

## THE CONCEPT AND ASSUMPTIONS ON SOCIO-ECONOMIC SPACE ANALYSIS

ZBYSZKO CHOJNICKI

The purpose of this report is to present the concept and foundations of research into the changes in the differentiation of socio-economic space. The study is to provide a synthetic picture of the changes in Poland's socio-economic space on the ground of the basic socio-economic indices and to consider its links to the geographical environment.

What has been completed up to now, i.e., in the first phase, is primarily of methodological and preparatory purpose. Empirical analyses consisted mainly in testing the methods and models.

The notion of socio-economic space is the fundamental underlying concept of the whole research project. It is a generalization of the spatial characteristics of different patterns constituting the spatial socio-economic system. The notion of socio-economic space has many theoretical implications if it is interpreted not only in terms of the role fulfilled by physical space in the socio-economic system covering physical distance but also in the more general terms deriving from the mathematical concept of space, i.e., of space treated as a set of elements fulfilling definite postulates.

Thus conceived, socio-economic space is to be interpreted as a category of the relational description of systems that are sets or subsets of socio-economic phenomena and which are considered in terms of their differences (space of properties), neighbourhood (topological space), distance (metric or physical space). So far, such a concept has not been extensively employed in this analysis. In space-economic studies this notion is often used in a more restricted sense, in its substantive meaning of area or its dimensions or capacity. The relational notion of space is more comprehensive and permits to comprise both what F. Perroux calls banal or geonomic space and economic space.<sup>1</sup>

The relational concept of space can also be referred to the geographical environment as the system which is the foundation for the socio-economic system. Geographical environment is an external system but it fulfills a significant role in the spatial differentiation of the socio-economic system. Analogously, this system can also be described in spatial terms, calling it geographical space.

Poland's socio-economic system comprises today several interrelated subsystems and spheres of activity each of which is the resultant of different historical processes.

The basic elements of differentiation and complexity of the system are the distribution of population and of the durable, or fixed products including the

<sup>1</sup> F. Perroux, Economic space: theory and applications, in: *Regional Development and Planning*, J. Friedmann and W. Alonso (Eds.), Cambridge, Mass. 1964, pp. 21-36.

infrastructure in the broad sense, that is the settlement network, productive and nonproductive facilities. They form patterns of relatively high spatial stability, closely interrelated with each other which, if they are locationally ill-adjusted, account for many significant spatial processes, such as migrations or commuting.

These patterns determine the distribution spheres of production processes, of services and of the production of nonmaterial goods. The differentiation of these patterns and spheres results in the spatial differentiation of the distribution of national income and of living conditions.<sup>2</sup>

The relations between these patterns and spheres are not of a simple direct causal nature which would produce direct vertical links between them in a given area. What does result is a comprehensive process of spatial interaction. Thus the system of spatial development comprises the mutual relations between the patterns and spheres both as regards spatial differentiation and spatial links.

The characteristics of the individual patterns and spheres can be regarded as the particular socio-economic subspaces, and the socio-economic space is their overall synthesis. The socio-economic space can therefore be interpreted as the synthesis of the nation's spatial economy, though not as a simple adding-up of the particular socio-economic subspaces but as a definite resultant of their mutual relations.

The notion of socio-economic space is used to reconstruct a definite state of the socio-economic system, which is dependent and conditioned by the processes of development governing it.

The spatial properties of the system must not be treated in a purely structural manner, in isolation from the process of development, that is as if they concerned the extra-temporal inner links of the system in which time has been engrossed in the spatial structure.

In practical research there occurs a sharp distinction, that of space vs. development, which is a difficult dilemma to solve.

When solving this dilemma it is necessary to remember that the developmental approach need not include a meticulous study of the origin of the spatial system; in particular, what is dispensable is a reconstruction of its historical development, but instead emphasis must be put on the changes in stability, resistance, the formation of new and the decline of old elements — all of which leads to a transformation of both the spatial system itself and of its intrinsic interactions.

The concept of time-space seems to be promising as a conceptual tool integrating the socio-economic space with the process of its development. The possibility of using this concept in our field of study was pointed out by H. Greniewski, who drew an analogy to relativistic physics as regards this concept. He wrote "Two contradictory phenomena may occur in one place (space) but at different times. For instance, a road crossing must be pulled down before a new two-level crossing is built in the same place. If phenomena are contradictory in time and occur in the same space an important question arises: how to assess the social advantages and the adverse effects of all transformations..."<sup>3</sup>

The methodology of studying the socio-economic system realizing the above assumptions in terms of socio-economic space, geographic space and time-space comprises two approaches: one analytical and one synthetic.

The analytical approach is based on the assumption that the socio-economic system is one whole defined by the set of its socio-economic properties. The

<sup>2</sup> Z. Zajda and S. M. Zawadzki, *Prognozy rozwojowe badań nad przestrzennym zagospodarowaniem kraju*.

<sup>3</sup> *Biuletyn KPZK PAN* 1968, 46, pp. 35-36.

spatial interpretation of this system is comprised in the category of the overall socio-economic space. This space can be described by a three-dimensional principal components model.

The above method identifies the latent structure of the overall space. The components are significant spatial patterns, that is the particular subspaces together with the dimension of time integrated into them. These patterns do not exhaust the whole set of subspaces but they are of basic importance both as regards the respective weights of the phenomena they represent and their persistence (or variation) in time.

In conclusion, these patterns may thus be identified as the carriers of changes in forming the inner structure of the overall space or as stabilized patterns which condition the crystallization of that structure.

The latter of the two approaches assumes that the particular spatial patterns constitute the socio-economic system which belongs to the category of metapatterns. The set of subspaces is, despite the multiplicity of its elements, a finite set, but its elements remain interdependent.

Thus the overall socio-economic space is a resultant of the particular subspaces which constitute its structure. This concept of overall space assumes that the properties of the socio-economic space are defined through the integration of the subspaces.

Regression analysis is the basic technique of linking the subspaces with one another from the standpoint of spatial differentiation. In this manner it is possible not only to define the types of mutual relations of the patterns but also to find out which of these relations are intrinsic. Another version of regression analysis, is the trend surface analysis of the potential of manpower, fixed capital, market demand and national income produced, and this analysis fulfills primarily a descriptive-explanatory function in the study of spatial links between patterns.

To sum up, the methodological idea of the integrated description of socio-economic time-space can ultimately be brought down to solving two research tasks: a) the macrostudy of the particular subspaces, b) the formulation of generalized statements about the variation of phenomena in the system as a whole such that have not been detected in the elementary patterns.

The study of subspaces can be reduced to analysing the spatial differentiation of specific socio-economic phenomena. Within the set of these subspaces, the population distribution pattern plays a dominant role.

A highly generalized description of the particular pattern of population is made using the trend surface method. As the point of departure, the population potentials created in given control points by the individual population masses of each unit belonging to the set of basic squares are established.

The population potential as a measure of differentiation and spatial links of the population serves as the foundation for the description of the particular socio-economic spaces; this description, which is strongly representative for the whole system, comprises also the effect of distance on the mutual interaction of socio-economic phenomena.

In order to generalize the spatial variation the trend surface method is employed. The trend surface method has the form of a multiple regression equation (an  $n$ -th degree polynomial) which defines the dependence of the population potential on the orthogonal geographic coordinates. This model permits a simplified description of highly complex population distribution patterns by separating the trend, i.e. systematic large-scale spatial changes called regional changes, from local or chance fluctuations. Maps of the trend can disclose spatial re-

gularities and constitute the point of departure for the interpretation of the spatial distribution of the population.

The generalized description of the spatial distribution of population by the trend surface method is repeated for several time points. The sequence of the estimated comparable multiple regression coefficients is viewed as a time series and this is followed by a study of the space-time trend in order to obtain a generalization of the spatial distribution of population in time. Each parameter of the function of spatial trend for a definite state of population distribution describes a definite spatial form, and the changes in the coefficients identify the time-related changes in the spatial forms of population distribution. These changes coincide with the phase of Poland's socio-economic development. Thus the value of this methodological concept consists in studying the relations between spatial structure and processes.

Poland's geographical environment is a system differentiating the socio-economic system's spatial structure. It has a different organization and the regularities governing it are of different character. As the ground structure for the socio-economic system, it has a definite level of utilization intensity. Diagnoses in this respect are possible if the input-output analysis is applied on the ground of the types of relief and land use in the pattern of delimited territorial units of economic activity.

The "geographic environment vs. society" relation provides the foundation of the concept of complex metasystem considered in terms of a unique synthesis of geographic space and a general synthesis of the socio-economic space.

The analysis of this metasystem must employ the principal components method. This method starts with a description of the statistical links between the variability of properties of the geographical environment and the spatial properties of the socio-economic system. As metafeatures underlying the correlations within a given set of properties, the components can be interpreted as essential properties of the geographical space integrated with the socio-economic space, properties on which are based the regularities observable in the spaces and which therefore are of great importance for the measurement, description and explanation of the variation of the metasystem.

The knowledge of variation in the spatial differentiation of the socio-economic system in the form of development trends may prove helpful in the task of forecasting and controlling the transformation of spatial structure.

Efficient forecasting is best served by a model of structure development. Unless such a model is at hand, the forecasting of future spatial structures may not be entirely unequivocal. In forecasting various research tools can be employed, both tools based on the knowledge of the evolution of spatial structures, which results from the knowledge of the mechanism of their development, and tools based on more general considerations concerning the direction in which the socio-economic system may be developing. In practice there are no solutions that would meet scientific requirements, though some research tools, as, e.g., extrapolation and developmental trends, can reinforce the scientific foundation of a forecast.