

## SYSTEMS ANALYSIS OF ECONOMIC POLICY

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### Summary

Economic policy as an object of system analysis differs from any complicated technical object in the fact that any subject who exerts influence on it has an ability to see the common goal through the prism of his/her own interests. And this ability may change in the event of changes taking place in the sphere of permissible actions under the impact of decision-making by other subjects, which gives rise to new options for the given subject. For the economy of the entire country they are formed from the combinations of local options and grow like an avalanche, while the quantitative concept of the common goal and the degree of its attainment is formed in the process of relationships between the representatives of various interests by coordinating them.

That is why for the system analysis of this policy it is necessary to study the reasons for the conduct and determine the spheres of permissible, realizable actions of all social forces which exert influence on it. This may be done in an obvious form or on the basis of the results of the people's reaction to such reasons. The former approach determines the normative principle of the analysis and the latter, its descriptive principle. Its further stages will be, respectively, optimization of the intentions of each social force with respect to the economy or prognostication of the consequences of their implementation, and subsequently coordination of those intentions with each other and/or steps taken to balance them off with such consequences.

Identity of the views of the subjects of intentions of the preferable actions by each serves as a testimony of various intentions having been coordinated. The variety of their interests and criteria of appraisal and also the factor of uncertainty in the economic development, caused by the people's mobility under its impact and nature's reaction to humans' production activity serve as an obstacle to that. If we exclude the aspect of nature's reaction, the nonantagonistic game of many persons serves as an analogue of such a situation.

The key to the solution of such a game lies in the Pareto optimum equilibrium. It may be achieved owing to the introduction of transfer payments which might be determined in the course of the game proper in the form of some of its participants' responses to the designs, chosen by others. This may serve as a basis of the mechanism ensuring a system approach to shaping an economic policy, with the key role to be played in it by the respectively adjusted budgetary-tax system.

Due to the specific features of economic policy, we will have negligible results if we try to make use of a "global" model laying claims to an all-round picture of the economy. Those features require that the processes taking place in it be described with the help of a system of interdependent models within which the goals and restrictions would be specified and the alternatives pinpointed, revised, compared and selected.

Each element of such a system is tantamount to formalization either of the entire economy, although viewed from a certain angle, or of the conduct of some of its participants, and it is conjugated with the other elements by the feedforward and feedback information. The problem of coincidence of the results of calculations on the basis of some individual models will be reduced to the stabilization with acceptable accuracy of information in these channels.

So far as the government of the country and the authorities of individual regions are concerned, more often than not it is formalization, close to Leontieff's dynamic model. It represents an optimized national accounts balance in which, along with others, the territorial section is taken into account. And so far as individual branches of the economy are concerned, they may be linear or nonlinear quasidynamic or dynamic models of various types (including the transport or location problem, the optimal set problem, etc.).

Preference given to the descriptive approach to the economic policy is manifested in application in its system modeling primarily of macroeconomic models of the Harrod - Domar type and of production functions, of demand functions, of cost functions, etc. They serve for pinpointing of the goals and for analysis of the general rate of economic development and also of the rates of development of individual branches of the economy. On the basis of interconnections those models are supplemented by the input-output dynamic models. Those models are made to look as optimization models as far as possible which offer an opportunity to make use of the methods of linear and nonlinear programming of the intersectoral contacts, of location of production units and interregional relations.

Analysis of the economic policy is complicated by uncertainty, inherent in the economic processes as such and in their consequences. In order to avoid possible errors due to that in system modeling, it would be useful to analyze each of the submultitudes of its sources, isolated according to a classification feature, as a statistical totality. Its conduct is represented in the form of statistical dependence on the indicators of economic development. Such functions, taken together, form a simulation model which is used to check with the help of forecasts whether or not some or other technologically possible solutions are permissible with account of their most probable effect on the sources of uncertainty, with the alternatives, which are unrealistic from this viewpoint, discarded.

## 1. Introduction

System analysis was first applied to complicated technical objects. In such cases the designer or researcher stays outside the system for which he formulates the general "global" goal without account for the contacts with its components and relationships among them and, consequently, without the corrective influence on their part. In that case the criteria of their preferable condition and functioning, being of "local" importance, play no role in pursuance of such a goal. Hence the respective methodological principles.

First, the sequence of actions is accepted where the determination of a goal and establishment of the limitations of choice with an attempt to take into account in advance their uncertain nature completely precede the search for its alternatives, and they are subsequently appraised on the basis of the "fixed" goals in fixed conditions.

Second, such alternatives will be found by the "brain-storming" method, since this requires the simultaneous use of multifaceted knowledge of the object which can hardly be expected from just one individual, so a special integrated group of experts is formed for the purpose.

Third, in order to appraise the alternatives, compare them and choose the optimal plan of action, a "global" mathematical model of the object is used with formalization of the general goal, set from the outside, to which all of its elements must be subordinated.

However, if we have a system whose individual components have at least been granted the gift of self-consciousness by nature, with each of them having his/her own specific life experience, vision and worldview and, therefore, with his/her own special interests serving as stimulants for his conduct on the basis of the innate ability for self-regulation and self-organization, that would be something different. The designer or researcher, who is obliged to take into account the effect of such components on any purpose as a manifestation of those abilities, willy-nilly finds himself among the participants in the analyzed processes on par with many others. So it becomes necessary to adapt system analysis to such a situation without the loss of its principal features. This is exactly what is required if economic policy serves as its object which regulates the reproduction of life supporting resources (see *Systems Analysis of Planning Processes* in EOLSS On-Line, 2002).

## 2. Economic Policy as an Object of System Analysis

The general goal of a country's economic policy consists in ensuring its integrity, vitality, current and future welfare, and it is viewed by any subject, who is able to exert influence on the attainment of this goal (the government, population and the authorities of any region, businessmen, etc.), through the prism of his/her own interests. And such a vision of that goal may undergo changes, if the sphere of permissible actions fluctuates. And this is what happens under the influence of other subjects' choice which gives rise to new alternatives for the given subject, with some of the former alternatives removed.

The respective opportunities for a country's economy are formed on the basis of the

combinations of local alternatives and are eventually turned into an avalanche. And the quantitative concept of the total gain, or its actual measure, is formed in interrelationships of the representatives of various interests by means of their coordination. Otherwise any actions are not realizable or not realizable effectively.

However, such a variety of alternatives may be taken into account and the optimal version with regard to its foreseeable results chosen or local decisions may be adopted which may most probably lead to coordination of various interests exclusively under a certain set of conditions. In that situation, without the need to form a privileged extra-system group of specialists, the "brain storming" must be ensured by attracting the knowledge of all those who in some way or other exert influence on the economy for the formation of the planned or already implemented in reality policy of development of that set of conditions, with a wide variety of views, given their mutual concessions, resulting in decisions or actions, acceptable for all.

Information about the intentions of the participants in shaping an economic policy and about such concessions may be either *a posteriori* or *a priori*. The former is represented in the data of the accomplished actions characterizing the actual prices of a certain period, the interest rates, taxes, monetary and commodity flows, financial concessions, etc. By taking them into account decisions are adopted on the subsequent steps for attraction and utilization of capital, development of some or other resources, development and distribution of various kinds of production facilities, sale of products, etc.

If that is done without a preliminary system analysis, in order to become acceptable to all, the policy will be adjusted in the process of actual management. And since feedback is expected to be realized after a considerably long period of time, at each given moment or period of that process its individual participants can hardly compensate for a certain share of the lost profit, and they will try to make up for it in future. Hence, the constantly tipped balance of interests whose coordination is manifested solely as a trend, with substantial losses for all.

Meanwhile *a posteriori* information may serve as a basis for *a priori* information for the future, and it is produced, supplied to the partners to be taken into account in their practice and, with account of their reaction, is adjusted in the iterative process, imitating the actual management. This makes it possible to adjust the regulators in such a way as to spare it the consequences of field experiments, and this is the chief goal of the system analysis of economic policy.

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## Bibliography

Arrow K.J. (1951). *Social Choice and Individual Values*, 99 pp. New York: Wiley; London: Chapman & Hall. [Principles, theoretical and methodological bases of social consensus achievement when economic policy development.]

Blackwell D. and Girshick M.A. (1954). *Theory of Games and Statistical Decisions*, 355 pp. New York: Wiley; London: Chapman & Hall. [Mathematical bases and models of decision theory in uncertainty conditions.]

Brennan G. and Buchanan J. (1985). *The Reason of Rules: Constitutional Political Economy*, 153 pp. Cambridge: Cambridge University Press. [Institutional bases of public consent achievement at making state social-economic policy.]

Buchanan J. and Tullock G. (1962). *The Calculus of Consent. Logical Foundations of Constitutional Democracy*, 361 pp. Ann Arbor: University of Michigan Press. [Methodology of quantitative evaluations of public consent achievement at making state social-economic policy on the base of theory of contracts.]

Danilov-Danilyan V.I. and Zavel'sky M.G. (1975). *The System of Optimal Long-Term Planning*, 320 pp. Moscow: Nauka [in Russian]. [Theory, methodology, models and algorithms of system approach to the forming economic policy by means of different interests coordination and its realization social consequences account.]

Lange O. (1964). *Optymalne Decyzje. Zasady Programowania*, 311 pp. Warsaw: Państwowe Wydawnictwo Naukowe. [Economic system economic and mathematical analysis methodological base.]

Tinbergen J. (1956). *Economic Policy: Principles and Design*, 276 pp. Amsterdam: North-Holland Publishing Company. [Principles, methodology and mathematical models of economic policy development.]

United Nations Economic Commission for Asia and the Far East (1960). *Programming Techniques for Economic Development. With Special Reference to Asia and the Far East. Report of the First Group of Experts on Programming Techniques*, 130 pp. Bangkok. [Main theoretical positions and tools of underdeveloped countries economic policy system development.]

von Neumann J. and Morgenstern O. (1944). *Theory of Games and Economic Behavior*, 625 pp. Princeton: Princeton University Press. [Game theory methodical tools in application to economic behavior analysis and economic policy development.]

Wicksell K. (1967). A New Principle of Just Taxation. *Classics in the Theory of Public Finance* (ed. by R.A. Musgrave and A.T. Peacock), pp. 72-118. London: MacMillan; New York: St. Martin's Press. [Taxation principles, ensuring public consent concerning state social-economic policy.]

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Among these are the following:

1. Optimization of Branch Planning at Industry (1967, in Russian), Moscow: Ekonomika.
2. Optimal Planning at a Firm (1970, in Russian), Moscow: Nauka.
3. System of Optimal Long-Term Planning of National Economy (1975, in Russian), Moscow: Nauka (together with Danilov-Danilyan V.I.).

4. Economic Interests and Federalism: Coming to an Agreement and Translating into Reality (1996, in Russian), Moscow: Editorial URSS (together with Petrosyants V.Z.).
5. Economy and Sociology of Labour (1998, in Russian), Moscow: Catallaxy.
6. On the System Reform of Economic Management in the Transition Period, New York: Journal "Matekon", 1996, Vol.31, No.4.

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