THE COURSE AND EFFECTS OF THE TRANSFORMATION PROCESS IN POLAND
IN DIFFERENT FIELDS OF SOCIAL AND ECONOMIC LIFE

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# AN ECONOMETRIC ANALYSIS OF THE SPATIAL VARIATION IN CONSUMPTION IN POLAND IN THE YEARS 1990-1998

## Introduction

The subject of the research presented in this paper is the state of and changes in consumption and its determinants, being a problem of great significance for every society. Furthermore, consumption is also a key issue of practical importance in the field of economic and social policy.

A quantitative approach was used as a methodological base for the research into consumption, which allowed an analysis of the most important interdependencies occurring in consumption, understood as a process of satisfying human needs with the help of goods and services.

The research mainly concerns the problem of spatial variation of consumption and its determinants. This problem is especially important in a situation of declining living standards, a common feature in periods of system changes, crises or slumps. This is because the negative effects of a recession on consumption show a strong regional variation around the national average due to various circumstances.

## 1. Consumption as a subject of research

People have always undertaken activities in order to satisfy their own needs. At each stage of the development of society's civilisation, specific principles have determined how its members participated in the consumption of goods and services produced. In a market economy, the use of goods available on the market is determined by the monetary resources the buyer possesses. The monetary resources arise as a result of the engagement of one's own capital in economic processes and – as is

the case for the largest part of society – as a result of selling one's own labour skills. Depending on the established principles of social policy in a given country, a certain proportion of the goods, and above all services, does not have to be bought by consumers, because those goods are available for free, being allocated according to established non-economic criteria. Most often this concerns services in the field of education and health care. The consumption of goods and services distributed on a non-payment basis has been described as the collective consumption, consumption of public and merit goods.

A proportion of the needs, even in a largely monetary economy, are not satisfied by goods and services bought on the market or allocated within the framework of the so-called collective consumption, but by the consumption of goods produced by consumers for their own needs. The extent of this so-called natural consumption depends on the extent of the commodity economy, the development of the service economy, the wealth of the society, and the existing consumption habits.

On the one hand, consumption is a process of satisfying human needs connected with the use of goods and services, while on the other hand – from the macroeconomic point of view – it is considered to be the aggregate of goods and services produced in the economy for consumption by society in a certain period. In the second case consumption is closely connected with the division of national income between investment and consumption.

As has been mentioned, from the point of view of an individual or a household, consumption can be considered to be a process of satisfying human needs. In this case, consumption means the total of goods and services consumed by a human being or his family with the aim of satisfying their needs. The determinants of consumption have, to a large extent, a macroeconomic character. They result from the level and structure of national income, as well as the accepted principles of its division and the way of realising this division in a country. These determinants make up the environment of the individual consumer, determine the accessibility of goods and services, and define the household income, the supply of goods and services, and the relation between individual and collective consumption.

Furthermore, the determinants of individual consumption are connected with the human being as an individual having needs. Thus, individual consumption is also connected with the fact that a human being is a biological organism and lives in social groups. In effect a model of consumption habits arises, resulting both from the needs and the living standard achieved.

Consumption is characterised by a relatively high level of inertia. Especially in periods of lower income (e.g. in a crisis situation), households often defend themselves against a fall in their level of consumption by taking up extra work, borrowing and reducing savings.

In relation to the determinants discussed above, two issues have been touched in the consumption research: the shaping of consumption from the point of view of the production process and consumption as a process satisfying the needs of an individual consumer.[1]

The first of the research issues distinguished leads with the help of an econometric approach to modelling macroeconomic categories, for example the national product, in relation to their basic determinants and division at the macro level. Models describing the size and structure of consumption as a result of the level of the national product and the policies regarding its division are of significant importance. These models consider consumption as an aggregate of goods and services intended to be consumed.

However, in modelling individual consumption, the origin and satisfaction of human needs are key issues. From the point of view of research, the following basic criteria for classifying consumption can be established:

- the type of needs satisfied in the consumption process;
- the type of goods and services consumed;
- the organisation of the consumption process;
- the consumer.

As mentioned before, consumption is considered as a process of satisfying human needs connected with the consumption of goods and services. In this depiction the consumer is an individual human being. An alternative is the macroeconomic approach, in which consumption is treated as the aggregate of goods and services available in a given period for consumption by society being the consumer.

A family, or more broadly speaking a household is a clearly defined consumer in the functioning of society. A household can be described as a voluntary relation between people living together, making common financial decisions related to the way of earning as well as spending the money. From the point of view of the scale of operations, this is the smallest economic entity. Households are of fundamental importance for the economy due to their number. The effects of decisions made by households are visible on markets for goods and services, as well as the markets for labour and capital. At the same time their consumption behaviour is the result of the state of the economy, and can be treated as a particular measure of its

[1] See: Łangowska, U., *Społeczno-gospodarcze uwarunkowania konsumpcji w Polsce w latach 1970-1990 w układzie przestrzennym*, Opole, 1993, p. 35 ff.

efficiency. For these reasons the laws and determinants of consumption behaviour of households are an area of economics that very often has been the subject of research. As a result of such research, theories have been developed describing the consumption function of households as well as laws defining their consumption patterns.

A goal of a household is assuring the survival of its individual members at an acceptable level within the given socio-economic environment. Therefore the existence of a household is determined by obtaining an income at or above a minimum level guaranteeing survival. Most often household income is obtained by selling the labour of individual members. This income is used mainly to purchase goods and services intended for satisfying household needs by way of their consumption.

The determinants of consumption behaviour are very diverse. Commonly two groups of determinants are distinguished, economic and non-economic. Economic determinants of decision-making by economic entities, consumption decisions included, have been a topic of economic interest for many years and are widely known. The following are considered to be the most important ones: income, savings, prices, taxes and credit. These factors shape the budgets of households and individual consumers. Another economic determinant of consumption is the range of products offered on the market. Furthermore, it has been argued that the accessibility of information about the possibilities and conditions for obtaining goods and services for consumption purposes is as important as the other factors.[2] The economic determinants of consumption are variable in time and space.

Cultural, political, technical, social, demographic and psychological factors belong to the category of non-economic determinants of consumption behaviour. The consumer, making decisions with respect to the type and quantity of goods and services to be purchased on the market as well as the time and place of purchase is influenced by a diversity of incentives created by his environment. These incentives come partly from the economic environment, in particular from the market created by marketing activities like: product, price, place, and promotion. Also the political, cultural, social and technological environment influence the consumer. All this determines, to a certain degree, the consumer characteristics, which in turn determine his needs and accepted manners of satisfying those needs. A detailed model of determinants of consumer behaviour, focusing from a very broad environment on his personality has been developed by P. Kotler.

[2] See: Krasiński, Z., Piasny, J., and Szulce, H., *Ekonomika konsumpcji*, Warszawa, 1984.

**Table 1.** Determinants of consumer behaviour

| Cultural factors | Social factors | Personal factors | Psychological factors | Consumer |
|---|---|---|---|---|
| | Aspiration group | Age and stage in the life cycle | | |
| Culture | | | Motivation | |
| | Family | Profession | | |
| | | | Perception | |
| Subculture | | Wealth | | |
| | Social role | | Education | Buyer |
| | | Life-style | | |
| | | | Attitude | |
| Social class | | Personality | | |
| | Social status | | Beliefs | |
| | | Ambitions | | |

Source: Kotler, P.H., *Marketing. Analiza, planowanie, wdrażanie i kontrola*, Warszawa, 1994, p. 161.

## 2. Identification and measurement of consumption and its determinants

The level and structure of consumption of goods and services are often identified with the level of satisfaction of needs at a given moment, and in this sense they can be treated as a measure of the standard of living.[3] Establishing the global range or level of consumption can, for example, be done on the basis of the quantity and structure of goods and services transferred with the aim of satisfying human needs in a unit of time. This requires macroeconomic research into those categories determining and reflecting the consumption of society. Such categories as mentioned below contain direct or indirect information about consumption:

- the global gross product (size and especially the sectorial structure of the global product);
- national income, national product (level and sectorial structure);
- sales of commodities and services (level and structure of sales);
- consumption (level and structure of the consumption budget).

In this way the level of consumption can be identified with the level of satisfaction of the society's material and cultural needs, as well as with the stream of goods and services contained in the collective consumption

[3] See: Pohorille, M., *Potrzeby, podział, konsumpcja*, Warszawa, 1985; Luszniewicz, A., *Statystyka społeczna*, PWE, Warszawa, 1978.

budget in a given period of time and place. However, in this case the efficiency aspect of consumption is not known and the level of acceptation of the goods and services consumed is unclear, as is the level of satisfaction from consumption.

Many problems appear when measuring the structure and volume of the stream of consumption goods and services. As a rule research can include those groups of goods and services which are a subject of official records. Measurement of the level of satisfaction of human needs can also concern such groups of needs for which consumption norms can be established, like norms for food intake, patterns of clothing use, etc.

Next the measurement of satisfaction of needs of a higher order (e.g. social and cultural) creates other problems. In this case it is normally almost impossible to construct a specific consumption model, mainly due to the fact that there are too many different ways of satisfying individual groups of such needs. Establishing the level of acceptation of the consumption process must be based on direct observation of the type and quantity of goods or services used by the consumer and the identification of their utility to the consumer. This requires the application of specific techniques for gathering information, namely questionnaires, interviews or polls, and as a rule, limitation of the research to parts of the community. Other difficulties arise when constructing a utility measure.

In this case consumption is a category that has many aspects. This makes measurement difficult. However, stressing the level of satisfaction when assessing consumption raises specific requirements when carrying out measurement. Besides selected groups of material needs like food, housing and clothing, with reference to which relatively objective norms can be established (consumption models), the measurement and assessment of satisfaction of needs (mainly) of higher order requires the application of qualitative evaluation methods. In such cases it is necessary to construct an adequate assessment scale, facilitating the measurement of qualitative data.

In the theory and practice of research of consumption behaviour, measures of the social effects of economic growth and measures describing the expenditure needed to achieve a certain level of consumption at a given moment and place are usually treated as homogeneous and considered together. Distinguishing the variables describing the effects at the level of consumption of different determinants in the sphere of material production, or social services and variables reflecting these determinants (so-called consumption factors having an external character) is not easy in practice. In spite of this, in theory a clear distinction between measures and factors of consumption is assumed, as well as the existence of

interdependencies of a cause-and-effect type between these groups of variables.

In the cause-and-effect analysis of the determinants of the consumption level, "such random variables that symptomatically can characterise the achieved level of satisfaction of material and non-material human needs at a given time and certain spatial unit" are called measures.[4] However, factors of consumption are described as random variables characterising the accessibility of consumption, i.e. the variables representing the conditions for satisfaction of needs.

Empirical research of the efficiency aspect of consumption usually has as a basis the assumption of the possibility of statistical measurement of the real level of satisfaction of human needs. However, on the basis of official statistics it is only possible to establish some manifestations of the satisfaction of needs. In most cases the assessment of the level of satisfaction of needs requires research into subjective feelings of consumers.

In consumption research carried out on a micro-social scale, the household is the basic unit of observation, and the socio-economic goals of these units are the starting point for the construction of a set of measures representing individual classes of needs connected with the functioning of the household.

The macro-social approach differs from the previous one in the sense that the unit of observation is not the individual consumer, but the whole collection of consumers, while the main subject of research are the factors determining the level of consumption.

In order to measure the level of satisfaction of needs according to a selected classification, it is necessary, as mentioned before, to establish measures representing each group of needs. This is a complicated and fundamental problem in such research.[5] The set of measures of factors of the level of consumption can have any level of detail. Furthermore, there are no objective procedures for the selection of groups of measures, which would represent in an unambiguous way the category of the standard of living for the sake of distinguishing different classes of needs. However, the lack of availability of statistical data is a significant problem. In the literature on this subject[6] it has been argued that the only feasible and effective method of establishing a set of measures, as well

[4] Luszniewicz, A., *Statystyka społeczna*, PWE, Warszawa, 1978, p. 9.

[5] See: Bartczak, S., *Nowa wersja wskaźnika stopy życiowej ludności*, *Wiadomości Statystyczne* 1969 nr 11; *Przestrzenne struktury konsumpcji (zróżnicowanie, uwarunkowanie, kształtowanie)*, S. Mynarski (ed.), Katowice, 1991, p. 103-110.

[6] See: Luszniewicz, A., op. cit., p. 18; Zienkowski, L., *Poziom życia. Metody mierzenia i oceny*, Warszawa, 1979.

as factors influencing the level and quality of consumption is their intentional selection. When selecting, certain general principles are applied with the aim of guaranteeing at least minimal formal correctness of the choice.

However, in practice there is a parallel application of quantitative variables describing consumption and its determinants. They are used when analysing the costs of the achieved consumption level, estimated on the basis of national income statistics. The quantitative approach has also been used in comparative research into the spatial variability of consumption.

In the research preferring the quantitative approach, a variety of artificial constructions for measuring determinants and the level of consumption are used. These constructions are measures of the efficiency of the expenditure on consumption by consumers, households and the state.[7]

Development and consumption are processes that cannot be separated from the space in which they take place. Both processes require a material base at a specific point in space. In the case of production processes or provision of services, the material base is made up of fixed assets (buildings, machines, equipment, etc.) and the technical infrastructure (roads, bridges, the energy-supply system, the water-supply system, etc,). However, consumption processes are in general connected with the place where the consumption takes place and the place where the goods and services are bought for the purpose of the satisfaction of needs.

The spatial division of development and consumption processes is, to a large extent, historically determined, since the spatial structure of the material base and human settlements is characterised by a high level of inertia.

In connection with the things mentioned above, a necessary element in research into consumption is the identification of its spatial determinants, as well as separating areas homogeneous with regard to these determinants. Therefore, in most of the research of consumption the profile of the place in which the consumption processes are realised is one of the fundamental problems. Because of difficulties with gathering information, determinants of consumption within spatial frameworks are researched more often than the level of consumption. Depending on the aim and the content-related scope of the research, different sets of measures are constructed describing the spatial aspects analysed. With regard to this, research into the spatial variation of consumption is con-

[7] Luszniewicz, A., op. cit., p. 21.

ducted with the aim of making a comparison between countries and between different regions of a country.

One of the earliest examples of research into the regional distribution of consumption is the research by B. Podolec and K. Zając,[8] in which a classification and comparative analysis of consumption in different regions in the years 1969 and 1972 was carried out with the use of a set of twelve characteristics. In later research this set of characteristics was significantly changed and modified.

The set of characteristics suggested by these authors contains factors influencing the level of consumption, the degree of availability of consumption, and measures of the level of consumption. However, the authors did not look for cause-and-effect dependencies between determinants and the achieved level of consumption in regions, although significant correlations indicating such dependencies can be found in their work.

The issue of spatial variation of consumption structures in a dynamic framework was researched by U. Łangowska and K. Hanusik.[9] In this research the problem of cause-and-effect relations between determinants and the level of consumption was broadly interpreted. The determinants of consumption were divided into eight groups: agriculture, industry, transport, market, housing, education and culture, health care, and environment. Each of the determinants mentioned is a compound category, described by several detailed features, reduced in the research to artificial variables. The initial set of features contained 34 variables observed in a spatial-dynamic framework.

Within the spatial framework, the dependency between determinants of consumption and the artificial measure of its level was analysed. The dynamic approach enabled the tracing through time of changes concerning the influence of determinants on consumption in regions and changes in the analysed categories.

At the turn of the 1990s detailed research of consumption was carried out in the framework of the Departmental Basic Research Programme (*Resortowy Program Badań Podstawowych*) entitled "Change in the consumption structure" and directed by J. Kramer.[10] The authors intro-

[8] See: Podolec, B., and Zając, K., *Ekonometryczne metody ustalania rejonów konsumpcji*, Warszawa, 1978.

[9] See: Łangowska, U., op. cit.; Hanusik, K., and Łangowska, U., *Ekonometryczna analiza kształtowania się konsumpcji w Polsce*, Opole, 1997.

[10] See: Kramer, J., *Konsumpcja. Prawidłowości, struktura, przyszłość*, Warszawa, 1993. In this research the spatial aspect of consumption was taken into consideration and the results were published [in:] *Przestrzenne struktury konsumpcji (zróżnicowanie, uwarunkowanie, kształtowanie)*, S. Mynarski (ed.), Katowice, 1991.

duced so-called system features of regions describing spatial determinants of consumption: A. size of the region, B. spatial density, C. concentration, D. specialisation, E. level of technology, F. human factors, and G. rationalisation. These system features were expressed with appropriate sets of as many as 57 features.

The latest work edited by R. Milic-Czerniak is devoted to an analysis of the situation of households in Central-European countries. Here a somewhat different set of measures of the standard of living is used, namely: gross domestic product in US dollars at the purchasing power parity; an artificial measure of the standard of living based on 10 different indicators of food consumption, social infrastructure services and wealth; an artificial measure of distances characterising the variation in social infrastructure; an indicator of human potential; an artificial measure of the possession of durable consumption goods; an artificial measure of food consumption; and the average life expectancy of men and women.[11]

The next dimension in which consumption is analysed is the time. In this case it is important to assure comparability through time of measures applied in such research and sufficiently long series of observations.

As can be seen from the above examples, the selection of variables representing determinants, accessibility and the level of consumption is one of the most difficult methodological problems when doing research. There are no objective criteria for selecting variables. This makes it necessary to take into consideration the subject and the aims of the research when selecting the range of variables.

## 3. Quantitative methods in the research of consumption

Consumption as a conceptual economic category has many features. Therefore, the analysis of such a complex phenomenon requires the application of appropriate methods. When researching individual variables, artificial indicators, as well as methods for analysing the distribution of random variables are used. Joint consideration of many features is possible with the application of taxonomic methods. These methods enable comparative analysis of those so-called multi-dimensional categories, both in time and space. However, connections between individual variables which characterise consumption, in particular cause-and-effect

[11] *Gospodarstwa domowe w krajach Europy Środkowej*, R. Milic-Czerniak (ed.), Warszawa, 1999, p. 39 ff.

relations, are described by econometric models. When making predictions also Markov models can be applied.

## 3.1. Methods for analysing the distribution of random variables

Empirical distributions of variables take the form of statistical series. Broadly interpreted these are statistical sequences of numbers, being the values of the realisation of the required variable. Statistical series are divided as follows: series containing all the individual realisations of a variable, and frequency tables containing the number of realisations of a variable in particular intervals. In order to describe the formation of qualitative features, so-called structural series can be applied, where the individual realisations of the feature are represented by the regularity of appearance in the researched sample. When the series describes a feature at different moments, it is called a time series. When the observation concerns a fixed moment in time and different objects, then the statistical series is called spatial or static.

When analysing statistical series, the average level of the realisation of the variable, its range of variability, the symmetry of the distribution and its concentration are all considered. Appropriate parameters describing statistical samples are used. They are divided into location parameters and dispersion parameters. The following are location parameters: the mean, the median and other quantiles, and the mode. Dispersion parameters are most often the second and third order centralised moments.

A certain amount of valuable information can be obtained by investigating the particular parameters separately. Research into population's wages or income is based on a detailed analysis of the distribution of the relevant random variable. Usually frequency tables are constructed with numbers of workers or households in each group according to wage or income.

In spatial and dynamic research into the variation of wages and income, the parameters of the distribution and other artificial measures find broad application.

An absolute measure of variation might be the range, defined as the difference between the highest and the lowest value of the variable. This measure is seldom applied in practice, because it only provides very general information. In the literature the variation in wages and income is most often described with the help of quantiles, mainly quartiles and percentiles. A number of relative measures is also based on quantiles. The Lorenz concentration coefficient, connected with the Lorenz curve, belongs to the most popular measures of concentration.

The coefficient of variability can be applied to assess dispersion, i.e. the ratio of the standard deviation to the mean. However, as a measure of asymmetry (skewness of the distribution) usually a coefficient of asymmetry is accepted, defined as the ratio of the centralised third moment to the cube of the standard deviation. This coefficient has a value of zero in the case of a symmetrical distribution. In the case of an asymmetrical distribution skewed to the right it has a positive values and in the case of an asymmetrical distribution which is skewed to the left it has a negative value.

A significant role in analysing and forecasting wages and income of the population is played by descriptions of those variables with help of theoretical distributions. Many papers are dedicated to the issue of matching theoretical distributions with empirical distributions of wages and income of the population.[12] The log-normal distribution has gained wide practical application. Z. Pawłowski has described with its help the distribution of wages of workers employed in the state-owned sector in the years 1953-1960.[13] The goodness of fit of the wage distribution of all workers, manual workers, white-collar workers and workers in individual branches of the economy to the log-normal distribution has been researched by J. Kordos and Z. Stroińska.[14] Also M. Radziukiewicz has applied the log-normal distribution to describe the income of the Polish population.[15]

The log-normal distribution, of course, is not the only theoretical distribution which has found application in research into wages and income. A set of right-skewed distributions can be mentioned here, in particular the Pareto distribution and the Pearson curve.

## 3.2 Methods for analysing the spatial variation of consumption

An economic region is an objective spatial and economic category. Its size and internal structure depend on the level of development of the

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[12] See: Kordos, J., *Metody analizy i prognozowania rozkładów płac i dochodów ludności*, Warszawa, 1973, p. 83 ff.

[13] Pawłowski, Z., *Ekonometryczne metody badania popytu konsumpcyjnego*, Warszawa, 1961.

[14] Kordos, J., and Stroińska, Z., *Statystyczne metody analizy rozkładu płac i dochodów ludności*, Warszawa, 1971. From the papers of the Institute for Statistical and Economic Research at the Central Statistical Office (ZBSE GUS), vol. 42; Kordos, J., *Metody analizy i prognozowania rozkładów płac i dochodów ludności*, Warszawa, 1973.

[15] Radziukiewicz, M., "Przydatność badań rozkładów dochodów", *Wiadomości Statystyczne* 1993, no. 12.

productive potential and the prevailing production relations. Differences in natural and geographical conditions, and the effects of heterogeneous factors of a historical and socio-economic nature have resulted in each region facing a different economic and ecological situation and having a different level of development and progress. In connection with the spatial structure of a country, one can divide the regions into more or less developed and having better or worse environmental conditions and standard of living. Thus, the level and structure of consumption is variable over the regions. Similarly, such distinctions can be made between macro-regions or states.

The application of traditional statistical methods for analysing spatial variation of consumption is not sufficient. In particular this is apparent when conducting qualitative and comparative research, which is the fundamental activity of almost all economic research. This results from the fact that the spatial objects compared are described with regard to the level of socio-economic development and the standard of living by several dozens of variables. In connection with this, taxonomic methods are more and more popular in spatial research, facilitating the analysis (classification, comparison) of objects in a multi-dimensional space.

Taxonomy is a scientific discipline related to the principles and procedures of classification, i.e. ordering, grouping, discrimination, delimitation, and dividing. The basic premises for making a classification are:

- reduction of the gathered information to a few basic categories, which enable drawing generalised conclusions and establishing typologies in the field of the issues researched;
- characterisation of homogeneous objects of analysis, which make it easier to distinguish systematic factors and eventual cause-and-effect relations;
- lowering the time and costs of research by limiting the issues considered to the most typical facts, phenomena and objects, while keeping the information loss relatively small and decreasing the probability of obtaining distorted results from the analysis.

Reality, which is analysed with help of taxonomic methods, is a collection of objects considered in time or space and is described by a set of statistical features.

In the case of research into the level of regional development the starting point is territorial division. It has to be decided if the analysis will be carried out dividing the country into administrative units or economico-geographical units. With respect to the needs of managing and planning, as well as the existing statistical material, adopting the existing administrative division is more practical. Using the administrative division enables simple decomposition of decisions concerning economic

policy of the state, handing over different tasks to be carried out by the proper administrative organs on a territorial level. For these reasons the object of classification is, as a rule, the administrative unit.

The next problem that has to be solved is establishing a preliminary list of features, describing the level of consumption (or its determinants) of the territorial unit under question. On basis of this preliminary list of features, created while taking content-related criteria into consideration, a set of diagnostic features is created.

The selection of diagnostic variables is a complicated process and usually also requires, besides a content-related analysis, a statistical analysis. The starting point for further considerations is a matrix of observations.

The main object of statistical assessment is the variability of features and their independence. The variability of features can be assessed on the basis of the variability coefficient, while the independence of features is studied with help of correlation coefficients.

A direct analysis of correlational dependencies, with reference to a larger set of variables is quite troublesome. Because of this, a series of statistical aids for the selection of the set of variables fulfilling the condition of independence has been developed. The starting point for analysing the independence of features is a correlation matrix, including a correlation coefficient for each pair of features.

The reduction of the set of preliminary features to a set of diagnostic traits can be carried by graphical methods. This method is based on the assumption that diagnostic variables should have a low correlation between each other.

The next stage, indispensable in most of the taxonomic procedures is to make the diagnostic (often heterogeneous) features comparable. This can be achieved with help of the classical standardisation procedure.

Standardised traits are characterised by two properties: the mean value of each of them is zero, and the standard deviation equals unity.

The direct application of diagnostic features (freed from units of measurement by, e.g., standardisation) in order to calculate values of measures of similarity of objects means at the same time that these features are all of the same importance in characterising the classified objects. This is also the case with regard to the particular variables. In socio-economic research such procedures are not always justified, because usually in sets of diagnostic features there are variables which contain varying levels of information from the point of view of the aims of the research. In order to take the different importance of individual diagnostic features into consideration, weights are constructed for the characterisation of the classified objects, which are later used to calculate the measures of similarity of the objects.

In general, two types of weights appear:
- weights concerning the content-related value of diagnostic features;
- weights showing the statistical properties of diagnostic features.

A significant part of taxonomic procedures relies on the aggregation of diagnostic variables into one artificial variable – a measure of development. Depending on the way of aggregating variables standard and non-standard methods can be distinguished.

In the non-standard methods the artificial feature comes into being as a result of taking the average of the normalised diagnostic variables. Two methods can be distinguished here: the method of the sum of standardised values and the ranking method.

Standard methods are based on the distance of objects from a standard hypothesis. For comparison, difference and ratio formulae are applied. Artificial measures appear as a result of comparing the real object with the standard one. The fundamental methodology of standard aggregation was created by Z. Hellwig. On the basis of of Hellwig's taxonomic measure of development, the idea of the standard model can be shown. In the discussed method an idealised model (model of development) is constructed, which creates the optimal observed values of the features. Next, the distance from the standard is established for each object. The distances obtained are transformed in such a way that they take values in the range [0,1] and they increase in the direction of the most favourable shape of the analysed phenomenon, which facilitates the comparative analysis.

A significant group of taxonomic methods is formed by methods in which ordering takes place on the basis of a matrix of distances between objects. They usually lead to a non-linear ordering of the set of objects.

Methods using graph theory belong to the most popular methods for ordering sets and making a division into subsets. The basis is a dendrite (a non-orientated coherent graph without cycles), whose nodes are objects, and edges the shortest distances between them. The neighbouring nodes in the dendrite are least differentiated with respect to all distinguished features. The division of the set relies on the removal of the longest edges.

The discussed methods are characterised by a large degree of simplicity and easiness of preparation of the appropriate computer programmes. Gradient methods belong to the less popular linear ordering methods. Their realisation leads to more complicated computational procedures. The idea of the gradient method relies on finding such an artificial variable, for which the difference between the distance of objects in a multidimensional space of features and one-dimensional space of artificial features is the smallest.

Calculation of artificial variables leads to the task of non-linear programming. The artificial variable that is obtained, as in the cases discussed earlier can be used for both linear ordering of the set of objects and comparative analysis.[16]

## 3.3 Econometric modelling of consumption

Econometric modelling is widely used in research into consumption. Econometric models are fundamental tools for econometric research. Such models are formal constructions, giving an idealised picture of reality. When constructing econometric models the mutual interdependence of economic categories are highlighted by the use of mathematical methods.[17] Furthermore, econometric models take the form of individual equations or systems of equations, and their structure is developed to a varying degree. However, categories whose structure is reflected by the model, or which make up their determinants, fulfil in econometric models the function of, respectively, dependent and independent variables.

In econometric modelling it is accepted as a principle that individual equations can express the mechanism of the determination of only one variable – an economic category. The equations of the model define the relation between the realisation of the dependent variables and variables playing a causal role (independent variables). In this place it is worthwhile to recall a trivial condition placed on phenomena, categories or processes, for which we want to construct models or which we want to take into consideration in models in the form of independent variables: measurability, understood as the existence of a direct or indirect means of transforming them into numbers.

Econometric models can vary greatly with respect to: the number of equations in the model, the number of independent variables, the analytical form of the equations, the character of relations between variables, the degree of randomness, etc.

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[16] See: Nowak, E., *Metody taksonomiczne w klasyfikacji obiektów społeczno-gospodarczych*, Warszawa, 1990; Pociecha, J., Podolec, B., Sokołowski, A., and Zając, K., *Metody taksonomiczne w badaniach społeczno-ekonomicznych*, Warszawa, 1988; Grabiński, T., Wydymus, S., and Zeliaś, A., *Metody taksonomii numerycznej w modelowaniu zjawisk społeczno-gospodarczych*, Warszawa, 1989.

[17] See: Pawłowski, Z., *Ekonometria*, Warszawa, 1972; Bartosiewicz S., *Ekonometria*, Warszawa, 1978.

The construction of econometric models creates many problems, both of an economic and a formal nature. The most significant problems are:

- to give an adequate description of the aims and the scope of the model, i.e. the possibility of defining unambiguously the phenomenon for which a model has to be constructed;
- the possibility of defining unambiguously and making an adequate selection of independent variables which describe various endogenous variables of the model;
- establishing the correct type of functional dependencies between variables in the model;
- research of correlations between modelled categories in time, space or space-time dependencies;
- establishing appropriate units of measurement for the phenomena – spatial objects and periods or moments where and when the measurement will take place;
- gathering an appropriate collection of statistical data for the realisations of variables;
- choice of the proper method for estimating the parameters of the model;
- verifying the correctness of the model.

The most important problem in the modelling of the economic phenomena, however, is that between the real object, which is the economy or an element of the economy, and the model there exists an indirect element – the image of the object that the author of the model has in his mind, expressed with the aid of a certain language and a certain theory describing the functioning of the object and the way of studying this object.[18]

In analysing the state and dynamics of economic phenomena and their determinants, causal and descriptive models possess the largest cognitive value. However, it is not always possible to construct such models, which in consequence means that often standard symptomatic models are used, like trend models. Besides statistical models, in which the spatial aspects of phenomena are reflected and standard trend models, where the only independent variable is the time, models based on cross-sectional data taken at different points in time have great importance.

In modelling the dynamics of consumption and its determinants on a macroeconomic scale, models of linear and exponential form are applied together with the Cobb-Douglas or Tinbergen type polynomial models.

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[18] See: Czerwiński, Z., Maciejewski, W., Smoluk, and A., Zadora, K.: *Ekonometria. Nadzieje, osiągnięcia, niedostatki*, Warszawa 1987, p. 11.

## 4. The spatial variation in consumption in Poland in the years 1990-1998

### 4.1. The determinants of consumption

As already mentioned, a large variety of factors influences the level of consumption. Of significant importance are the economic development, the natural environment, the demographic situation, the level of technical and social infrastructure and the level of wealth. Those factors are characterised by an uneven distribution in the spatial framework of the country, which to a large extent determines the uneven distribution of consumption. The research presented in this paper attempts to identify the influence of the socio-economic transformation in Poland on the formation of the spatial structure of consumption between 1990-1998.

In the theoretical part of this work, considerations regarding the selection of appropriate features for describing the determinants of the level of consumption were introduced, together with the analysis of sets of variables applied in the research into this category, which is ultimately always a result of the research aims and their spatial and temporal scope.

In the research presented, the categories were observed in 1990, 1994 and 1998. With respect to the necessity to assure comparability, the considered phenomena were described by the same variables, which means that the final set of diagnostic variables was limited. It has to be stressed that the variables chosen reflect to a sufficient degree the basic groups of determinants of the level of consumption.

The economy creates the basis of consumption, and in relation with this it is, above all, necessary to analyse the spatial variation of economic development in the country. In the research presented below, it is assumed that the following categories indicate the level of development:

1. the rate of unemployment;
2. the value of investment outlays per capita in thousands of zlotys;
3. the value of gross fixed capital per capita in thousands of zlotys;
4. the purchase of agricultural products per hectare arable land in zlotys;
5. the value of industrial production sold per capita in thousands of zlotys.

The conditions for accessibility of consumption are, among other things, created by the social infrastructure in the region. The level of the social infrastructure is indicated by the following features:

1. the number of pupils in grammar schools per 1000 inhabitants;
2. the number of hospital beds per 10,000 inhabitants;
3. the number of doctors per 10,000 inhabitants.

Society's wealth is, on the one hand, a direct determinant of consumption, while, on the other hand, it is the result of earlier consumption. The level of wealth can be assessed on the basis of the following features:
1. the sales of retail goods per capita is zlotys;
2. the number of rooms per 1000 inhabitants;
3. the average monthly salary in zlotys;
4. the energy use in households in kWh;
5. the number of cars per 1000 inhabitants.

The level of development of civilisation of regions is characterised by features like:
1. the percentage of the population living in cities;
2. infant mortality per 1000 live births;
3. the net migration per 1000 inhabitants;
4. the use of electricity in households in kWh;
5. the number of telephone subscriptions per 1000 inhabitants.

In general, these variables can be interpreted both as a measure and as a result of the development of civilisation.

For each group of determinants of consumption, and also for the set as a whole, a dynamic artificial measure is established according to the Hellwig method, which enables the analysis of the spatial variation of the phenomena and its changes through time. In this way, a linear ordering of provinces is obtained with respect to the distribution of particular groups of determinants.

The distribution of artificial variables in the Polish provinces is similar to the normal distribution, which is illustrated by the characteristics in Table 2 and the distribution of these artificial variables shown in Figures 3, 6, 9, 12 and 15.

**Table 2.** Fundamental characteristics of artificial variables of determinants of consumption in the years 1990, 1994, and 1998

| Artificial measure | Average value | | | Standard deviation | | | Variability coefficient | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 1994 | 1998 | 1990 | 1994 | 1998 | 1990 | 1994 | 1998 |
| Economic development | 0.302 | 0.180 | 0.337 | 0.090 | 0.122 | 0.139 | 30% | 68% | 41% |
| State of the social infrastructure | 0.353 | 0.443 | 0.507 | 0.212 | 0.217 | 0.201 | 60% | 49% | 40% |
| Level of wealth | 0.239 | 0.432 | 0.567 | 0.160 | 0.156 | 0.185 | 64% | 37% | 27% |
| Development of civilisation | 0.435 | 0.420 | 0.600 | 0.185 | 0.240 | 0.255 | 42% | 57% | 43% |
| Level of general consumption | 0.262 | 0.258 | 0.407 | 0.120 | 0.144 | 0.152 | 46% | 56% | 37% |

Source: Own calculations.

## 4.2. The spatial variation of economic development in provinces

The state of the economy in regions influences in a crucial way the supply of goods and services on the market, the level of the material base of trade and services, the development of technical and social infrastructure, people's income, and resulting from this – the demand on the regional market as well as the level of security of the population in a social sense. On the other hand, in economically developed regions the natural environment is seriously threatened. This is one of the most important factors influencing consumption, also within spatial arrangements.

In Poland the current state of the economy is, to a large extent, the result of many diverse conditions, both natural and historical as well as a wide range of interrelated factors in the field of economic and regional policy in the period after World War II. The spatial variation in the level of economic development remained at a similar level over the research period, and in 1994 a significant reduction in the value of the measures was observed.

Based on the five features mentioned earlier, a dynamic artificial variable has been created with the aid of the Hellwig method (see Table 2), which is the basis for the division of provinces into groups with a similar level of economic development (see Table 3 and Figures 1 and 2). The range of variability of the artificial measure (0.088-0.926) and the distribution of its standard deviation through time in the provinces investigated points out the existence of a large variation in economic development of regions and decreasing measures of development in 1994, in particular in the areas economically lagging behind. However, in 1998 an increase in the level of the measures of economic development took place, and in provinces with large agglomerations the level of 1990 was significantly exceeded. The dynamics of the economic changes analysed in regions is illustrated in a general way in Figure 3 by the distributions of artificial variables of the level of economic development in the Polish provinces in particular years.

In 1990 the analysed artificial variable had a distribution similar to the normal distribution, with a strong concentration around the mean. In 1994 the lowest level of the artificial measure of economic development could be observed, which is a reflection of the introduction of the so-called shock therapy in the Polish economy. The distribution of the measure of development is skewed to the left in that year, and is flatter in comparison to 1990. In 1998 the level of economic development improved. However, this improvement was accompanied by an increase in the spatial variation – the distribution became more symmetrical, flat-

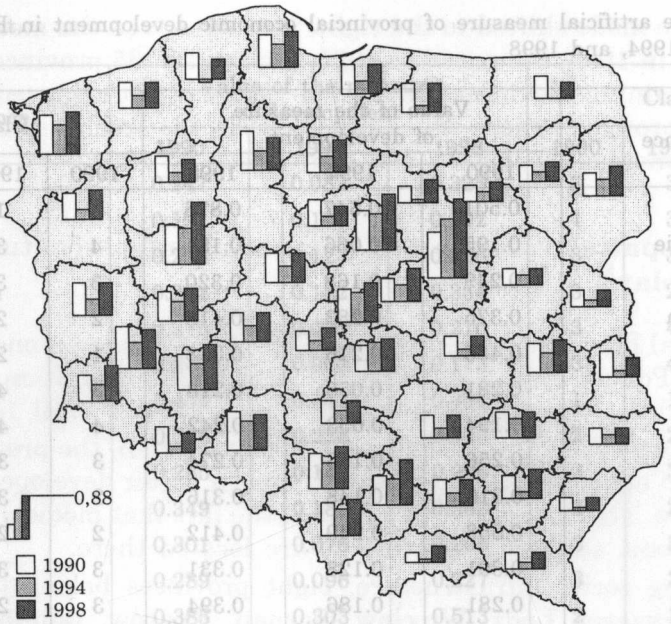


**Fig. 1.** The distribution of the measure of provincial economic development in the years 1990, 1994, and 1998

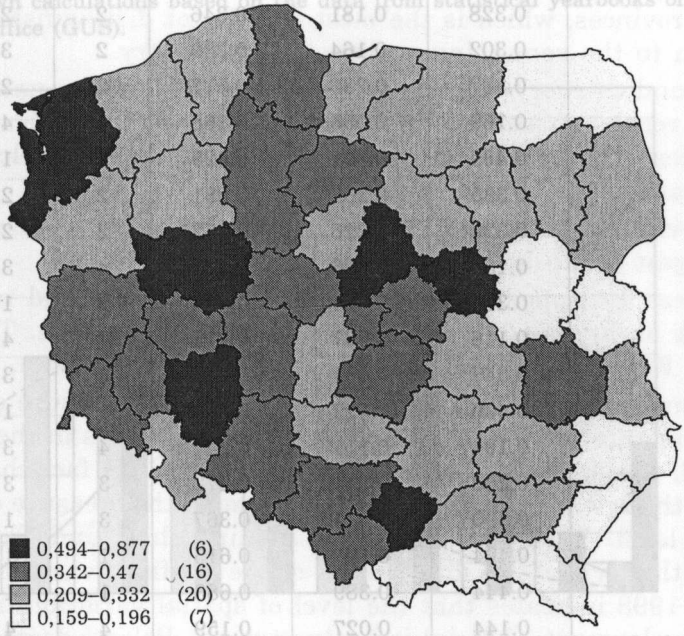


**Fig. 2.** The spatial variation of provincial economic development in Poland in 1998

**Table 3.** The artificial measure of provincial economic development in Poland in the years 1990, 1994, and 1998

| Province | Value of the measure of development | | | Class | | |
|---|---|---|---|---|---|---|
| | 1990 | 1994 | 1998 | 1990 | 1994 | 1998 |
| Warszawa | 0.501 | 0.647 | 0.876 | 1 | 1 | 1 |
| Białe Podlesie | 0.195 | 0.066 | 0.184 | 4 | 3 | 4 |
| Białystok | 0.249 | 0.168 | 0.320 | 3 | 3 | 3 |
| Bielsko-Biała | 0.375 | 0.283 | 0.418 | 2 | 2 | 2 |
| Bydgoszcz | 0.456 | 0.216 | 0.358 | 1 | 2 | 2 |
| Chełm | 0.281 | 0.055 | 0.213 | 3 | 4 | 3 |
| Ciechanów | 0.194 | 0.053 | 0.242 | 4 | 4 | 3 |
| Częstochowa | 0.256 | 0.156 | 0.274 | 3 | 3 | 3 |
| Elbląg | 0.316 | 0.148 | 0.316 | 2 | 3 | 3 |
| Gdańsk | 0.358 | 0.249 | 0.412 | 2 | 2 | 2 |
| Gorzów | 0.301 | 0.128 | 0.331 | 3 | 3 | 3 |
| Jelenia Góra | 0.281 | 0.186 | 0.394 | 3 | 2 | 2 |
| Kalisz | 0.336 | 0.197 | 0.342 | 2 | 2 | 2 |
| Katowice | 0.397 | 0.287 | 0.469 | 1 | 2 | 2 |
| Kielce | 0.242 | 0.100 | 0.255 | 3 | 3 | 3 |
| Konin | 0.328 | 0.181 | 0.346 | 2 | 2 | 2 |
| Koszalin | 0.302 | 0.164 | 0.289 | 2 | 3 | 3 |
| Kraków | 0.337 | 0.286 | 0.517 | 2 | 2 | 1 |
| Krosno | 0.169 | 0.056 | 0.168 | 4 | 4 | 4 |
| Legnica | 0.489 | 0.301 | 0.425 | 1 | 1 | 2 |
| Leszno | 0.335 | 0.208 | 0.381 | 2 | 2 | 2 |
| Lublin | 0.330 | 0.216 | 0.352 | 2 | 2 | 2 |
| Łomża | 0.183 | 0.096 | 0.237 | 4 | 3 | 3 |
| Łódź | 0.373 | 0.325 | 0.434 | 2 | 1 | 2 |
| Nowy Sącz | 0.116 | 0.037 | 0.172 | 4 | 4 | 4 |
| Olsztyn | 0.347 | 0.087 | 0.324 | 2 | 3 | 3 |
| Opole | 0.439 | 0.327 | 0.394 | 1 | 1 | 2 |
| Ostrołęka | 0.194 | 0.111 | 0.237 | 4 | 3 | 3 |
| Piła | 0.280 | 0.121 | 0.272 | 3 | 3 | 3 |
| Piotrków | 0.290 | 0.314 | 0.367 | 3 | 1 | 2 |
| Płock | 0.424 | 0.398 | 0.615 | 1 | 1 | 1 |
| Poznań | 0.444 | 0.389 | 0.683 | 1 | 1 | 1 |
| Przemyśl | 0.144 | 0.027 | 0.159 | 4 | 4 | 4 |
| Radom | 0.220 | 0.082 | 0.229 | 3 | 3 | 3 |

**Table 3.** Cont.

| Province | Value of the measure of development | | | Class | | |
|---|---|---|---|---|---|---|
| | 1990 | 1994 | 1998 | 1990 | 1994 | 1998 |
| Rzeszów | 0.247 | 0.082 | 0.325 | 3 | 3 | 3 |
| Siedlce | 0.191 | 0.106 | 0.192 | 4 | 3 | 4 |
| Sieradz | 0.225 | 0.127 | 0.256 | 3 | 3 | 3 |
| Skierniewice | 0.264 | 0.182 | 0.354 | 3 | 2 | 2 |
| Słupsk | 0.275 | –0.028 | 0.210 | 3 | 4 | 3 |
| Suwałki | 0.241 | 0.005 | 0.173 | 3 | 4 | 4 |
| Szczecin | 0.431 | 0.341 | 0.494 | 1 | 1 | 1 |
| Tarnobrzeg | 0.306 | 0.228 | 0.303 | 2 | 2 | 3 |
| Tarnów | 0.285 | 0.141 | 0.296 | 3 | 3 | 3 |
| Toruń | 0.349 | 0.183 | 0.362 | 2 | 2 | 2 |
| Wałbrzych | 0.301 | 0.076 | 0.209 | 3 | 3 | 3 |
| Włocławek | 0.289 | 0.096 | 0.227 | 3 | 3 | 3 |
| Wrocław | 0.385 | 0.303 | 0.513 | 2 | 1 | 1 |
| Zamość | 0.189 | 0.112 | 0.195 | 4 | 3 | 4 |
| Zielona Góra | 0.355 | 0.191 | 0.384 | 2 | 2 | 2 |

Source: Own calculations based on the data from statistical yearbooks of the Central Statistical Office (GUS).

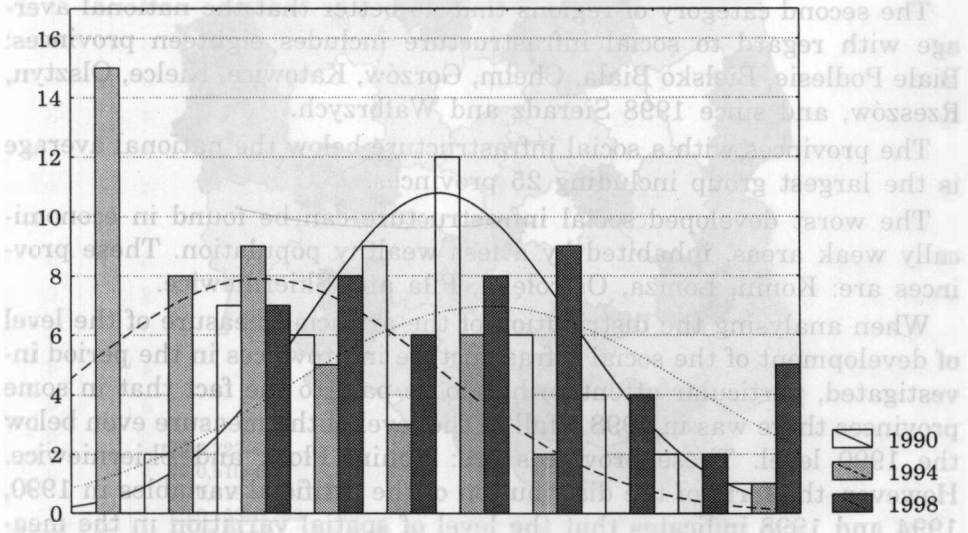


**Fig. 3.** The distribution of the artificial measure of provincial economic development in Poland in the years 1990, 1994, and 1998

ter, and the mode shifted to the right. An increase in the measure of development in 1998, compared to 1990, occurred in 35 provinces, while in the 14 remaining provinces the level of 1990 was not achieved. However, in all the provinces there was an increase in the level of dynamic measure of economic development in comparison to 1994.

### 4.3. The spatial variation of the social infrastructure in Poland

The social infrastructure under the centrally directed economy was financed in Poland by the state budget, and in the transition period the basic principles of its functioning were not changed until 1999.

As is illustrated in Table 4 and in Figures 4 and 5, the provinces with large urban agglomerations in general have a better developed social infrastructure. This is mainly the result of the fact that medical academies and important academic institutions are located there.

Regarding social infrastructure, eight provinces belong to the first group: Warszawa, Łódź, Wrocław, Poznań, Kraków, Lublin, Szczecin, Białystok and since 1998 Gdańsk. In most cases – except for the Lublin and Białystok provinces – these are provinces that are better developed economically. Specialist medical services are concentrated in the capitals of these provinces, which is the most significant distinguishing feature in relation to the remaining regions of the country.

The second category of regions that do better that the national average with regard to social infrastructure includes eighteen provinces: Białe Podlesie, Bielsko Biała, Chełm, Gorzów, Katowice, Kielce, Olsztyn, Rzeszów, and since 1998 Sieradz and Wałbrzych.

The provinces with a social infrastructure below the national average is the largest group including 25 provinces.

The worst developed social infrastructure can be found in economically weak areas, inhabited by a less wealthy population. These provinces are: Konin, Łomża, Ostrołęka, Piła and Skierniewice.

When analysing the distribution of the artificial measure of the level of development of the social infrastructure in provinces in the period investigated, particular attention has to be paid to the fact that in some provinces there was in 1998 a fall in the level of the measure even below the 1990 level. These provinces are: Konin, Płock and Skierniewice. However, the form of the distribution of the artificial variables in 1990, 1994 and 1998 indicates that the level of spatial variation in the measure of development of social infrastructure in Poland decreased insignificantly in those years (see Figure 6).

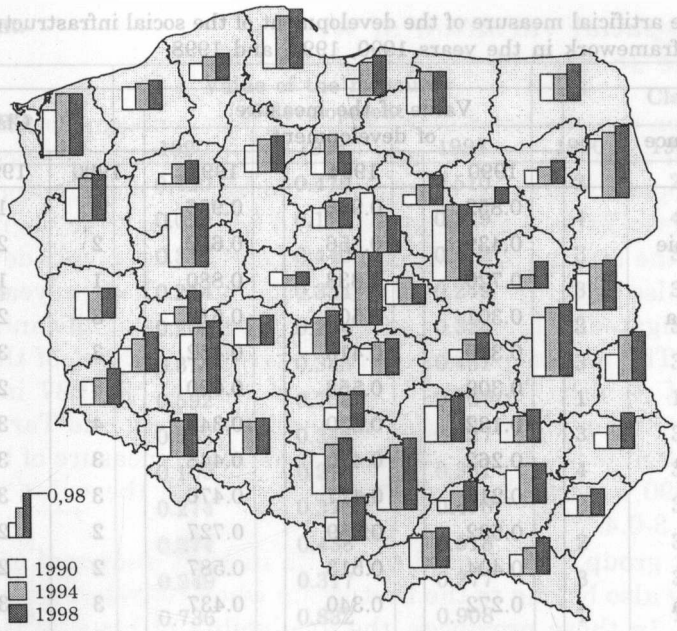


**Fig. 4.** The distribution of the measure of development of provincial social infrastructure in the years 1990, 1994, and 1998

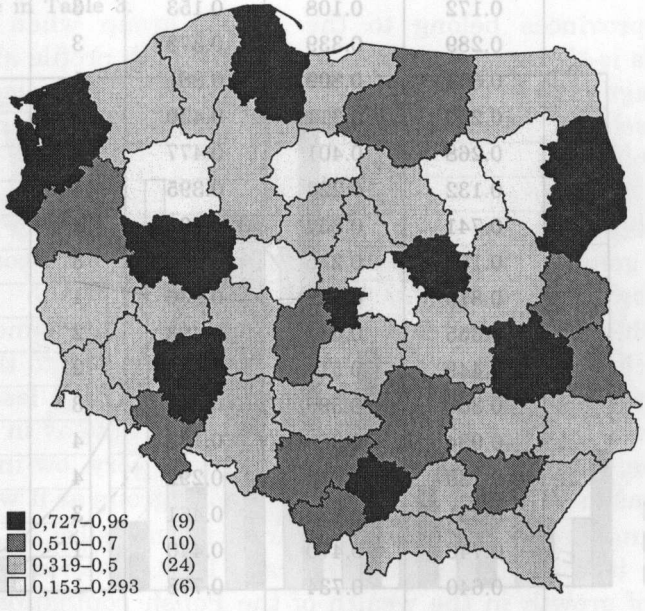


**Fig. 5.** The spatial variation of the development of provincial social infrastructure in Poland in 1998

**Table 4.** The artificial measure of the development of the social infrastructure in Poland in a spatial framework in the years 1990, 1994, and 1998

| Province | Value of the measure of development | | | Class | | |
|---|---|---|---|---|---|---|
| | 1990 | 1994 | 1998 | 1990 | 1994 | 1998 |
| Warszawa | 0.852 | 0.936 | 0.956 | 1 | 1 | 1 |
| Białe Podlesie | 0.439 | 0.556 | 0.612 | 2 | 2 | 2 |
| Białystok | 0.720 | 0.833 | 0.880 | 1 | 1 | 1 |
| Bielsko Biała | 0.301 | 0.505 | 0.519 | 3 | 2 | 2 |
| Bydgoszcz | 0.310 | 0.413 | 0.452 | 3 | 3 | 3 |
| Chełm | 0.309 | 0.558 | 0.620 | 3 | 2 | 2 |
| Ciechanów | 0.132 | 0.230 | 0.348 | 4 | 3 | 3 |
| Częstochowa | 0.262 | 0.410 | 0.448 | 3 | 3 | 3 |
| Elblog | 0.210 | 0.417 | 0.476 | 3 | 3 | 3 |
| Gdańsk | 0.532 | 0.659 | 0.727 | 2 | 2 | 1 |
| Gorzów | 0.404 | 0.513 | 0.587 | 2 | 2 | 2 |
| Jelenia Góra | 0.272 | 0.340 | 0.437 | 3 | 3 | 3 |
| Kalisz | 0.216 | 0.308 | 0.378 | 3 | 3 | 3 |
| Katowice | 0.496 | 0.630 | 0.698 | 2 | 2 | 2 |
| Kielce | 0.450 | 0.540 | 0.573 | 2 | 2 | 2 |
| Konin | 0.172 | 0.108 | 0.153 | 3 | 4 | 4 |
| Koszalin | 0.289 | 0.339 | 0.373 | 3 | 3 | 3 |
| Kraków | 0.664 | 0.809 | 0.881 | 1 | 1 | 1 |
| Krosno | 0.250 | 0.311 | 0.430 | 3 | 3 | 3 |
| Legnica | 0.268 | 0.401 | 0.477 | 3 | 3 | 3 |
| Leszno | 0.132 | 0.222 | 0.395 | 4 | 4 | 3 |
| Lublin | 0.741 | 0.857 | 0.901 | 1 | 1 | 1 |
| Łomża | 0.156 | 0.215 | 0.284 | 3 | 4 | 4 |
| Łódź | 0.810 | 0.908 | 0.936 | 1 | 1 | 1 |
| Nowy Sącz | 0.355 | 0.444 | 0.493 | 2 | 3 | 3 |
| Olsztyn | 0.449 | 0.517 | 0.533 | 2 | 2 | 2 |
| Opole | 0.307 | 0.399 | 0.451 | 3 | 3 | 3 |
| Ostrołęka | –0.034 | –0.004 | 0.186 | 4 | 4 | 4 |
| Piła | 0.139 | 0.258 | 0.292 | 4 | 3 | 4 |
| Piotrków | 0.331 | 0.425 | 0.461 | 3 | 3 | 3 |
| Płock | 0.746 | 0.470 | 0.440 | 1 | 3 | 3 |
| Poznań | 0.640 | 0.734 | 0.778 | 1 | 1 | 1 |
| Przemyśl | 0.185 | 0.235 | 0.333 | 3 | 3 | 3 |
| Radom | 0.130 | 0.234 | 0.320 | 4 | 3 | 3 |

**Table 4.** Cont.

| Province | Value of the measure of development | | | Class | | |
|---|---|---|---|---|---|---|
| | 1990 | 1994 | 1998 | 1990 | 1994 | 1998 |
| Rzeszów | 0.420 | 0.479 | 0.510 | 2 | 2 | 2 |
| Siedlce | 0.028 | 0.153 | 0.319 | 4 | 4 | 3 |
| Sieradz | 0.317 | 0.440 | 0.512 | 3 | 3 | 2 |
| Skierniewice | 0.254 | 0.334 | 0.249 | 3 | 3 | 4 |
| Słupsk | 0.206 | 0.274 | 0.324 | 3 | 3 | 3 |
| Suwałki | 0.315 | 0.345 | 0.431 | 3 | 3 | 3 |
| Szczecin | 0.592 | 0.756 | 0.767 | 1 | 1 | 1 |
| Tarnobrzeg | 0.253 | 0.346 | 0.427 | 3 | 3 | 3 |
| Tarnów | 0.109 | 0.249 | 0.381 | 4 | 3 | 3 |
| Toruń | 0.274 | 0.378 | 0.476 | 3 | 3 | 3 |
| Wałbrzych | 0.374 | 0.438 | 0.518 | 2 | 3 | 2 |
| Włocławek | 0.249 | 0.317 | 0.377 | 3 | 3 | 3 |
| Wrocław | 0.736 | 0.832 | 0.908 | 1 | 1 | 1 |
| Zamość | 0.191 | 0.284 | 0.451 | 3 | 3 | 3 |
| Zielona Góra | 0.335 | 0.347 | 0.379 | 2 | 3 | 3 |

Source: Like in Table 3.

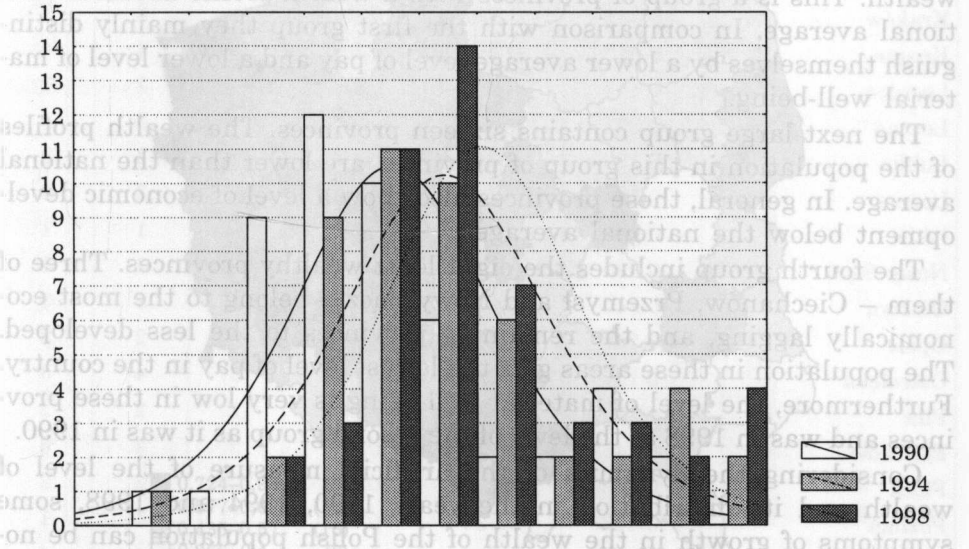


**Fig. 6.** The distribution of the artificial measure of development of provincial social infrastructure in Poland in the years 1990, 1994, and 1998

## 4.4. The spatial variation of wealth of the society in Poland

Wealth on the one hand is the result of past consumption and the economic level achieved earlier, and on the other hand influences the consumption opportunities in the future. The spatial distribution of wealth in Poland (see Table 5 and Figures 7 and 8) is, to a large degree, convergent with the spatial distribution of the level of economic development. Wealth is also a feature with a large variation in the first year of the period investigated, while this variation decreases significantly in 1994 and 1998. The richest province with regard to the level of the artificial measure of wealth, Warszawa, achieved a level of 0.637 in 1990 and 0.995 in 1990. For the provinces Radom, Nowy Sącz and Tarnów, where the population is the least wealthy, the artificial measure of this feature took in 1990 a value below zero, while in 1999 the value was in the range of 0.3-0.4.

The first group, with regard to wealth in 1998 composed of nine provinces. They also belong to the first group when considering economic development. In those provinces, the availability of housing is above the national average. The population living in those areas obtains a relatively high level of pay, and has achieved the highest level of material well-being in the country.

Sixteen provinces belong to the second group when considering wealth. This is a group of provinces with a wealth profile above the national average. In comparison with the first group they mainly distinguish themselves by a lower average level of pay and a lower level of material well-being.

The next large group contains sixteen provinces. The wealth profiles of the population in this group of provinces are lower than the national average. In general, these provinces also show a level of economic development below the national average.

The fourth group includes the eight least wealthy provinces. Three of them – Ciechanów, Przemysł and Nowy Sącz – belong to the most economically lagging, and the remaining provinces to the less developed. The population in these areas gets the lowest level of pay in the country. Furthermore, the level of material well-being is very low in these provinces and was in 1998 at the level of the second group as it was in 1990.

Considering the dynamics of the artificial measure of the level of wealth and its distribution in the years 1990, 1994 and 1998, some symptoms of growth in the wealth of the Polish population can be noticed, together with a decrease in the spatial variation of this category (see Figure 9).

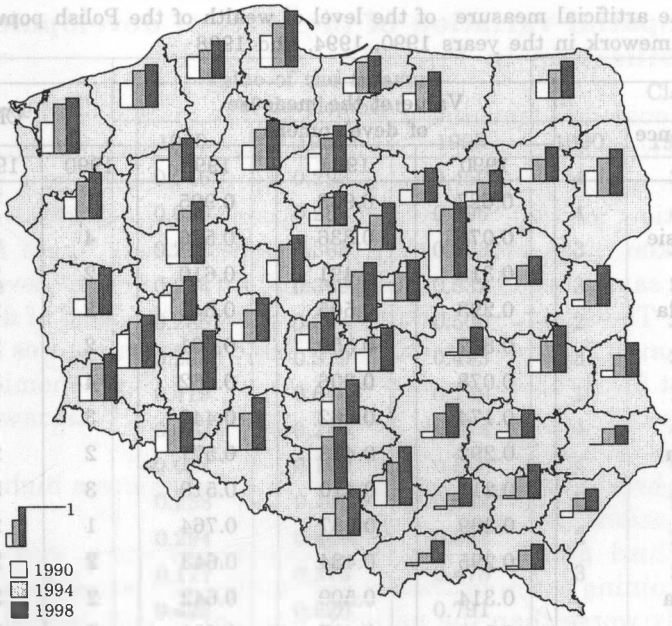


**Fig. 7.** The distribution of the measure of the provincial level of wealth in the years 1990, 1994, and 1998

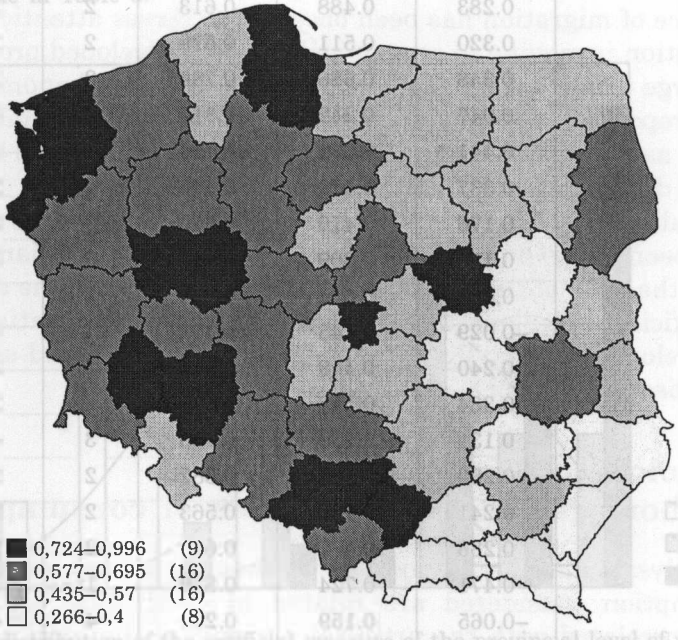


**Fig. 8.** The spatial variation of the provincial level of wealth in Poland in 1998

**Table 5.** The artificial measure of the level of wealth of the Polish population within a spatial framework in the years 1990, 1994, and 1998

| Province | Value of the measure of development | | | Class | | |
|---|---|---|---|---|---|---|
| | 1990 | 1994 | 1998 | 1990 | 1994 | 1998 |
| Warsaw | 0.627 | 0.933 | 0.995 | 1 | 1 | 1 |
| Białe Podlesie | 0.076 | 0.336 | 0.526 | 4 | 3 | 3 |
| Białystok | 0.318 | 0.491 | 0.610 | 2 | 2 | 2 |
| Bielsko Biała | 0.293 | 0.505 | 0.645 | 2 | 2 | 2 |
| Bydgoszcz | 0.342 | 0.559 | 0.661 | 2 | 2 | 2 |
| Chełm | 0.078 | 0.306 | 0.462 | 4 | 3 | 3 |
| Ciechanów | 0.174 | 0.262 | 0.440 | 3 | 4 | 3 |
| Częstochowa | 0.292 | 0.443 | 0.577 | 2 | 2 | 2 |
| Elbląg | 0.211 | 0.410 | 0.519 | 3 | 3 | 3 |
| Gdańsk | 0.399 | 0.587 | 0.764 | 1 | 2 | 1 |
| Gorzów | 0.295 | 0.484 | 0.643 | 2 | 2 | 2 |
| Jelenia Góra | 0.314 | 0.509 | 0.642 | 2 | 2 | 2 |
| Kalisz | 0.244 | 0.437 | 0.601 | 2 | 2 | 2 |
| Katowice | 0.544 | 0.690 | 0.820 | 1 | 1 | 1 |
| Kielce | 0.088 | 0.332 | 0.456 | 3 | 3 | 3 |
| Konin | 0.283 | 0.488 | 0.613 | 2 | 2 | 2 |
| Koszalin | 0.320 | 0.511 | 0.579 | 2 | 2 | 2 |
| Kraków | 0.348 | 0.586 | 0.786 | 2 | 2 | 1 |
| Krosno | 0.047 | 0.242 | 0.317 | 4 | 4 | 4 |
| Legnica | 0.441 | 0.631 | 0.724 | 1 | 1 | 1 |
| Leszno | 0.337 | 0.479 | 0.603 | 2 | 2 | 2 |
| Lublin | 0.176 | 0.410 | 0.612 | 3 | 3 | 2 |
| Łomża | 0.159 | 0.309 | 0.457 | 3 | 3 | 3 |
| Łódź | 0.488 | 0.674 | 0.796 | 1 | 1 | 1 |
| Nowy Sącz | –0.029 | 0.145 | 0.303 | 4 | 4 | 4 |
| Olsztyn | 0.240 | 0.419 | 0.527 | 2 | 3 | 3 |
| Opole | 0.334 | 0.518 | 0.693 | 2 | 2 | 2 |
| Ostrołęka | 0.131 | 0.269 | 0.435 | 3 | 4 | 3 |
| Piła | 0.282 | 0.485 | 0.582 | 2 | 2 | 2 |
| Piotrków | 0.241 | 0.460 | 0.563 | 2 | 2 | 3 |
| Płock | 0.286 | 0.477 | 0.633 | 2 | 2 | 2 |
| Poznań | 0.471 | 0.724 | 0.839 | 1 | 1 | 1 |
| Przemyśl | –0.065 | 0.159 | 0.290 | 4 | 4 | 4 |
| Radom | 0.031 | 0.223 | 0.374 | 4 | 4 | 4 |

**Table 5.** Cont.

| Province | Value of the measure of development | | | Class | | |
|---|---|---|---|---|---|---|
| | 1990 | 1994 | 1998 | 1990 | 1994 | 1998 |
| Rzeszów | 0.046 | 0.296 | 0.450 | 4 | 3 | 3 |
| Siedlce | 0.080 | 0.254 | 0.395 | 4 | 4 | 4 |
| Sieradz | 0.211 | 0.365 | 0.503 | 3 | 3 | 3 |
| Skierniewice | 0.214 | 0.369 | 0.532 | 3 | 3 | 3 |
| Słupsk | 0.285 | 0.394 | 0.506 | 2 | 3 | 3 |
| Suwałki | 0.233 | 0.379 | 0.493 | 3 | 3 | 3 |
| Szczecin | 0.419 | 0.646 | 0.749 | 1 | 1 | 1 |
| Tarnobrzeg | 0.083 | 0.246 | 0.374 | 4 | 4 | 4 |
| Tarnów | –0.027 | 0.169 | 0.358 | 4 | 4 | 4 |
| Toruń | 0.238 | 0.447 | 0.642 | 2 | 2 | 2 |
| Wałbrzych | 0.294 | 0.464 | 0.554 | 2 | 2 | 3 |
| Włocławek | 0.177 | 0.375 | 0.478 | 3 | 3 | 3 |
| Wrocław | 0.425 | 0.620 | 0.791 | 1 | 1 | 1 |
| Zamość | –0.002 | 0.208 | 0.266 | 4 | 4 | 4 |
| Zielona Góra | 0.206 | 0.440 | 0.621 | 3 | 2 | 2 |

Source: Like in Table 3.

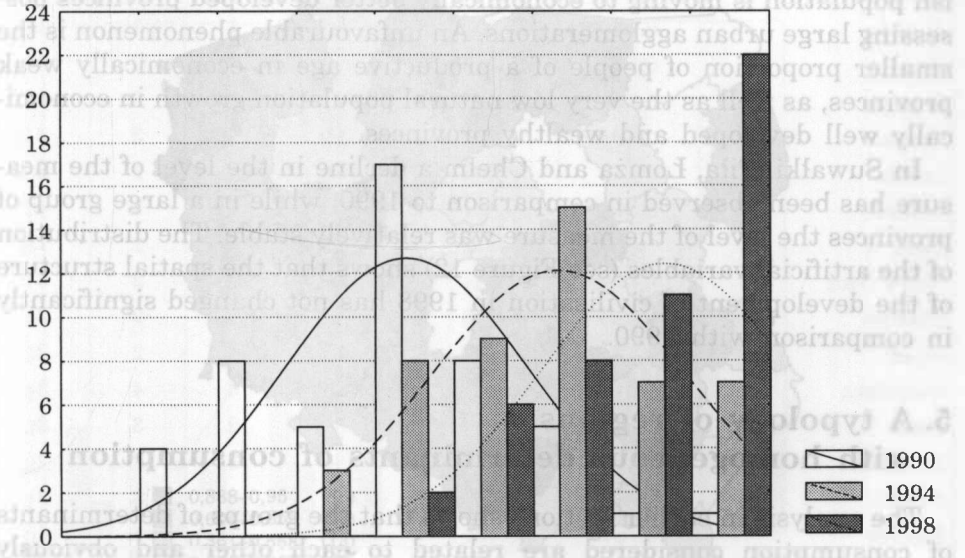


**Fig. 9.** The distribution of the artificial measure of the provincial level of wealth in Poland in the years 1990, 1994, and 1998

### 4.5. The spatial variation of the level of development of civilisation in Poland

The regional development of civilisation is mainly analysed from the point of view of its connection with the level of consumption. Therefore, besides the typical features characterising the demographic potential of the population, also the level of urbanisation and the attractiveness of regions is taken into consideration. As stressed earlier, these features reflect at the same time the demographic effects of regional development of civilisation. The spatial distribution of profiles of the level of development of civilisation in Poland is presented in Table 5 and in Figures 10 and 11.

The most favourable situation can be found in the economically developed and wealthy areas. This first group includes: Warszawa, Gdańsk, Kraków, Łódź, Poznań and Szczecin.

Twenty three provinces in the second group achieve a higher measure than the national average.

In the third group, containing thirteen provinces, and the fourth group, containing seven provinces, the profiles are respectively worse, or significantly worse than the national average. A particularly bad situation existed during the whole period in the provinces Łomża and Sieradz.

The fact that already in the second group of provinces a mainly negative balance of migration has been observed deserves attention. The Polish population is moving to economically better developed provinces possessing large urban agglomerations. An unfavourable phenomenon is the smaller proportion of people of a productive age in economically weak provinces, as well as the very low natural population growth in economically well developed and wealthy provinces.

In Suwałki, Piła, Łomża and Chełm a decline in the level of the measure has been observed in comparison to 1990, while in a large group of provinces the level of the measure was relatively stable. The distribution of the artificial variables (see Figure 12) shows that the spatial structure of the development of civilisation in 1998 has not changed significantly in comparison with 1990.

## 5. A typology of regions with homogeneous determinants of consumption

The analysis in earlier sections shows that the groups of determinants of consumption considered are related to each other and obviously strongly correlated with the artificial variable of the level of consumption. In order to establish the strength of these relations, a correlation

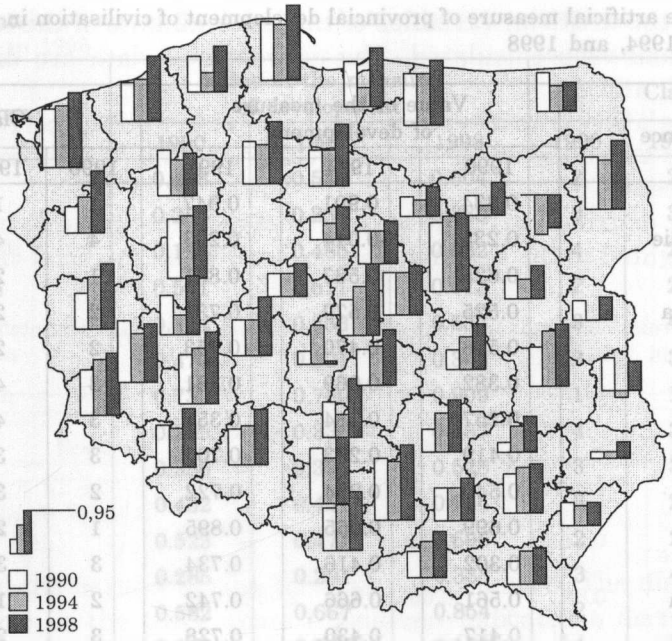


**Fig. 10.** The distribution of the measure of provincial development of civilisation in the years 1990, 1994, and 1998

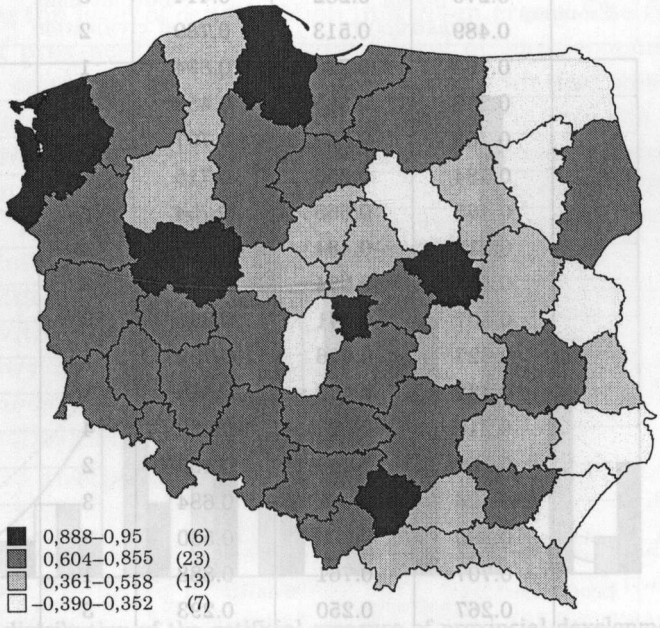


**Fig. 11.** The spatial variation of the provincial development of civilisation in Poland in 1998

**Table 6.** The artificial measure of provincial development of civilisation in Poland in the years 1990, 1994, and 1998

| Province | Value of the measure of development | | | Class | | |
|---|---|---|---|---|---|---|
| | 1990 | 1994 | 1998 | 1990 | 1994 | 1998 |
| Warszawa | 0.834 | 0.901 | 0.947 | 1 | 1 | 1 |
| Białe Podlesie | 0.235 | –0.014 | 0.293 | 4 | 4 | 4 |
| Białystok | 0.625 | 0.587 | 0.831 | 1 | 2 | 2 |
| Bielsko Biała | 0.525 | 0.570 | 0.731 | 2 | 2 | 2 |
| Bydgoszcz | 0.518 | 0.470 | 0.753 | 2 | 2 | 2 |
| Chełm | 0.382 | –0.069 | 0.361 | 3 | 4 | 3 |
| Ciechanów | 0.257 | 0.184 | 0.351 | 3 | 4 | 4 |
| Częstochowa | 0.419 | 0.293 | 0.700 | 3 | 3 | 2 |
| Elbląg | 0.549 | 0.254 | 0.722 | 2 | 3 | 2 |
| Gdańsk | 0.699 | 0.655 | 0.895 | 1 | 2 | 1 |
| Gorzów | 0.302 | 0.416 | 0.734 | 3 | 3 | 2 |
| Jelenia Góra | 0.561 | 0.666 | 0.742 | 2 | 1 | 2 |
| Kalisz | 0.417 | 0.430 | 0.728 | 3 | 2 | 2 |
| Katowice | 0.675 | 0.568 | 0.826 | 1 | 2 | 2 |
| Kielce | 0.258 | 0.474 | 0.624 | 3 | 2 | 2 |
| Konin | 0.270 | 0.282 | 0.414 | 3 | 3 | 3 |
| Koszalin | 0.489 | 0.513 | 0.789 | 2 | 2 | 2 |
| Kraków | 0.763 | 0.723 | 0.894 | 1 | 1 | 1 |
| Krosno | 0.278 | 0.385 | 0.453 | 3 | 3 | 3 |
| Legnica | 0.763 | 0.599 | 0.707 | 1 | 2 | 2 |
| Leszno | 0.484 | 0.250 | 0.715 | 2 | 3 | 2 |
| Lublin | 0.465 | 0.668 | 0.754 | 2 | 1 | 2 |
| Łomża | 0.018 | –0.484 | –0.385 | 4 | 4 | 4 |
| Łódź | 0.423 | 0.574 | 0.939 | 3 | 2 | 1 |
| Nowy Sącz | 0.307 | 0.441 | 0.541 | 3 | 2 | 3 |
| Olsztyn | 0.627 | 0.616 | 0.799 | 1 | 2 | 2 |
| Opole | 0.432 | 0.472 | 0.655 | 3 | 2 | 2 |
| Ostrołęka | 0.218 | 0.125 | 0.382 | 4 | 4 | 3 |
| Piła | 0.554 | 0.419 | 0.496 | 2 | 3 | 3 |
| Piotrków | 0.426 | 0.461 | 0.684 | 3 | 2 | 2 |
| Płock | 0.399 | 0.399 | 0.530 | 3 | 3 | 3 |
| Poznań | 0.707 | 0.761 | 0.888 | 1 | 1 | 1 |
| Przemyśl | 0.267 | 0.250 | 0.293 | 3 | 3 | 4 |
| Radom | 0.229 | 0.412 | 0.538 | 4 | 3 | 3 |

**Table 6.** Cont.

| Province | Value of the measure of development | | | Class | | |
|---|---|---|---|---|---|---|
| | 1990 | 1994 | 1998 | 1990 | 1994 | 1998 |
| Rzeszów | 0.488 | 0.549 | 0.604 | 2 | 2 | 2 |
| Siedlce | 0.288 | 0.239 | 0.380 | 3 | 3 | 3 |
| Sieradz | 0.156 | 0.485 | 0.032 | 4 | 2 | 4 |
| Skierniewice | 0.531 | 0.511 | 0.613 | 2 | 2 | 2 |
| Słupsk | 0.424 | 0.233 | 0.557 | 3 | 4 | 3 |
| Suwałki | 0.470 | 0.301 | 0.341 | 2 | 3 | 4 |
| Szczecin | 0.730 | 0.760 | 0.909 | 1 | 1 | 1 |
| Tarnobrzeg | 0.129 | 0.336 | 0.437 | 4 | 3 | 3 |
| Tarnów | 0.386 | 0.395 | 0.528 | 3 | 3 | 3 |
| Toruń | 0.432 | 0.441 | 0.764 | 3 | 2 | 2 |
| Wałbrzych | 0.523 | 0.471 | 0.696 | 2 | 2 | 2 |
| Włocławek | 0.285 | 0.201 | 0.383 | 3 | 4 | 3 |
| Wrocław | 0.582 | 0.667 | 0.854 | 2 | 1 | 2 |
| Zamość | 0.085 | 0.090 | 0.179 | 4 | 4 | 4 |
| Zielona Góra | 0.450 | 0.652 | 0.799 | 2 | 2 | 2 |

Source: Like in Table 3.

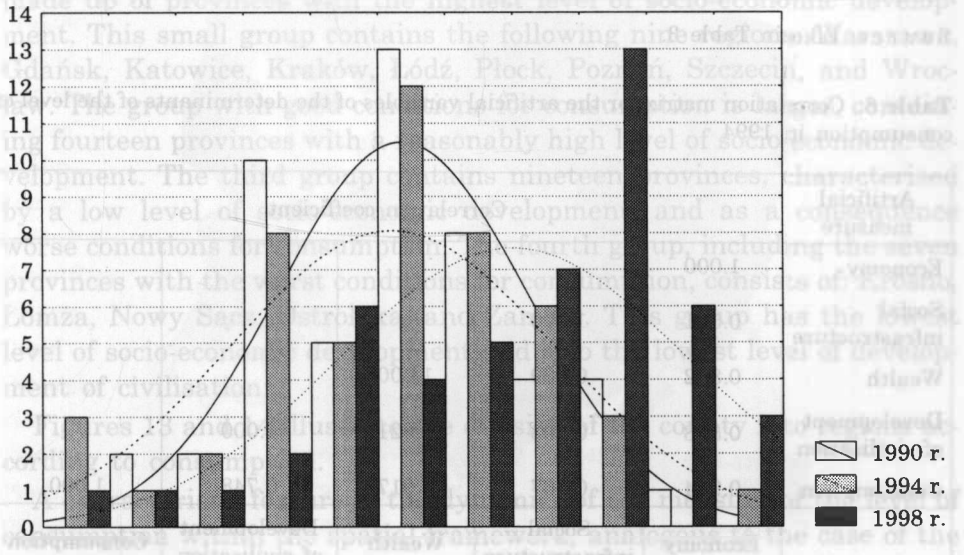


**Fig. 12.** The distribution of the artificial measure of provincial development of civilisation in Poland in the years 1990, 1994, and 1998

matrix for the artificial variables of the determinants of the level of consumption has been calculated. The appropriate data are displayed in Tables 7, 8 and 9.

The correlation matrices show that particularly strong correlations exist between economic development, wealth and the level of consumption in provinces.

The joint distribution of the measures of the determinants of consumption, highlighted in the research, is presented by an artificial variable con-

**Table 7.** Correlation matrix for the artificial variables of the determinants of the level of consumption in 1990

| Artificial measure | Correlation coefficient | | | | |
|---|---|---|---|---|---|
| Economy | 1.000 | | | | |
| Social infrastructure | 0.511 | 1.000 | | | |
| Wealth | 0.801 | 0.556 | 1.000 | | |
| Development of civilisation | 0.704 | 0.541 | 0.735 | 1.000 | |
| Consumption | 0.922 | 0.727 | 0.923 | 0.820 | 1.000 |
| | Economy | Social infrastructure | Wealth | Development of civilisation | Consumption |

Source: Like in Table 3.

**Table 8.** Correlation matrix for the artificial variables of the determinants of the level of consumption in 1994

| Artificial measure | Correlation coefficient | | | | |
|---|---|---|---|---|---|
| Economy | 1.000 | | | | |
| Social infrastructure | 0.571 | 1.000 | | | |
| Wealth | 0.802 | 0.639 | 1.000 | | |
| Development of civilisation | 0.598 | 0.603 | 0.621 | 1.000 | |
| Consumption | 0.934 | 0.767 | 0.917 | 0.748 | 1.000 |
| | Economy | Social infrastructure | Wealth | Development of civilisation | Consumption |

Source: Like in Table 3.

**Table 9.** Correlation matrix for the artificial variables of the determinants of the level of consumption in 1998

| Artificial variable | Correlation coefficient | | | | |
|---|---|---|---|---|---|
| Economy | 1.000 | | | | |
| Social infrastructure | 0.565 | 1.000 | | | |
| Wealth | 0.850 | 0.625 | 1.000 | | |
| Development of civilisation | 0.610 | 0.564 | 0.682 | 1.000 | |
| Consumption | 0.950 | 0.734 | 0.936 | 0.755 | 1.000 |
| | Economy | Social infrastructure | Wealth | Development of civilisation | Consumption |

Source: Like in Table 3.

structed on the basis of all the features distinguished. The distribution of this variable in the three years considered indicates a decrease in the variation in consumption and an increase in its level (see Figure 15).

On the basis of the artificial variable of consumption (see Table 9), the provinces have been separated into four groups, with similar conditions determining the level of consumption in a given group. The first group is made up of provinces with the highest level of socio-economic development. This small group contains the following nine regions: Warszawa, Gdańsk, Katowice, Kraków, Łódź, Płock, Poznań, Szczecin, and Wrocław. The group with good conditions for consumption is larger, containing fourteen provinces with a reasonably high level of socio-economic development. The third group contains nineteen provinces, characterised by a low level of socio-economic development, and as a consequence worse conditions for consumption. The fourth group, including the seven provinces with the worst conditions for consumption, consists of: Krosno, Łomża, Nowy Sącz, Ostrołęka, and Zamość. This group has the lowest level of socio-economic development and also the lowest level of development of civilisation.

Figures 13 and 14 illustrate the division of the county into regions according to consumption.

A characteristic feature of the dynamics of the measure of the level of consumption within the spatial framework, analogous to the case of the measure of economic development, is the significant decrease in its level in most of the Polish provinces in 1994.

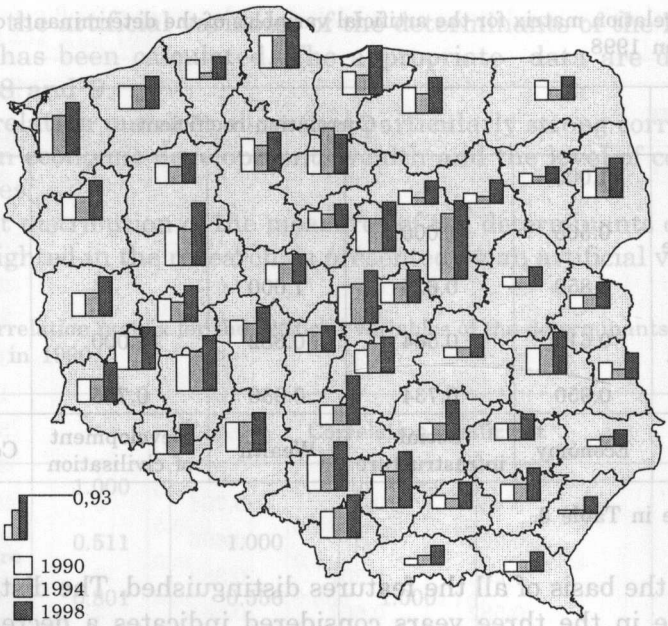


**Fig. 13.** The distribution of the artificial measure of the level of consumption in Polish provinces in the years 1990, 1994, and 1998

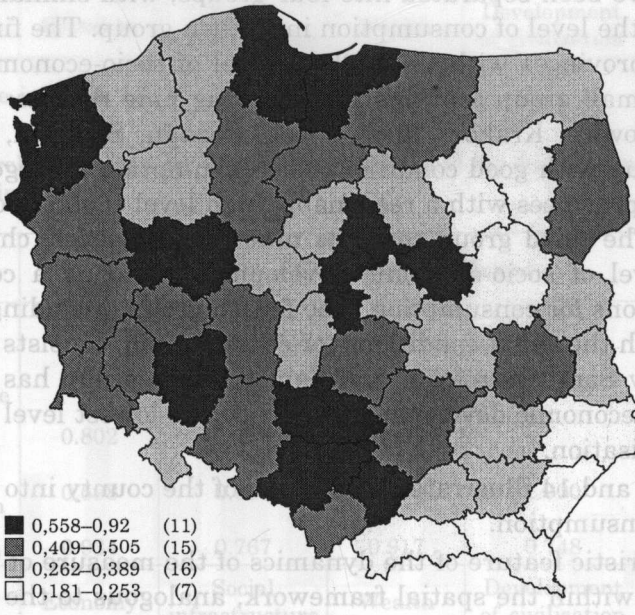


**Fig. 14.** The spatial variation of the artificial measure of the level of consumption in Polish provinces in 1998

**Table 10.** Artificial measure of the level of consumption in Polish provinces in the years 1990, 1994, and 1998

| Province | Value of the measure of development | | | Class | | |
|---|---|---|---|---|---|---|
| | 1990 | 1994 | 1998 | 1990 | 1994 | 1998 |
| Warszawa | 0.583 | 0.767 | 0.918 | 1 | 1 | 1 |
| Białe Podlesie | 0.152 | 0.146 | 0.298 | 3 | 3 | 3 |
| Białystok | 0.321 | 0.335 | 0.480 | 2 | 2 | 2 |
| Bielsko Biała | 0.318 | 0.357 | 0.486 | 2 | 2 | 2 |
| Bydgoszcz | 0.377 | 0.313 | 0.450 | 2 | 2 | 2 |
| Chełm | 0.195 | 0.128 | 0.304 | 3 | 3 | 3 |
| Ciechanów | 0.138 | 0.090 | 0.276 | 4 | 4 | 3 |
| Częstochowa | 0.237 | 0.232 | 0.375 | 3 | 3 | 3 |
| Elbląg | 0.252 | 0.216 | 0.388 | 3 | 3 | 3 |
| Gdańsk | 0.384 | 0.389 | 0.558 | 1 | 2 | 1 |
| Gorzów | 0.273 | 0.252 | 0.447 | 2 | 3 | 2 |
| Jelenia Góra | 0.270 | 0.289 | 0.462 | 2 | 2 | 2 |
| Kalisz | 0.262 | 0.251 | 0.412 | 2 | 3 | 2 |
| Katowice | 0.439 | 0.427 | 0.596 | 1 | 1 | 1 |
| Kielce | 0.185 | 0.203 | 0.342 | 3 | 3 | 3 |
| Konin | 0.249 | 0.215 | 0.360 | 3 | 3 | 3 |
| Koszalin | 0.280 | 0.264 | 0.381 | 2 | 2 | 3 |
| Kraków | 0.383 | 0.436 | 0.645 | 1 | 1 | 1 |
| Krosno | 0.107 | 0.115 | 0.220 | 4 | 3 | 4 |
| Legnica | 0.438 | 0.390 | 0.504 | 1 | 2 | 2 |
| Leszno | 0.281 | 0.241 | 0.435 | 2 | 3 | 2 |
| Lublin | 0.316 | 0.350 | 0.496 | 2 | 2 | 2 |
| Łomża | 0.111 | 0.069 | 0.207 | 4 | 4 | 4 |
| Łódź | 0.433 | 0.483 | 0.612 | 1 | 1 | 1 |
| Nowy Sącz | 0.073 | 0.100 | 0.234 | 4 | 4 | 4 |
| Olsztyn | 0.317 | 0.229 | 0.409 | 2 | 3 | 2 |
| Opole | 0.358 | 0.362 | 0.471 | 2 | 2 | 2 |
| Ostrołęka | 0.100 | 0.087 | 0.252 | 4 | 4 | 4 |
| Piła | 0.242 | 0.213 | 0.336 | 3 | 3 | 3 |
| Piotrków | 0.252 | 0.341 | 0.423 | 3 | 2 | 2 |
| Płock | 0.395 | 0.394 | 0.566 | 1 | 2 | 1 |
| Poznań | 0.468 | 0.524 | 0.738 | 1 | 1 | 1 |
| Przemyśl | 0.053 | 0.054 | 0.181 | 4 | 4 | 4 |
| Radom | 0.110 | 0.115 | 0.262 | 4 | 3 | 3 |

**Table 10.** Cont.

| Province | Value of the measure of development | | | Class | | |
|---|---|---|---|---|---|---|
| | 1990 | 1994 | 1998 | 1990 | 1994 | 1998 |
| Rzeszów | 0.192 | 0.181 | 0.369 | 3 | 3 | 3 |
| Siedlce | 0.099 | 0.112 | 0.234 | 4 | 4 | 4 |
| Sieradz | 0.182 | 0.215 | 0.297 | 3 | 3 | 3 |
| Skierniewice | 0.228 | 0.234 | 0.372 | 3 | 3 | 3 |
| Słupsk | 0.238 | 0.091 | 0.290 | 3 | 4 | 3 |
| Suwałki | 0.224 | 0.121 | 0.262 | 3 | 3 | 3 |
| Szczecin | 0.442 | 0.479 | 0.607 | 1 | 1 | 1 |
| Tarnobrzeg | 0.182 | 0.213 | 0.310 | 3 | 3 | 3 |
| Tarnów | 0.141 | 0.135 | 0.303 | 4 | 3 | 3 |
| Toruń | 0.277 | 0.256 | 0.451 | 2 | 3 | 2 |
| Wałbrzych | 0.286 | 0.212 | 0.341 | 2 | 3 | 3 |
| Włocławek | 0.210 | 0.159 | 0.285 | 3 | 3 | 3 |
| Wrocław | 0.425 | 0.453 | 0.644 | 1 | 1 | 1 |
| Zamość | 0.080 | 0.108 | 0.202 | 4 | 4 | 4 |
| Zielona Góra | 0.281 | 0.272 | 0.447 | 2 | 2 | 2 |

Source: Like in Table 3.

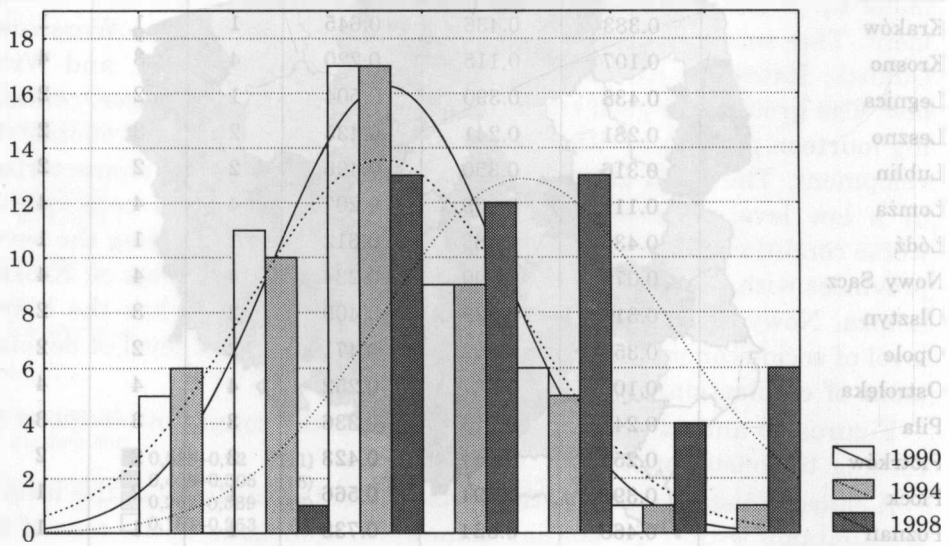


**Fig. 15.** The distribution of the artificial measure of the level of consumption in Polish provinces in 1990, 1994, and 1998

It can be hypothesised that in each of the groups of provinces distinguished different consumption preferences appear, which in addition vary according to the type of household.