Universal Journal of Industrial and Business Management 2(5): 111-118, 2014 http://www.hrpub.org
DOI: 10.13189/ujibm.2014.020501

Economic Growth, Welfare and Institutional Changes: Game and Aggregate Model

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Abstract The problem of economic growth and the impact on him of institutional change is considered in the paper. In the institutional change framework the mechanism of how a change of rules influences on the agents welfare is shown. An aggregated economic model of the system development depending on the initial standard of living, rates of consumption and resources depletion is represented. The model of economic growth, taking into account the institutional changes of the system shows the impact of these changes on the welfare of agents on the example circuit of chess. Example with the game of chess is a scheme to study the impact of institutional changes on the overall dynamics of the economic system, the interaction of agents and distribution of wealth. Basic mathematical equations are obtained based on a graphical representation of the reactions of agents in the game for a variety of options for their interaction. Such "game" schemes are usually not reflected in the classical models of aggregate economic growth is not taken into account the impact of these institutions. In the proposed scheme, the economic changes in the game model , as well as in the aggregate model of economic growth , representing a theoretical model shows the influence of institutional settings on the growth of the economic system.

Keywords Institutional Change, Economic Growth, Welfare, Aggregate Model; The Speed and Frequency of Economic Change, Effect of Chess Game

JEL: B52 D02 E02 E11 I31 O43.

1. Introduction

Far from always economic growth brings life relief to the population, causes satisfaction, and provides easing of social burden. In economic history there are cases when economic growth was accompanied by inequality increase. The similar situation is described by the so-called S. Kuznets's curve. However, situations when existence conditions of the given curve are broken are possible, and S. Kuznets's regularity is not observed on these or those intervals of social and economic development (Kuznets, 1971, 1989). In particular, the data on developing countries presented by A.Sen show that income distribution uniformity created in the economy influences the social results of the development greatly (Sen, 1997).

According to quantitative and qualitative parameters the basic characteristics of economic growth in the 20th century were reduced to the following: 1) high increment rate (per capita production), labor productivity, and besides quick changes in the economy structure, society and ideology; 2) qualitative changes - expansionist character of the growth at the expense of technologies transfer and growth limitation, that is, presence of this phenomenon in the most developed countries, while 75 % of the population of the earth do not reach a minimum essential standard of living.

Speaking about economic growth factors, it is important to note four major economic systems, the conditions of which define both the quality of economic growth, the meaning of structural changes and growth rate. They are: technological system presented by real sectors and technological level of economy; financial system; institutional system including laws, rules and models of behavior, regulations; social system or society's structure, defining the level, the quality and the lifestyle of the country's population, direction and potential of human capital development, forming consumers' preferences, defining demand, state of health and qualification. These parameters define the possibilities of economic growth and its quality.

It is especially desirable to notice, that institutional changes, being the results of technological progress and management, change economy greatly and define the stylistics of the development and economic growth. Moreover, the known criteria of well-being, V.Pareto-efficiency, the ones of N.Kaldor-J.Hicks, T.Scitovsky, A.Sen (Kaldor, 1939, Hicks, 1939, Scitovsky, 1973, Sen, 1997), are formulated for static conditions, when institutions do not change, but in practice the change of rules alters the income distribution, changes the exchanges character between the agents at micro-level and can't but count in macroeconomic scale, including the results of economic growth: the rate and qualitative parameters.

The present study is important in the sense that it allows you to show the impact of institutional changes on the welfare of the economic system, to change the criteria of well-being, as well as demonstrate the dependence of economic growth on the institutional changes in the most general aggregate model.

The article develops a model under welfare economics, which takes into account the impact of changes on the welfare system and economic growth, and also shows the aggregate growth model of the system, taking into account the reaction of agents (subsystems) that have different baseline levels of intellectual capital (institutional factors)

Welfare economics is a branch of economic science, which develops approaches for assessing the economic well-being, prosperity, prosperity, social system, allows you to build analysis in evaluating the cost-effectiveness of the final distribution of assets (resources, income) and growth of the system.

Net economic welfare (NEW) - macroeconomic indicator that takes into account the change of social welfare under the influence of factors that are not reflected in the GDP figures. Such factors include general economic activity, voluntary work, help neighbors, charitable activities, activities in the shadow economy, free time, leisure, pollution, etc. (In 1972, the American professor William Nordhaus and James Tobin suggested the figure).

Under the economic well-being refers to the real incomes of the agents, regardless of their reflection in the official statements. considered in the theoretical model - it benefits the two agents with different abilities to play the game in a changing institutions.

2. Institutional Change and Economic Welfare

We will demonstrate the model of institutional changes on the example of chess game in which a grand master and a “second-rated athlete” take part. Other things being equal, when the rules of the game are clear and known to both players, the probability of the grand master’s victory is very high, as he possesses the better level of attainment, knowledge of the chess theory and wider experience. In other words, if we use economic vocabulary, the intellectual capital of the grand master is considerably higher than the second-rated athlete’s. However, if in the course of the game there will be a change of game rules the probability of the grand master’s victory, as the general result of the game, will be steadily reducing and will depend on the rules themselves and the frequency of rules change. Eventually, the variant when this probability is equal to zero is possible, that is, the grand master will not gain the victory (drawn game), or will lose the game to the player with lower intellectual capital, practice and knowledge of chess game (Sukharev, 2011).

Thus, at high frequency of rules change the grand master can lose the game to “the second rate”. Hence, knowledge, practice, and intellectual capital lose their value as a factor of production and competitive rivalry and depreciate at high rate of institutional changes, as well as with the absence of reasoning and logic inconsistence (when there is no expediency and logic or target adequacy). The result is the competitive winning of the weakest agent which seems to have to obviously lose at such provision with the factor. The present effect is coordinated with the effect of hyper-selection known in the evolutionary economy, but is just provided by the institutional changes characteristics. That is why, it is possible to assert, that high speed of changes in economy - reorganization, modernizations, application of new rules, regulations and laws are directly the anti-innovative factor of its development as it creates the condition of the unpredictable winning for the agent who was not able and should not have won the game under condition of rules system available at the initial point of time.

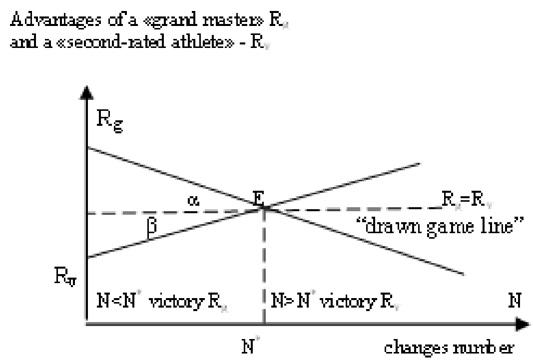

Figure 1. Model of chess game effect

In Figure 1 the model-scheme of chess game effect is presented. Certainly, economists should be interested in the case when with the game rules change “second-rated athlete” wins as the winning of the grand master is quite predicted for the obvious advantage according to intellectual capital (the level of health of players is accepted as equal, which is an obvious model simplification, by the way). Hence, it is necessary to consider the rules change bringing advantages increase for “second-rated athlete”, that is R_v. Generally, it does not mean at all, that as a result of such changes the advantages of the grand master should necessarily be reduced, that is, that curve R_g is not necessarily falling. It can be parallel to X-axis, or have a positive slope and crosses the X-axis in point N^* considerably more to the right. It will only expand the advantages zone of the grand master. X-axis corresponds to the changes number of game rules. Of course, there are two serious assumptions in the model: 1) the content of changes and its qualitative main body is not estimated (it is characteristic of the similar models of supply and demand); 2) there is a dependence between the number of changes at a time unit (frequency of changes) and the advantages of “grand master” and “second-rated athlete” which is accordingly reflected by curves R_g and R_v. We will consider, that rules changes allow the advantages growth for the “second-rated athlete”. Otherwise his victory is blocked by the advantages of the grand master which cannot be overcome. At such assumptions it is necessary to specify, that one-time change of rule subject to the quality and content of this change can at once lead to “grand master’s” defeat, or some similar discrete changes can cause the same result. In such case the situation will not be described by the designated curves (Sukharev, 2011).

When the number of game rules changes is insignificant, as it is seen from the Figure, the grand master’s advantage is obvious and ends with a victory more to the left of point N^*, if more to the right of this point, then the “second-rated athlete” wins, and in point N^* there is “drawn game” as the advantages are equal $R_g = R_v$. We will understand the number of game rules changes, carried out during the period from the beginning of the game up to its termination owing to the victory of one of the players or an objective drawn game, as the change frequency. Then, on the basis of the Figure and introduced signs, it is possible to write down:

$$\frac{\partial R_g}{\partial t} = \frac{\partial R_v}{\partial t} + (tg\alpha + tg\beta)\frac{\partial (N^* - N)}{\partial t}$$

In consideration of $N^* = \text{const}$, $\alpha \neq f(t)$ $\beta \neq f(t)$

$$\frac{\partial R_g}{\partial t} = \frac{\partial R_v}{\partial t} - (tg\alpha + tg\beta)\frac{\partial N}{\partial t} = \frac{\partial R_v}{\partial t} - n(tg\alpha + tg\beta)$$

whence

$$n = \frac{1}{tg\alpha + tg\beta}\left[\frac{\partial R_v}{\partial t} - \frac{\partial R_g}{\partial t}\right]$$

If $R_g = 0$, then $\frac{\partial R_v}{\partial t} = (tg\alpha + tg\beta)n$, that is, the advantage change of “second-rated athlete” is proportional to the change frequency of game rules where proportionality coefficient (k) is the advantages response of the “grand master” and the “second-rated athlete” to the change frequency of game rules: $\frac{\partial R_v}{\partial t} = kn, k = (tg\alpha + tg\beta)$.

As we see, institutional changes are defined by:

- Quality (content)
- Velocity (frequency)
- Adaptability potential of agents and institutes

The typical model when the benefits of the grand master are reduced and the benefits of the “second-rated athlete” increase was considered above. However, the following variants of system’s functioning are possible:

1) the benefits of the grand master are reduced, the benefits of the “second-rated athlete” are invariable at the same level, or the benefits of the grand master are invariable, and the benefits of the “second-rated athlete” increase with the growth of institutional changes in a time unit;
2) the benefits of the grand master increase when the benefits of the “second-rated athlete” are invariable or reduced;
3) the benefits of both the grand master and the “second-rated athlete” grow or decrease simultaneously.

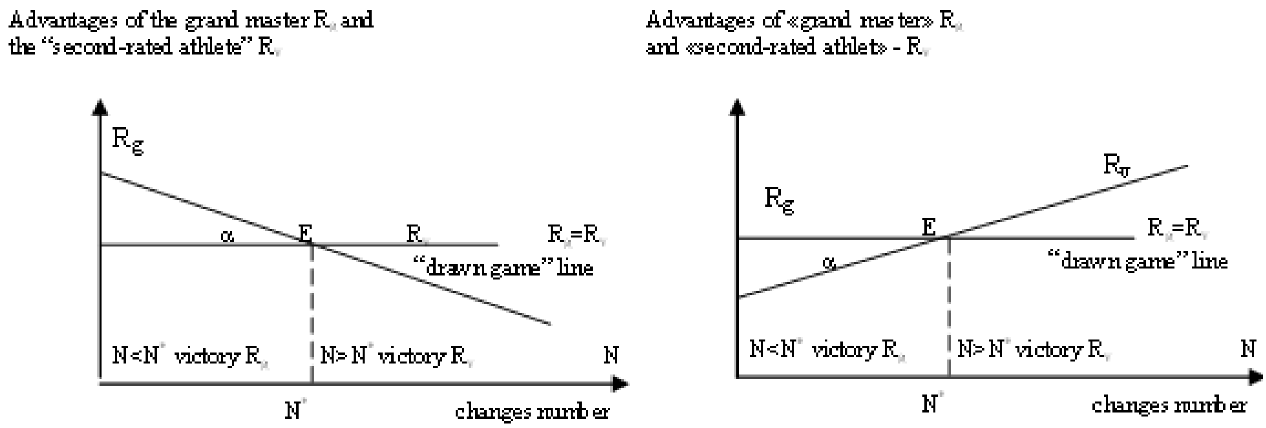

Figure 2. The scheme reflecting variant 1 model

Mathematically the change of benefits in Figure 2 can be presented as follows:

$$\frac{\partial R_g}{\partial t} = \frac{\partial R_v}{\partial t} + tg\alpha\frac{\partial (N^* - N)}{\partial t} = \frac{\partial R_v}{\partial t} - \frac{\partial N}{\partial t}tg\alpha$$

$$\frac{\partial R_g}{\partial t} = \frac{\partial R_v}{\partial t} - n(t)tg\alpha$$

If the benefit of the “second-rated athlete” is insensitive to institutional changes (it does not matter whether the rules change and how quickly because the main thing is contact with the grand master and not the result of the game), then with the reduction of the grand master’s benefit the loss of the latter (Figure 2, on the left) will be observed at some value of institutional changes speed. If the benefit of the grand master is insensitive to institutional changes, the benefit of the second-rated athlete can increase, if changes of the content favor it, then from some changes number N* (Figure 2 on the right) the second-rated athlete will win.

As for variant 2, when the benefits of the grand master increase at invariable or reduced benefits of the second-rated athlete, the situation is described by the victory of the grand master and is graphically presented on Figure 3. We have the same situation at insensibility of the grand master's benefit to institutional changes (experience and the level of change adaptability is very high), when the benefit of the second-rated athlete will be reduced (the lower scheme in Figure 3.) It is a truncated or one-sided institutional neutrality.

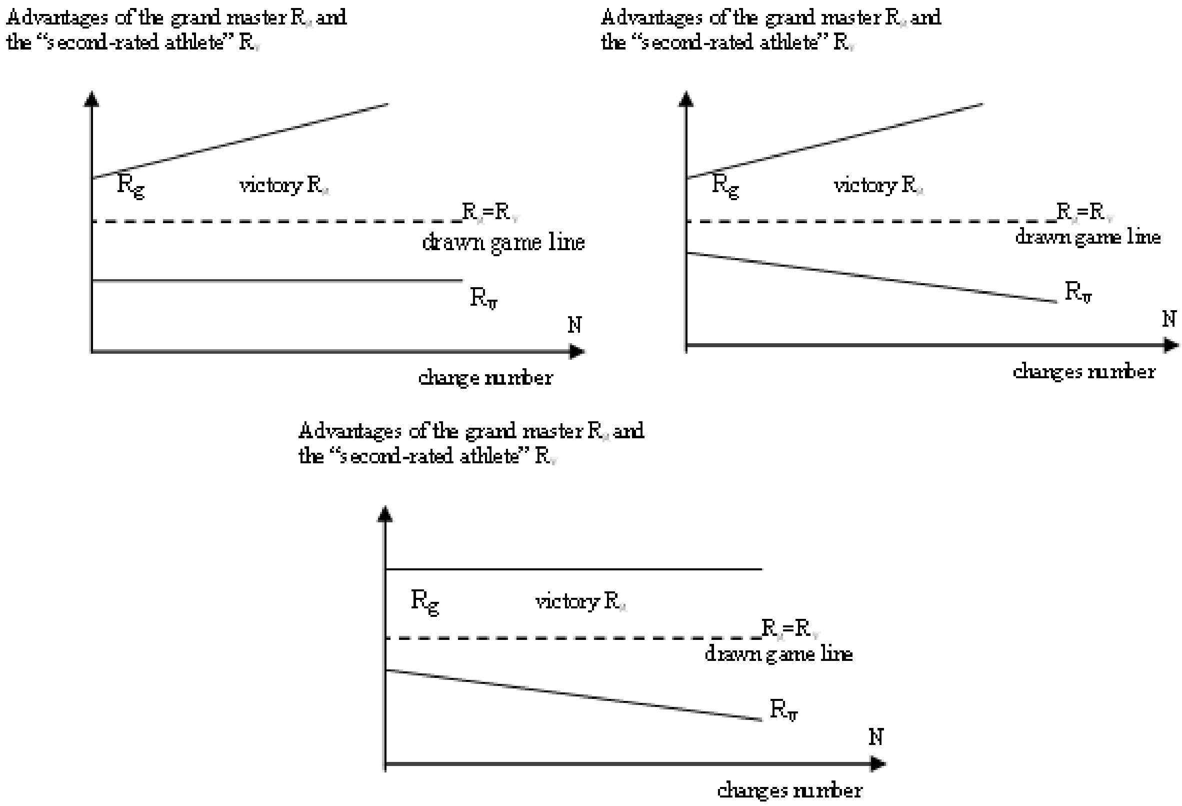

Figure 3. The scheme reflecting variant 2 model

The benefits of the "second-rated athlete" may not change, if it is all the same to him, whether he would win or lose. If he considers the game with the grand master is honorable anyway, these benefits can increase with institutional changes growth in a time unit. Then the general result will depend on how quickly the benefits of the "second-rated athlete" and the grand master increase. At increase of benefits of both agents and the corresponding content of institutional changes and their velocity it is possible to have a situation, when the grand master will lose all the same, despite the benefit growth (Figure 4 on the left).

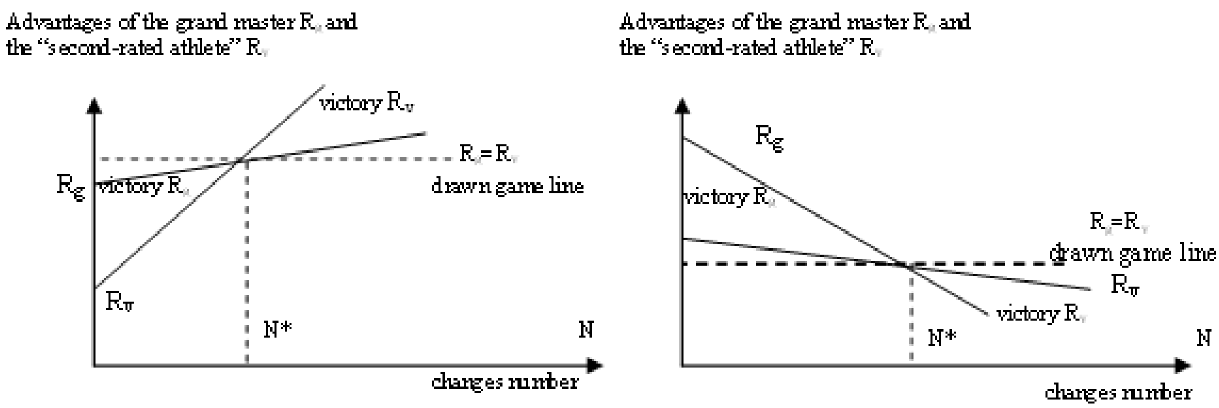

Figure 4. The scheme reflecting variant 3 model

If with the increase of institutional changes in a time unit N the benefits of both the grand master and the "second-rated athlete" are reduced (Figure 4, on the right), the grand master wins on a segment more to the left of N*, and on the segment more to the right the "second-rated athlete" does. Benefits decrease of both game participants is connected with the fact that both of them feel uncomfortable and dissatisfied with the game due to the institutional changes, the necessity of adaptation to them and perceptions. All these demand some efforts and physical, moral and intellectual expenses. Therefore the benefit is reduced for both participants. At the same time the correlation of these benefits and quality of these changes are so, that on one segment the grand master will win all the same and on other he won't. If love for the game per se is so high for the two players with obviously various intellectual capital that it brings great satisfaction, and it is unimportant for them how much the rules of the game change and, moreover, the players can get some additional comfort and interest due to these rules, there will be benefits growth of two players. The victory of one of them will be defined by the correlation of this growth velocity (curves angle of slope), and by the content and frequency of changes (Sukharev, 2011).

Institutional changes can affect the well-being of economic system. This aspect is not considered in the standard theory of well-being and is not reflected in the criteria of well-being estimation (V.Pareto-effectiveness, N.Kaldora - J. Hicks, T.Scitovski, A.Sen, etc.). If the standard of well-being of "grand master- second-rated athlete" system is measured by the total benefits which the agents obtain from participation in the game, then $U = R_g + R_v$. Having expressed the benefits of the grand master R_g through the benefits of the "second-rated athlete" R_v, we will have:

$$U = 2R_v + (tg\alpha + tg\beta)[N^* - N]$$

Well-being change will be:

$$\frac{\partial U}{\partial t} = 2\frac{\partial R_v}{\partial t} - (tg\alpha + tg\beta)\frac{\partial N}{\partial t} = 2\frac{\partial R_v}{\partial t} - kn(t),$$
$$where$$
$$k = (tg\alpha + tg\beta)$$
$$n(t) = \frac{\partial N}{\partial t}$$

Thus, well-being change depends on benefit double change of the system's agent least provided with the resource, on changes velocity (the higher the velocity, the less the value of well-being change) and on the agents' adaptation level which is set by slope angle of reactions curves corresponding to the benefits R_g and R_v.

At one-sided institutional neutrality (Figure 2), we will get:

$$\frac{\partial U}{\partial t} = 2\frac{\partial R_v}{\partial t} - tg\alpha\frac{\partial N}{\partial t} = 2\frac{\partial R_v}{\partial t} - n(t)tg\alpha .$$

In this case economic system's well-being will be composed of the well-being of the grand master and the "second-rated athlete" $U=U_g+U_v$..

In the event when institutional changes do not influence conditions of accumulation and expenditure of intellectual capital, but result in benefits reduction of the grand master even at the same benefits of the second-rated athlete, there will be decrease of system's well-being. As a result the intellectual capital of the grand master which surpasses the intellectual capital of the second-rated athlete $IK_g > IK_v$, will not allow the grand master to win.

According to I.Bentham, the purpose of system's well-being maximization will be achieved at well-beings sum maximization of the agents comprising this system (utilities, benefits). According to John Rawls maximization of system's well-being is achieved at well-being maximization of the agent who is in the worst position. It is possible to express these two criteria in the following way (Feldman and Serrano, 2006):

$$U \rightarrow \max(\text{according to I.Bentham})$$
$$U_V = R_V + IK_v \rightarrow \max(\text{according to John Rawls})$$

In other words, institutional changes providing winning to the "second-rated athlete" promote the general well-being increase. Incidentally, if in addition to that the well-being of the grand master is not reduced, then according to I. Bentham there is well-being increase as U_v t is a part of U. At the same time it is necessary to notice that expenses for institutional changes and players' relations with those who and in whose interests this or that rule is changed according to its content and with this or that frequency (velocity), do not appear in the model. When the number of the "second-rated athlete" increase in economic system and intellectual capital of the grand masters relatively depreciates, it is inappropriate to speak about the increase of system's well-being, at least until the "second-rated athletes", having obtained the benefit from the winning, spend it on education to reach or approach the level of the grand master. It is not the fact at all that elimination of grand masters' domination in the economy with the strengthening of the "second-rated athletes" leading part will raise the well-being of public system. Yes, the benefits of the second-rated athletes will increase, but the intellectual capital of the grand masters will not be involved. Besides their benefits will go down. The general result will be defined by this correlation, and Rawls criterion, as well as a number of other estimation criteria of well-being level (Pareto, Kaldor-Hicks, Scitovsky), are not quite applicable, to put it mildly, as they were designed with the assumption of non-influence of institutional changes on agents' well-being and behavior (benefits).

In Figures 1 and 4 Pareto-effective system's condition is a point of equilibrium as at movement from this point there is a situation when some agent relative to another one is better, so he wins, but another one is necessarily worse, so he loses. In this point $R_g=R_v$ and $U = 2R_v$. Thus there is a "drawn game" in the given point as a result but the standard of well-being is not maximum, as at N <N* the function is U> $2R_v$. At such number of institutional changes in a time unit, that is, velocity, N* reaches the Pareto-optimum result at corresponding curves slopes R_g and R_v, but it does not provide the greatest system's well-being.

At one-sided institutional neutrality (Figure 2) there is a possible situation when from point N* the position of one agent (benefit growth) improves and the position of another one does not worsen. It means that this point stops to be the Pareto-efficiency point. When the benefit of one agent does not change, and the benefit of another is reduced with the growth of changes number (Figure 3, below), it is undesirable to carry out institutional changes. They will obviously reduce the system's well-being. If the benefit of one agent does not change, and the benefit of another one increases (Figure 3, on the left), the changes are possible and their velocity should be defined by necessary estimation of benefit increase of one of the agents.

Kaldor-Hicks criterion will be suitable at institutional changes if it is possible to have a change of move that acts as the certain analogue of compensation correcting benefit. In other variant compensation is impossible, if only the model of fee possibility for the victory is not introduced when the defeated party can share the fee of the winner with the won agent. Here a collusion is possible, and the model will have absolutely different perspective. And Scitovsky criterion (Scitovsky, 1973), on the contrary, should impose a ban for a change of move. In Figure 3, on the right, there is a situation when benefit of the grand master increases from the number of changes, and the one of the second-rated athlete is reduced. At growth of N only grand master is better at once and the second-rated athlete is simultaneously worse. Hence, in point N=0 there was a Pareto-effective condition, as the deviation from it, improving the condition of one agent occurs only with the worsening of the condition of another one. Thus, this case demonstrates that institutional changes should not be carried out. Basically, the general idea of the suggested model assumes negative influence of institutional changes on the result of economic agents' interaction with unequal intellectual capital.

It is extremely important to note, that standard criteria of public welfare estimation are certain institutional standards which are far from the systems idea and vision of well-being standard and its change.

If initial well-being standards of co-operating agents are known, and the term well-being is equivalently defined between all the agents and approved by them, the well-being improvement of one of them leads to the general standard of well-being increase without worsening of other agents' well-being irrespective of what level of well-being scale this agent is.

Thus, in the short run institutional changes do not have smaller value than in the long run of economy functioning. They correct at once the behavior vector of agents, their model, reaction; they change benefits and basic economic proportion, correlation of received benefits and losses at their interaction.

Thus, in the short-term period the value of institutional changes is not less, than on long intervals of economy functioning. They correct the vector of agents' behavior, their model, reaction, change the benefits and the basic economic proportion at once. That is, they correct the correlation of received benefits and loss at interaction.

3. Economic Growth and Institutional Change

Present a simple model of aggregate economic growth and institutional change for economic systems. Let r – be natural resources per capita; g – the living standard (life quality, non-metering the functions quality); - income (product) per capita; S (t) - productivity function, resource transformation into a product; N - population of the global system; i – a designation for a separate country, then:

$$r = \frac{R}{N}; g = \frac{P}{N} = \frac{\sum_{i=1}^{m} P_i}{N}$$

Really, for some countries g_j> g (relatively rich countries), for others g_i <g (relatively poor countries). Or P_j / N_j> P/N and P_i / N_i <P/N. The problem is in increasing g_i for the individual countries to the level of living standard P/N. At that the living standard of the rich will be higher all the same, that is, $P_j / N_j > P/N = P_i / N_i$.

The living standard can be defined:

$$g = \frac{P}{N} = \frac{R(t)S(t)}{N(t)}; R(t) = r(t)N(t); g = r(t)S(t)$$

Thus, it depends on the resource quantity per capita and processing functions (productivity) of this resource. If resources per capita are ever less, then the general degree of life quality can be supported only at the expense of the technical-technological changes increasing function s (t). Possibilities function of income (product) creation for i country will be:

$$P_i = \frac{R_i(t)}{N_i(t)} S_i(t)$$

Function S (t) depends on institutional conditions, investments into science and education, initial condition of fund basis of economic system and industrial (technological) efficiency greatly. When function N (t) essentially increases and function R (t) is reduced (the resources are exhausted), to keep P (t) a technological breakthrough is required. Simultaneously, population growth, even subject to the delay of such growth, can sharply increase function pressure of demand in economy. But again, for the system with wide resource base, it could stimulate development, including technologies, and at the limited or reduced resource base, it only promotes a system's depression. High demand is not met and it destabilizes the system.

Taking time derivative of "the living standard", we will

get the expression connecting the speeds of change g, P, N (accordingly υ_{gi}, υ_{Pi}, υ_{Ni}) for i country:
g - g_i → min dg/dt = dg_i/dt

$$\upsilon_{gi} = \frac{1}{N_i(t)}\upsilon_{Pi} - \frac{1}{N_i^2(t)}P_i(t)\upsilon_{Ni},$$

where: $\upsilon_{Pi} = dP_i(t) / dt$, $\upsilon_{Ni} = dN_i(t) / dt$.

In the extreme point we have semblance of small and big system as product change of resource provision and resource productivity of the system on time is identical for small and big system. If such problem is formulated for all i = 1 … m, where m - the number of the countries, we will get a multiple parameter problem of optimization, which can be solved at the expense of function s (t) at decrease of r (t), and at r (t) = 0 it has no solution, the decision is zero, to be more exact. Therefore, the function kind s (t) should be such, that this function could resist to the decrease of r (t), in other words, r (t) in the general view should depend on s (t). The selection of these functions can be carried out only empirically on the basis of accumulated data on world economy and the economy of separate countries.

Let Q be the explored, initial stocks of power resources. Let the exhaustion speed be equal to V_1 and not change, and V_2 is the speed of finding of new sources (stocks) of energy. Then during the period T, stock Q = V_1 T will be exhausted. From which the time, when the resources are over, is T = Q / V_1. It is so with the assumption, that the number of living people does not change N_1. But during this period their number can increase (or theoretically to decrease) $N_2 = N_1 + V_N T$, where V_N – the average speed of population increase (the sign of speed means population increase or reduction). It is possible to write down the expression for volume of resource per capita by the period of time t:

$$r(t) = \frac{Q - V_1 t + V_2 t}{N_1 + V_N t}, \text{ or } \quad g(t) = \frac{Q - V_1 t + V_2 t}{N_1 + V_N t} s(t)$$

Hence, the life quality in the economic system depends on the initial resource and population, speed of resource exhaustion and possibilities of new resources discovery and use or stocks expansion of known resources, and on the productive processing of resources s (t).

Thus, institutional changes made with a certain speed, strongly influence the welfare change. It is possible to present crisis and growth phases of economic system through the value change of this welfare, having expressed the frequency (speed) of changes which characterizes this or that cyclic dynamics phase.

We'll have the expression to define institutional changes frequency, corresponding to the system's greatest level of welfare (U→max, $\frac{\partial U}{\partial t} = 0$), having defined the frequency of institutional changes for crisis and growth phase sand having expressed it through the benefit change of the least prepared agents (R_v) and the system's general intellectual capital level (U_s). Then the changes frequency n (t) corresponding to the highest welfare level of the system will be defined:

$$\frac{\partial U}{\partial t} = 2\frac{\partial R_V}{\partial t} - kn(t) + \frac{\partial U_S}{\partial t} = 0$$

$$n(t) = \frac{2}{k}\frac{\partial R_V}{\partial t} + \frac{1}{k}\frac{\partial U_S}{\partial t} = 2\lambda\frac{\partial R_V}{\partial t} + \lambda\frac{\partial U_S}{\partial t},$$

$$\lambda = \frac{1}{k}; k = (tg\alpha + tg\beta); \frac{\partial U}{\partial t} > 0, t < t_0; \frac{\partial U}{\partial t} < 0, t > t_0$$

Value k is elasticity of benefit reactions of the richest and the least rich agents from the point of view of intellectual capital on institutional and, generally, economic changes (on their frequency, speed and qualitative content).

For crisis and growth phase (see the Figure 5), changes frequency will be the following respectively:

A. depression-crisis:

$$n(t) > 2\lambda\frac{\partial R_V}{\partial t} + \lambda\frac{\partial U_S}{\partial t}$$

$$\frac{\partial U}{\partial t} < 0, t > t_0$$

B. growth-revival:

$$n(t) < 2\lambda\frac{\partial R_V}{\partial t} + \lambda\frac{\partial U_S}{\partial t}$$

$$\frac{\partial U}{\partial t} > 0, t < t_0$$

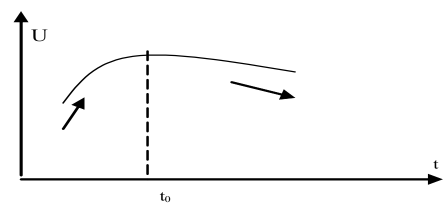

Figure 5. Welfare, institutional changes in the period of crisis and growth

In the service economy which we observe today, the concept of "reserve" "disappears" as the reserve can exist only for material goods (products), but with regard to services, this concept is not suitable. Services are not reserved, though in some cases, it is correct to speak about the delay of service. However, in this connection the cycle of inventories loses the previous importance and there appears an important problem of considering not only the interference of several cycles against each other and on "the big wave", but also how this influence, if the importance of the phenomenon and its share in the general created income is reduced, will change in general (Sukharev, 2013).

If "the living standard" of economic system does not change, then

$$\nu_{gi} = 0$$

$$\nu_{Pi} = \frac{P_i(t)}{N_i(t)}\nu_{Ni}$$

Welfare change of economic system can be identified with its change of "the living standard". Then

$$v_{gi} = \frac{\partial U}{\partial t} = 2v_{Rv} - kn(t) + v_{Us}$$

$$v_{Rv} = \frac{\partial R_V}{\partial t}; v_{Us} = \frac{\partial U_s}{\partial t}, then$$

$$2v_{Rv} - kn(t) + v_{Us} = \frac{1}{N_i(t)} v_{Pi} - \frac{1}{N_i^2(t)} P_i(t) v_{Ni}, whence$$

$$v_{Pi} = \frac{P_i(t)}{N_i(t)} v_{Ni} + 2N_i v_{iRv} + N_i v_{iUs} - N_i k_i n_i(t)$$

Thus, the growth rate of economic system (national income) is defined by the growth rate of the population, reasonable speed of income change of the least well-to-do and adapted agents, change speed of the system's intellectual capital, and also the agents' sensitivity to institutional changes (k) and frequency (speed) of these changes n (t). At that, with the increase of former parameters, according to the introduced model the growth rate will be reduced. It agrees with the fact that at economic system reforms, growth rate is usually slowed down, though, the effect of reforms will certainly be defined even by the development phase when these reforms begin, that is, the effect is determined by the crisis period or revival and growth process.

4. Conclusions

To summarize, some conclusions:

a) institutional changes velocity (their frequency) should provide natural result which in economy with prevailing inter-specific resources comes to the rise of more educated, skilled, competent agent (intellectual capital possessor). It is this condition that is fundamental in respect of innovative type stimulus designing of economic growth;
b) the content of any changes should assume the estimation of the system's well-being change;
c) competition in economic system depends on the character, the content of institutional changes and the fundamental institutes influencing rivalry mechanisms heavily, negative selection becoming the integral element of modern competition determined by the institutes;
d) institutional changes have the property, the essence of which is that until they have not occurred, it is difficult to estimate their content, because the result which the system will have is not absolutely clear. Certainly, it creates the basic difficulties in the models use of institutional changes and in obtaining such models;
e) probably it is not absolutely correct to transfer conclusions received on the model "grand master-second-rated athlete" on the estimation of acceptable speed of institutional changes concerning the whole sectors of economic system though the revealed basic regularity, in my opinion, will remain. Changes of institutes can provoke negative selection and bring down the well-being of economic system. That is why it is necessary to have special criteria within the limits of economic policy designing and in the framework of institutional planning;
f) institutional changes can considerably affect the well-being of economic system, and no one of the known classical estimation criteria of a well-being standard take this aspect into consideration;
g) there is a paradoxical result, which says that, on the one hand, the second-rated athlete's victory is the infringement of stereotype (standard) institutes and is connected with institutional inefficiency caused by velocity increase of institutional changes at their corresponding content and, on the other hand, according to the Rawls criterion, well-being increase of the weakest (poorest) agent will increase public well-being as well, and in this case the well-being of the second-rated athlete increases because of his victory and benefits growth Rv, the intellectual capital not changing IKv. The intellectual capital of the grand master has not also disappeared anywhere, it remained the same, but the benefits were reduced with the loss.

REFERENCES

[1] Feldman A., Serrano R. (2006) Welfare Economics and Social Choice Theory, Springer Sciency+Business Media Inc., 403 p.

[2] Hicks J. R. (1939) The Foundations of Welfare Economics, Economic Journal, 49: 696-712

[3] Kaldor N. (1939) Welfare Propositions of Economics and Interpersonal Comparisons of Utility, Economic Journal, 49: 549-552

[4] Kuznets S. (1989) Economic development, the family and income distribution. Selected Essays. - Cambridge University Press, 463 p.

[5] Kuznets S. (1971) Economic Growth of Nations: Total Output and production Structure. Cambridge, Mass., pp. 303-354.

[6] Scitovsky T (1973) The Place of Economic Welfare in Human Welfare, Quarterly Review of Economics and Business, 13: 7-19

[7] Sen A. (1997) On Economic.- Inequality, New York, Norton, 260 p.

[8] Sukharev O.S. (2013) Theory of Economic Changes. Problems and Decisions. – Moscow (eng): KRASAND, 2013, 368 p.

[9] Sukharev O.S. (2011) Elementary model of Institutional Change and Economic Welfare. Montenegrin Journal of Economics, 7, (2): 55-64.