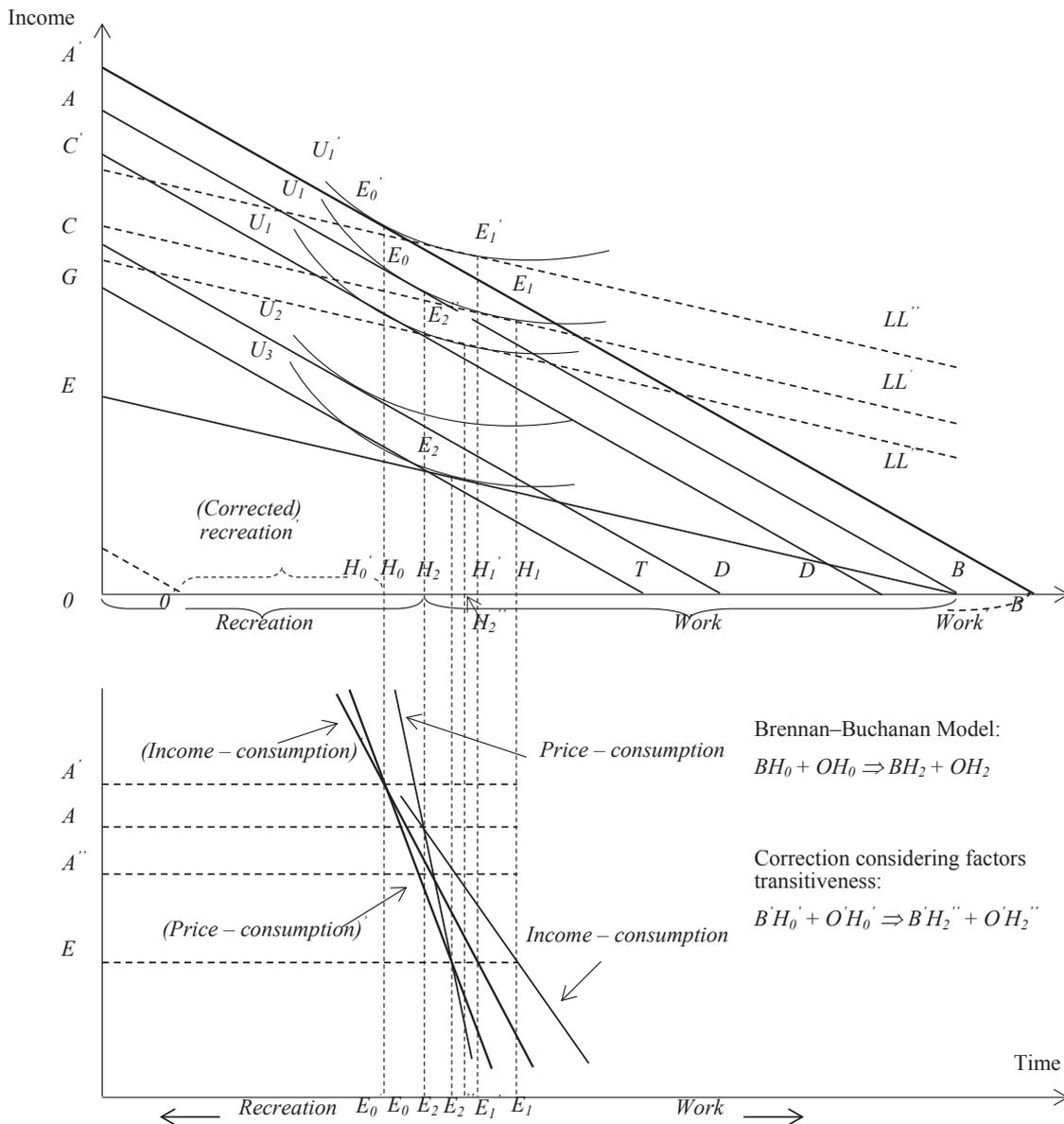


Fig. 1. Rationale for balanced approach to regulatory policy in the plane of recreational socio-economic relations

Source: Developed by the author on the basis on Brennan-Buchanan Model, 1980

Hence, the representatives of the economic theory of public choice G. Brennan and J. M. Buchanan (1980) suggested that the public may limit the actions of the government-monopolist by lowering the tax base.

For a basis, they took the idea of A. Breton (1974) that the government is completely controlled by legislation and at the same time is a monopolist in the production of public goods. In their model, the scientists accentuate on the possibility of restricting the actions of government officials by using the tax laws i.e. the limitation of incomes received by the state.

As of the beginning of 2017, as well throughout the years of independence of our state, the question of taxes reduction for the Ukrainians rises. Reasonably, the theoretical question arises of how low these taxes can be in general, not being attached to a specific country and how it can affect the correlation of such benefits as work and leisure. According to (Nureev, 2005: 369–370), assuming that the marginal taxes have a linear character, and then ideal prerequisites for taxation are the following factors:

- the “work” and “leisure” is the normal benefits that are mutually substituted;
- the population maximizes the utility within budgetary limitations, if it is relevant, comparing time on labour and time for rest;
- the public expenditures are the transfers that are directed in favour of the taxpayers;
- the balanced budget exists, in which the taxes are allocated between the public authorities (“bureaucrats”, i.e. the public servants) and the recipients of transfer payments.

First, consider the how the model works according to given factors. By abscissa axis, let's defer the total time of an individual, including the time on labour and time for rest. (Note that overall tendencies and results obtained based on the model in Fig. 1, can be transferred to macrolevel through their prior aggregation, taking into account an individual unified, that is a unit of population). By ordinate axis, let's defer the income of the individual. Then AB is a budgetary limitation, the point E_0 on the line AB is the status quo of an individual in terms of the time distribution on working time (BH_0) and leisure time (OH_0). The line CD ($CD \parallel AB$) reflects the perfect tax. EB is a budget line of a higher marginal tax ($(AE / AO) > (AC / AO)$). Then points E_0 and E_2 are optimal for the population (in the case of marginal tax – E_0 and E_3 respectively).

The population chooses the perfect tax with less distorted tax base because of indifference curves are $U_2 > U_3$. Recall that the model of G. Brennan and J. M. Buchanan in the context of the analysis the dynamics of correlation “working time – leisure time” demonstrates not so much taxation as a financial tool and process, but as part of a regulatory policy that reflects the conflictual relationship of taxpayers and public bodies that distribute these taxes are not always

properly from the standpoint of population. Thus, according to this thesis, the regulatory body in order to maximize the budget will raise the tax to AG , as soon as the population will be ready to reduce the utility to U_3 (respectively, the marginal tax will be installed at the level AE / AO). As a result, the optimum point (in our interpretation – a point of status quo) will shift from E_0 to E_2 .

If the regulatory body will introduce the undistorted tax simultaneously, the budget line EB will shift in position LL' , and the optimal point from E_2 to E_1 respectively. Distance E_0E_1 corresponds to the effect of substitution and E_0E_2 – to the effect of income. Since the $E_0E_1 > E_0E_2$ (the curve “price – consumption” will pass through the projection of points E_0 and E_2 , and the curve “income – consumption” – through the points E_0 and E_1) then working hours will be reduced from BH_0 to BH_2 ($E_0E_1 - E_0E_2 = H_0H_2$). That is, at higher taxes the population will reduce their working hours on the value E_1E_2 , which eventually will cause a decline in tax payments.

Now proceed to provisions which, in our opinion, require to make certain changes to the specified model in order to obtain additional results of analysis of correlation “work – rest” taking into account the national socio-economic specifics, namely:

- if to consider the situation depicted in accordance with the description above to Fig. 1, in the context of the current state of recreational relations in Ukraine as a state with transitive economy and high level of shadowing of socio-economic processes, then it not displayed the proportion of time that is not fixed in a direct relationship with the official incomes of the population;

- similarly, the level of income taxation of the population that at present is topical in Ukraine, in theory, can be changed in the direction desirable for the population, that it is likely to facilitate the process of taxation, not its complication as it has shown in Fig. 1.

Thus, according to these two provisions, let's display the following amendments in Fig. 1:

- AB is displaced in $A'B'$, because the parts of the income of the population are not official and therefore the time spent to work is not officially counted. Accordingly, LL' is shifted to LL'' . We obtain new optimization points that lie on the indifference curve U_1' : E_0' and E_1' ;

- at the same time, we reduce tax loading: CD is shifted to the right to $C'D'$. We obtain E_2'' – the point of intersection the indifference curve U_1'' and the budget line LL''' .

Projecting the points E_0', E_2'', E_1' on the time axis, we get a situation in which the substitution effect exceeds the income effect ($E_0'E_1' > E_0'E_2''$), as in the original model formulation ($E_0E_1 > E_0E_2$).

However, even with the condition of tax reduction ($CD \Rightarrow C'D'$), we observe a situation where the

population is resting less than in the background of developed economy: $O'H_2'' < OH_2$, but employs over: $H_2''B' > H_2B$; despite the fact that officially works less by the amount BB' , from which taxes are not paid.

However, according to the optimistic forecast, eventually on condition when the economy is emerging from the shade (in general terms, a switch from the transitive to developed status) we will obtain official mode of the work in which, while maintaining taxes on proposed more advantageous for the population level, ultimately the ratio leisure and work will be established, which is corresponding to the principles of sustainable development and the conditions of a healthy lifestyle.

3. The model of functioning of the recreational sector of the national economy

The investment in the recreational sector in Ukraine as of 2015 is virtually absent in absolute terms and in relative terms – compared to the industries of production sector (Table 1).

Table 1

The percentage of investment to the recreation in Ukraine in the structure of economic activity at the end of 2015*

Type of economic activity	The volume of foreign direct investment (equity), million USD	The structure of investment, %
Total	43371,4	100,0
Agriculture, forestry and fishing	500,6	1,2
Industry	13280,1	30,6
Education	10,7	0,0
Healthcare and social assistance provision	46,2	0,1
Arts, sports, entertainment and recreation	117,4	0,3
Other types (transport, trade, finance etc.)	29416,4	67,8

*Compiled based on the (Ukrayna, 2005: 186)

One of the major factors that explain the low activity of investors and the lack of wide national program of investment in recreation is the imperfection of mechanism for the distribution of investment resources, which, in turn, is linked to the stochasticity of transformational process in the recreational sector and disequilibrium of the behaviour of relevant regulatory bodies of the state.

The model of the recreational sector dynamics in general form (based on the recommendations in the works of Moiseev, 2003: 248–253; Bellman, 1961; Izmalkov, 2008) can be represented by following way, namely, in three stages: the functioning of the

recreational sector, behaviour of regulatory authorities regarding recreational business entities, allocation of investment recreational resources.

The functioning of the sector. Consider the recreational industry in certain territorial limits (across the country, some regions, one region separately given area, etc.) as a socio-economic system, which includes N of recreational enterprises, dynamic state of each of them (stability, sustainable development, survival, etc.) is denoted by the vector ri . Construct the system of differential equations:

$$\dot{r}_i = f_i(v_i, u_i, m_i(u_i), \xi_i), \quad (1)$$

where $i = 1, \dots, N$;

$v_i(t)$ – state and/or external financial investments of i -th recreational enterprise the direction of which is carried out by a coordination of contest of projects for the development of recreation, million UAH;

$(v_1, \dots, v_N) \in G_v$ – the volume of financial investments limited at the time of the contest by the magnitude G_v , million UAH;

u_i – the vector of management of the recreational enterprise (a set of managerial organizational-economic, administrative and socio-psychological instruments), $u_i \in R_{ui}$, where R_{ui} – the managerial potential of i -th recreational enterprise (the ability to conduct an effective management, using human and social potentials of human resources and making possible impact to external constraints);

$m_i(u_i)$ – the incentives that motivate i -th recreational enterprise to a socially and ecologically equilibrated activity (such as privileged taxation, interest-free lending, etc.), $\{m_1(u_1), \dots, m_N(u_N)\} \in G_m$, where G_m – the state budget constraints that may be aimed at stimulating the equilibrated recreation;

$\xi_i(t)$ – some random function of time that is explained firstly, by the impact of a human factor on the course of any socio-economic processes, especially such as recreation, where the social component has a high significance. Secondly, by multilevel of recreational processes realization and managing them, as well as the relevant information asymmetry. Third, by instability and availability of crisis phenomena in the development of macroeconomics, politics, international relations, etc. that may have at least an indirect and sometimes direct impact on the functioning of the recreational sector of the national economy.

The levels of awareness of the state and enterprises of the recreational sector concerning values $\xi_i(t)$ are different, hence $\xi_i \in R_\xi$, where R_ξ – amount of information on strengths and weaknesses, opportunities and threats of its activities, which has i -th recreational enterprise; $\xi_i \in G_\xi$, where G_ξ – the total scope of all recreation relevant information held by the relevant public authority. It is clear that $R_\xi \neq G_\xi$.

Given the above, an entity of the recreational business will manage its activities in this way, including the

responding to the impact from the side of the state in order to maximize the functional:

$$J_i = \int_0^{T_i} F_i(r_i, u_i, v_i, m_i(u_i), \xi_i, t) \partial t. \quad (2)$$

Equation (2) is the problem of optimal control. Herewith operation F_i over ξ_i can be approximated operation of mathematical expectation or operation of minimization, i.e.:

$$F_i = \min_{\xi_i \in R_i} \widehat{F}(r_i, u_i, v_i, m_i(u_i), \xi_i, t). \quad (3)$$

The behaviour of regulators. The regulatory authorities, on the basis of the foregoing constraints, have the following possibilities to influence on some recreational enterprises and industry in general:

- to distribute the investments v_i within their total volume G_v ;
- to form a motivational mechanism and some motivational instruments that are displayed in the character of functions $m_i(u_i)$;
- to determine the structure and strength of impacts on management opportunities on actors of the recreational business R_u .

Accordingly, the objective function of regulatory authorities regarding the functioning of the recreational sector can be written as follows:

$$J = \int_0^T F(r_1, \dots, r_N, u_1, \dots, u_N, v_1, \dots, v_N, m_1(u_1), \dots, m_N(u_N), \xi_1, \dots, \xi_N, t) \partial t. \quad (4)$$

Provided a transparent regulatory policy the values r_i and u_i will be some operators from $v_i(t)$, m_i and ξ_i , i.e.

$$J^* = \int_0^T F^*(v_1, \dots, v_N, m_1, \dots, m_N, \xi_1, \dots, \xi_N, t) \partial t. \quad (5)$$

In the equation (5), as in previous equations (1–4) the random factor ξ_i is present because recreation as a socio-economic process cannot be fully managed, especially in transitivity conditions that are strengthened by the scale crisis situations in almost all aspects of society life.

An approximation of the stochastic factor to determined factor is required: the rule of formalization the parameter ξ_i should be regulated in a certain way. Thus, according to the principle of foresight prediction (denoted as Q), we can assume the possibility of optimization of the state regulation and better coordination of joint action of the state and of the recreational business, for example, in the form of public-private partnerships and so on. Accordingly, a certain possibility arises to mathematically formalized stochastic factor in the equation presented above, for example, through the operation of mathematical expectation or the operation of minimization (similar to the equation 3). Then the functional (5) can be written as follows:

$$J^* = \min_{\xi_i \in Q} \int_0^T F^*(v_1, \dots, v_N, m_1, \dots, m_N, \xi_1, \dots, \xi_N, t) \partial t. \quad (6)$$

The allocation of investment recreational resources. Subject to the relative elimination of the randomness factor in decision-making by regulators (in terms of collegial

discussion and general conduct of public tenders) regarding the distribution of financial investment resources among the enterprises of the recreational sector that are planning to implement their socially oriented and cost-effective projects simultaneously, – the objective function of operation of the recreational sector (according to the concept of sustainable development in Ukraine) is reduced to the determination of vector and the implementation of effective management of $u_i(t)$ and, therefore, appears in the form of the first equation (second equation is a limitation of the objective function) in the following system:

$$\left\{ \begin{array}{l} J_i = \int_0^{T_i} F_i(r_i, u_i, v_i, t) \partial t \\ r_i = f_i(r_i, v_i, u_i, t), u_i \in R_{u_i} \end{array} \right. \quad (7)$$

4. Conclusions

So, as a result of conducted research, the following conclusions can be made. Firstly, the issue of equilibration of regulatory policy in the recreational sector of the national economy is actualized, including the question of targeted distribution of state and external financial investments. Secondly, it is proved that regulatory policy should establish the frameworks that on the one hand, do not allow public authorities to exercise extra influence on the economy of recreation, on the other hand, to keep the behaviour of the recreational business entities within the limits of normal socio-economic activity – on the basis of analysis of the continuum “recreation – work” by means of modified Brennan-Buchanan model. It is revealed that even with the condition of the tax reduction, the situation when the population rests less and works more than in the background of the developed economy is observed. However, according to the optimistic forecast, eventually on condition when the economy is emerging from the shade, we will obtain official mode of the work in which, while maintaining taxes on proposed more advantageous for the population level, ultimately the ratio leisure and work will be established, which is corresponding to the principles of sustainable development. Thirdly, on the basis of methodical principles of the theory of optimal control, the model of the functioning of the recreational industry under the conditions of transitivity of the national economy is developed, particularly includes a component of the management of investment resources. As a part of the proposed model, the peculiarities of the functioning of the recreational sector as a combination of recreational enterprises are explored as well as the factors of behaviour of relevant regulatory authorities are analysed. *Further developments* will be devoted to issues of the implementation of competition policy as well as state investment policy in the recreational sector of the national economy.

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Анна ШЕВЧЕНКО**РЕГУЛЯТОРНАЯ ПОЛИТИКА И ОПТИМИЗАЦИЯ РАСПРЕДЕЛЕНИЯ ИНВЕСТИЦИОННЫХ РЕСУРСОВ В МОДЕЛИ ФУНКЦИОНИРОВАНИЯ РЕКРЕАЦИОННОЙ ОТРАСЛИ**

Аннотация. Целью исследования является обоснование теоретико-методического подхода к усовершенствованию регуляторной политики, а также процесса распределения финансовых инвестиций с помощью модели функционирования рекреационной отрасли национальной экономики. *Методология исследования* включает применение теории оптимального управления для формирования модели функционирования рекреационной отрасли, а также определения поведения регуляторных органов и возможностей оптимизации распределения инвестиционных ресурсов в рекреационном секторе национальной экономики. *Результаты.* Актуализирован вопрос уравниваемости регуляторной политики в рекреационной отрасли национального хозяйства, в том числе и в отношении целевого распределения государственных и внешних финансовых инвестиций. Также доказано, что регуляторная политика должна устанавливать рамки, которые, с одной стороны, не позволяют государственным органам осуществлять излишнее влияние на экономику рекреации, а с другой стороны, удерживают поведение субъектов рекреационного бизнеса в пределах нормальной социально-экономической деятельности – на основе анализа континуума "рекреация – труд" с помощью модифицированной модели Бреннана–Бьюкенена. Выявлено, что даже при снижении налогов наблюдается ситуация, когда население отдыхает меньше, а работает больше, чем в условиях развитой экономики. Однако согласно оптимистическому прогнозу, со временем при условии выхода экономики из тени можно получить официальный режим работы, в котором при сохранении налогов на предложенном более выгодном для населения уровне наконец-то установится соотношение отдыха и труда, отвечающее принципам устойчивого развития общества. *Практическое значение.* На основе применения методических положений теории оптимального управления разработана модель функционирования рекреационной отрасли в условиях транзитивности национальной экономики, которая, в частности, включает компоненту управления инвестиционными ресурсами. В рамках предложенной модели исследованы особенности функционирования рекреационной отрасли как совокупности рекреационных предприятий, а также проанализированы факторы поведения соответствующих регуляторных органов, что может быть использовано в практической деятельности субъектов рекреационного бизнеса. *Оригинальность.* В работе разработан принципиально новый подход к анализу функционирования и управления предприятиями рекреационной отрасли на основе экономико-математического моделирования с использованием элементов теории оптимального управления. Также усовершенствован методологический подход к обоснованию роли регуляторной политики в установлении оптимальных точек на континууме "отдых – рабочее время".