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Research Article

Cybernetic Model Dependency Productivity and Economics Growth from Taxes

Yury Abrukin*

Department of Cybernetics, Independent researcher, New York, USA

ABSTRACT

The concept of dependency productivity of the workforce from production, distribution and consumption taxes was developed and complemented by the motivation of business owners to obtain productivity as the main resource of functioning business-profit by access to the same source of motivation-taxes. This work attempts to formulate this concept in terms of the theory of control by developing a cybernetic model of the process and setting the ground to build the mathematical model. It is based on creation block diagram closed-loop feedback control system on production and state level for two main output parameters-productivity and economic growth. This allows us to find the link between these two output parameters (from the production and state levels) which are the taxes. Was introduced in connection with major concepts of thermodynamic and process of control in social system.

Keywords: Productivity, Economic growth, Control system, Non-linear dynamic system

INTRODUCTION

The approach developed in the conceptual model proposed by Abrukin [1] in which key factors of productivity growth are determined by psychological factors of motivation of the workforce and business and capital owners by access to taxes, allows to create a mathematical model based on quantitative parameters - taxes. The only difference is that for the workforce those factors directly represent financial reward, free time and workplace conditions [1]. and the most significant focus for business is profit Abrukin [2] all on production level. This means that the productivity of the workforce is under control, mainly based on business motivation factors. At the same time the workforce and business are under the control of state motivation factors such as production, distribution and consumption taxes, and under the influence of demotivation factors for the workforce and business created by society.

MATERIALS AND METHODS

To build the mathematical model based on the theory of control, we need to apply the ideas and terminology of the theory of control using formal definitions of the theory to objects of economic processes found in research. The first is the input signal or input [3]. Next, the input signal (input) is processed by the controller, which obtains information on the input and processes it. After processing the signal, the controller issues a control or actuating signal or does it *via* a special element called actuator. Furthermore, the actuating signal goes to the part of the system which called the process under control or plant [4]. The plant or process under control processes the actuating signal and generates an output signal or output. There are open loop and closed loop control systems. For an open loop system (process under control) only the actuating signal is executed. In the closed loop system output signal is directed to the feedback element to compare it to the plan or goals of the system (technical, living or social) and produces a positive or negative control signal which is sent as corrections of the input of the controller again, to adjust the controlling system.

Based on these definitions, we can consider that the workforce is a system, that represents all parts of the control system, including the reception of input signals, performing functions of the controller, issuing an actuating signal and processing the signal at the same time- as the process under control (plant). At the same time the workforce represents a feedback element that processes output signals from all types of rewards from business and produces corrections of productivity at the production level. Rewarding information from the state also serves as input for the workforce, providing another control loop at the state level. The same approach could be applied to business with a difference: the main function of business as controller, issuer of actuating

Correspondence to: Yury Abrukin, Department of Cybernetics, Independent researcher, New York, USA, Tel: +15168848567; E-mail: yabrukin@gmail.com
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signal and plant together is to provide means for running business from technical and workforce standpoint and at the same time to be as feedback element, which is supposed to produce profit as the most important material and informational substance to continue business activity and react to how state handles the needs of business. In the same way that business reacts to information and financial flow, psychological factors create motivation for productive work of the workforce based on positive feedback, fueled by the living needs of the workforce on the level of production.

RESULTS

The next step of creating a mathematical model is to structure the conceptual model into a block diagram which allows us to set up connections between all objects of the researched system. To formalize the psychological factors observed in experiments, which are supposed to be included in the cybernetic model, it would be easier to generalize some of them to reflect their psychological nature. Let us assume how these factors could represent the value for the human nature of the workforce. Defining them as human preferences, as the most valuable input parameter for the control system, we may describe them in terms of quality of time as the most appealing for human nature. Based on this we can create input parameter as the quality of work time Qt^{w}, which includes work conditions and quality non-work time Qt^{nw}, - which includes financial reward and free time. We can assume that quality of work time allows the workforce to obtain more benefits from using nonwork time.

The block diagram of the control system productivity and economic growth on the level of production and state is presented in Figure 1. The descriptions of all inputs and outputs are presented below.

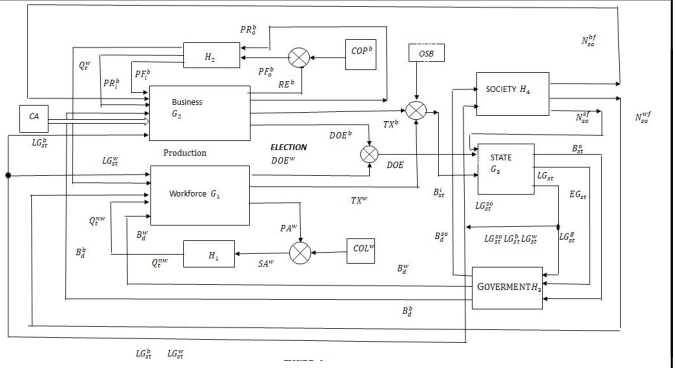

Figure 1: Cyberneatic model

For workforce (G1) input (5):

Q_t^{w} - quality of work time for workforce;

Q_t^{nw} - quality of non-work time for workforce;

B_d^{w} - budget distribution for workforce;

N_{so}^{w} - negative factors from society for workforce;

LG_{st}^{w} - state legislation for workforce;

For workforce G1 output (3):

PA^{w} - workforce payroll;

Tx^{w} - taxes produced by workforce;

DOE^{w} - workforce decision on election;

For workforce feedback element (H1) input (1):

PA^{w} - workforce payroll;

SA^{w} - workforce savings = (PA^{w} - COL^{w});

COL^{w} - workforce cost of living;

For workforce feedback element output (1):

Q_t^{nw} - quality of non-work time for workforce;

For business (G2) inputs (6):

PF_i^{b} - profit for business input;

PR_i^{b} - business productivity input;

B_d^{b} - budget distribution for business;

N^{bf}_{so} - negative factors of society for business;

LG^{b}_{st} - state legislation for business;

CA - Capital;

For business (G2) - output (4):

RE^{b} - business revenue;

PR^{b}_{o} - output for business productivity;

PF_o^{b} - profit for business output = (RE^{b} - PA^{w}- COP^{b});

COP^{b} - cost of production;

Tx^{b} - taxes produced by business;

DOE^{b} - business decision on election;

For business feedback element (H2) input (2):

PR_o^{b} - business productivity output;

PF_o^{b} - profit for business output;

For business feedback element (H2) output (3):

PR^{b}_{i} - business productivity input;

PF^{b}_{i} - profit for business input;

Q^{w}_{t} - quality of work time for workforce;

For State (G3) input (3):

B_{st}^{i} - budget for state input (T^{Xw}+T^{Xb}+OSB);

where T^{Xb}, T^{Xw} - taxes from business and workforce;

OSB - other sources of budget;

DOE - decisions on election from workforce and business;

N^{sf}_{so} - negative factors from society to state;

For State (G3) output (3):

B^{o}_{st} - budget for state output;

EG_{st} - actual economic growth for state;

LG_{st} - legislation for government, workforce, business, society;

For feedback element for state - government (H3) input (3):

B_{st}^{o} - budget for state output;

EG_{st} - economic growth for state;

LG_{gt} - legislation for government;

For feedback element for state - government (H3) output (3):

B_{d}^{w} - budget distribution for workforce;

B_{d}^{b} - budget distribution for business;

Bd^{so} - budget distribution for society;

For feedback element for state - society (H4) input (2):

LG_{so} – legislation for society;

B_{d}^{so} - budget distribution for society;

For feedback element for state – society (H4) output:

N^{sf}_{so} - negative factors from society to state;

N^{wf}_{so} - negative factors from society to workforce;

N^{bf}_{so} - negative factors from society to business;

DISCUSSION

The block diagram allows us to visualize dependency productivity and economic growth from access workforce and business to production, distribution and consumption taxes *via* principles of democracy, to be accurately called economic principles of democracy. The system of controlling productivity and economic growth is represented on a block diagram as a closed-loop control system with positive and negative feedback on two levels – production and state. It is known that negative feedback included in the control loop allows positive feedback to be kept under control. We can observe that society represents the source of negative feedback starting with criminal situation, lack of healthcare system, educational, cultural, justice, and legislation system, which reduces positive feedback signals from business and state and prevents indefinite grows of the productivity (by definition of the positive feedback). Idea of negative feedback as a source de-motivation of workforce and business owners in terms of productivity allow us to conclude that negative feedback originates from any kind of uncertainty and disorder in society. It determines negative psychological factors affecting life and decision making beside the work and focus and concentration on productive work, gaining and utilizing skills, and conducive ability of productive work. For business owners it undermines their efforts to develop successful business.

The notion of uncertainty and disorder has the scientific definition - entropy, which originates from thermodynamic. As per Mavrofides et al. [5] "There two ways to consider and measure entropy: (i) a measure of the unavailable energy in closed thermodynamic system and (ii) measure of disorder of a closed thermodynamic system. The first measure is associated with conversion heat energy mechanical energy. The second is associated with probabilities of the occurrence of particular arrangement of gas." C. Shannon in 1948 [6] found that exist analogue the entropy of thermodynamic system in informational systems, which formulated exactly the same way and described it as "information, choice and uncertainty". Mavrofides et al. [5] marked that Shannon's approach to "entropy in communicational context refers to generalization of Boltzmann's statistical entropy" connecting it with next notion of information "From Shannon's viewpoint information is the measure reduction of the statistical entropy". Introduction of entropy allow us explain why society in social-living systems represents the source of uncertainty and disorder. From informational perspective disorder and uncertainty as entropy of society could be reduced by information and money which represents control from state by means of the budget, legislation and justice system.

Above mentioned definition of entropy includes another very important variable of the thermodynamic system – energy. It called internal energy thermodynamic for closed thermodynamic system. While ago some scientists started consider concept of energy from thermodynamic in application to processes in social-living systems. As per Stepanic et al. [7] "The initial of this attempt is to establish analogies between some thermodynamic variables and some social system characteristics. A thermodynamic variable that we start with is the internal energy of a thermodynamic system. We now introduce an analogous quantity that we call internal energy of social system, 'U'. The internal energy of a social system 'U' is appropriate, yet at this stage unknown, combination of actor characteristics. Relevant actor characteristics, among others, are material assets, acquired knowledge, skills, and psycho-physicals characteristics. In social systems, U can be interpreted as a measure of total resources of the system, determined according to some set of generally accepted social standards.

As per the opinion of Mavrofides et al. [5], energy is needed to gain and retain freedom. "And that secures the ability of social (or psychic) systems to perform an act of change could be capital, in its widest sense: social influence for instance, or political power, or money and property (economic capital), or knowledge (cultural capital) and numerous other notions, that all seem to converge to one thing, exactly that which Pierre Bourdieu defines as symbolic capital. Therefore, we propose to conceive of systematic energy as the symbolic capital that self-referential system possesses."

The general definition of energy in physics "Energy is the ability to do work or cause change. It is different from a force. A force is the thing that causes the change, while energy can be thought of as the impetus behind the force [8]. It takes energy in order to apply a force, and applying a force to an object often transfers energy to it". The Mavrofides et al refers to the notion of energy in social system as ability social (or psychic) systems to perform the act of change. We can see that concept of energy to thermodynamic system and social system is the similar. The different is the carrier of the energy [5]. Both authors consider concept of systems energy *via* concept of "material asset, money or property, acquired knowledge" and "political power, money and property (economic capital), or knowledge (cultural capital)' [8]. This coincidence the points of view allows us widespread concept of energy not only for social system in general,

but for each and every participant of social-living system including its population, workforce and business.

Approach in this article allow us to consider that each and every participant of work and business process has to possess knowledge, skills, money and property to perform a work, required by the goals of the person, the business or society, which creates the base to perform the change or work. The money in this case performs function of force as "a thing that cause the change" or work. Accumulation money for the period time (another variable) pursuing special goal allows forming all types of capital which was mentioned above as source of energy as per society, so per workforce and business.

As it has been observed by some authors Van Gigh [10], "Organisms, man-made systems and social systems can all be comprised in the larger set of ecological systems of which they are but component parts. We can learn the principles of control by studying the behavior of ecosystems. As Holling and Goldberg have noted, ecological systems have the following essential properties:

a) They exhibit feedback

b) They show a "historical quality "because they respond not only to present events but also the past ones. Unlike machines that are assembled out of preexisting parts, they have evolved over time and are defined, in part of their history.

c) They present "non-linear" structural properties due to lags, thresholds, and limits. "The distinctive behavior of systems flows from these properties." "Living systems are dynamic process; that is, they undergo with time."

There are several ways to build a mathematical model of the control system. They are based on two main types of control systems: linear, time invariant and dynamic non-linear, time variant. The linear time invariant control system mathematically described either by a transfer function or a state space model. However, from the description of the living and eco system above, we can conclude that the model dependency productivity and economic growth from taxes look like a dynamic non-linear time variant system. It could also be found from the cybernetical model that COL, COP and negative factors from society may also be considered by having elements of non-linear properties. This type of system requires a different approach: in particular a non-linear system does not have a transfer function representation. Because of this a linear approximation of the transfer function could be used [3]. A similar approach was developed to build a mathematical model of a non-linear dynamic system by using the iteration scheme. "The iteration scheme is based on replacement of the original non-linear equation by sequence of linear time-varying equations whose solutions converge into the space of continuous functions to solution of the non-linear system" as proposed by Tomas-Rodriguez et al [9].

CONCLUSION

We can observe, from block diagram, that there is a link between two main output parameters of the control system -productivity and economic growth. Economic growth is calculated based on GDP. Based on the definition of US Bureau Economic Analysis "GDP measures the value of the final goods and services produced in the United States (without double counting the intermediate goods and services used up to produce them)." This means that the value of final goods and services includes taxes as a part of the value. Because productivity is dependent on access to the workforce and business on taxes this connection with economic growth exists. In this case we can observe that taxes and election processes affect economic growth at the state level and that feedback from state level as a budget distribution and law and justice system affect productivity at the production level.

At the same time, we cannot assume that a mechanical increase or decrease in taxes automatically increases productivity and consequently economic growth. Based on the conclusions of this work we need to admit that productivity will be increased only if a change in taxes will affect the psychological factors of motivation for the workforce, particularly the quality of nonworking and working time at the production and state levels, including their families. The same actions at the production and state levels are assumed affect the motivation to increase productivity and profit for the business.

STATEMENTS AND DECLARATION

- The author has no relevant financial or non-financial interests to disclose.
- The author has no competing interests to declare that are relevant to the content of this article.
- The author certifies that he has no affiliations with or involvement in any organization or entity with any financial interest or nonfinancial interest in the subject matter or materials discussed in this manuscript.
- The author has no financial or proprietary interests in any material discussed in this article.

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