



Geographia

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Geographia Polonica nr 7

INSTITUTE OF GEOGRAPHY
POLISH ACADEMY OF SCIENCES

Geographia

Polonica

7

PWN—Polish Scientific Publishers

Warszawa 1965

<http://rcin.org.pl>

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Krakowskie Przedmieście 30, Warszawa 64
POLAND

PAŃSTWOWE WYDAWNICTWO NAUKOWE
(PWN — POLISH SCIENTIFIC PUBLISHERS)
WARSZAWA 1965

<http://rcin.org.pl>

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THE DEFINITION OF URBAN AND NON-URBAN SETTLEMENTS IN EAST-CENTRAL EUROPE

MARIA KIELCZEWSKA-ZALESKA

One of the most interesting facts of our times is the process of urbanization which has caused great changes in the manner of living and culture of whole nations. It is also the core of geographical research. The more rapid the process of urbanization the more important the research becomes.

Such countries as Poland, Rumania, Bulgaria, Hungary which once were primarily agricultural countries with small numbers of town inhabitants are now violently changing. In these countries urbanization has progressed along with the social changes and the industrialization which came with the new political system after the Second World War. Data show it very clearly in Table 1.

In Poland, within 15 years (1946—1960) the number of town inhabitants increased by almost 7 millions (about 100%). In other countries changes have been equally great. New industrial regions, together with new industrial towns arose and a new settlement pattern developed. Settlement geography and economic geography are interested not only in studying these processes but also in making an estimation of their social and economic importance. Numerous studies, for instance those of K. Dziewoński [2], M. Blažek [3], T. Mendöll [4], I. Sandru [5] have analysed the chief problems in different countries. Taking into account their achievements, their rich statistical analysis and interpretation there is a necessity for some comparative and critical studies on this subject.

From this point of view the chief problem is to find out the real limit of urban and non-urban settlement in each country. It is the problem of establishing a criterion on which the differentiation between these two types of settlement should be based and in consequence the number of urban population may be fixed. It is the question of whether in reality the figures in Table 1 are comparable. Without such common criterion it is impossible to compare the evolution of urbanization not only in these countries but also in others in the whole world. This paper is intended to

show the differences found in one particular area, after all not so great when compared to the whole world, but sufficiently differentiated to show its difficulties.

The distinguishing of urban from non-urban settlements, in turn, connected with the question of what is to be regarded as an urban settlement, is a subject which has a wide literature. It is not intended to discuss this theoretical problem here. Some principles, however, must be established before we start on our analysis.

In general, in official statistics settlements are regarded as urban settlements with an urban population when they have a town status (charter). The East Central European countries, however, have not been subject to comparable historical conditions and so there exists, first of all, a necessity of rendering historical interpretation of the limit of urban settlement from the administrative point of view.

THE NUMBER OF TOWNS WITH TOWN-STATUS (CHARTER)
AND THEIR ACTUAL SIGNIFICANCE

The countries of East-Central Europe have an ancient network of towns and the urbanization process began in remote times. The existing towns often date back to various periods of the early and late Middle Ages or to the times when large estate owners founded residential towns, or finally to the era of industrialization in the 19th century.

These processes were interrelated and following one another gave a complicated structure to the urban pattern so that the historically formed number of towns with town status is in each country based on different principles. Urban rights received long ago may, therefore, decide whether a settlement is a town or not even though the former urban functions may have diminished and not always be of value today. Therefore the number of towns considered from an administrative point of view is not equal to the number of really existing urban settlements. Especially in the countries I am speaking about, where the processes of urbanization are going through a very intensive phase of development, this fact can be seen very clearly. Thus first of all it should be noticed that the number of towns undergoes constant changes and fluctuations.

For the last 15 years between 1946 and 1960, in Poland these changes are expressed by the following figures. The number of towns in Poland increased from 732 to 745. The difference is slight, only 13 towns, but it covers the fact that within this period 62 new towns were created and 45 towns were deprived of town status. These great fluctuations were connected with the existence of a large number and a great density of small towns of feudal origin many of which had an agricultural hinterland showing slight economic activity.

In 1960, Poland had 172 towns with less than 3 thousand inhabitants, among which 4 towns had even less than one thousand inhabitants: Lędyczek 403, Dukla 550, Szlichtyngowa and Wyśmierzyce, and in 15 of them over 50% of the population were living from agriculture. Indeed in the majority of these towns the agricultural population constitutes the most numerous group of working people. The small towns of Western Pomorze and Wielkopolska are particularly distinguished by a high percentage of agricultural population, a marked feature ever since their foundation. Also in the East of Poland, where in the 17–18th centuries many small towns were established by great landowners (in Podlasie, Eastern Mazowsze and in the neighbourhood of Lublin), there are many agricultural towns in which other functions have never developed very strongly. This situation has not even been much improved through industrialization in the 19th and 20th centuries. Already in the 19th century the grants of urban status were revised and some scores of towns were deprived of their charter. Indeed the fluctuations concerning the lower limits of towns and the problems this raised were noted in our country a long time ago and they are still an important problem now [6]. If until today numerous small settlements of agricultural type have retained the town charter, it is only on account of long traditions and inherent conservatism. The new process of urbanisation has not reached the majority of these settlements where either the number of population has decreased in the last 15 years (48 towns) or it has increased but below the mean increase of population. These small towns, however, are primarily settlements with a typically urban building and lay-out. The role they play of local centres in the rural settlement pattern, is largely the cause of their specific position and their persistence.

There is no standard criterion in Poland on which the town charter is given or taken back. Neither a minimal number of population, nor its professional structure have been determined as in the USSR.

That is why the number of towns with a charter does not correspond to the real number of urbanised settlements. The limit of town is too low and there is a number of towns which should not be considered as urban and urbanised settlements. There is a similar situation in some parts of Rumania, for instance in Transylvania. Small feudal towns were created there as results of similar processes. In Rumania there also have been some fluctuations in the number of towns in the last few years. In 1948, 14 towns were deprived of town charter, mainly along the USSR border and in consequence of the border changes they have lost their previous hinterland and importance. New towns however arose after the Second World War. Of the total number of 181 towns, in 1960, there were 48 newly created towns. Within these groups there are numerous small

towns of historical character with mainly agricultural functions. As many as 24 towns had less than 5 thousand inhabitants and 99 towns less than 10 thousand.

In Czechoslovakia the historical network of towns is very dense but it has been changed in an intensive way by the industrial settlements. Also serious changes were introduced in administrative and statistical units. The settlements are classified into four groups but according to the number of their inhabitants and not according to their functions. The rural settlement limit is now settled at 2000 inhabitants. Every unit under this number is regarded as rural. Only the settlements with more than 5 thousand inhabitants, or centres of districts, have the right to possess the real town status and to choose their council (*Metský Narodní Vybor*). Only 15 settlements under 5 thousand have such rights. A great number of settlements between 2 and 5 thousand do not have real town status but at the same time they are regarded as small towns (*male mesta*) and have a different situation from the administrative as well as from the economic point of view. In result, in Czechoslovakia changes were most revolutionary. The old historically formed town limit has been completely abandoned.

The problem of the lower limit of a town historically formed is quite different in Hungary. Hungary has not a single town with less than 5 thousand inhabitants and the most numerous towns are of 20 to 50 thousand inhabitants (33 out of a total number of 63). These differences in the size of towns and in their lower limit are connected with quite a different urbanisation process in the great Hungarian plain. The creation of towns in the plain was influenced by a few factors which T. Mendöll has clearly explained and stated [4]. They are connected with the early nomadic traditions especially with the winter settlements from the times of the *Magyar* conquest. Also the influence of the pastoral economy maintained for a long time in these territories is to be noted. Finally the period of Turkish wars and occupation hampered the development of the West European feudal structure in the towns and villages. In this period great concentrated settlements of rural population arose in which the urbanization processes developed only later. The influences of the geographical environment also were not an obstacle in the development of large settlements. The characteristic feature of a Hungarian town as compared with a Polish or Czechoslovakian town is its conjunction within one concentrated unit of big both rural settlements and urban centres without agricultural functions.

The urban nucleus is situated either in the centre of the settlement or is dispersed in several places within the agricultural quarters. Those rural-urban settlements occupied great areas as large arable land is

included within their administrative borders. For instance, in 1960 Hajduboszormony had 311 km² with 32 thousand inhabitants, Karcog 387 km² and 26 thousand inhabitants, Mezotur 290 km² and 23.6 thousand inhabitants and Nagykowa 226 km² and 25.8 thousand inhabitants. The large agricultural areas organised in this type of settlement, have been the cause of creating isolated dispersed settlements, the so called *tanya* the utilization of which was at first seasonal. Later these *tanya* changed into independent farms but social and economic ties with the *intravillanum* remained and thus they belonged to the town not only from the historical and administrative but also from the economical point of view. This specific system of settling agricultural and non-agricultural population has created difficulties for fixing the number of towns in Hungary. There are tendencies to recognise as a town only these parts of settlements which are inhabited by non-agricultural population and to define the degree of urbanization according to their size. A special study by Mendöll and the methods used in these calculations are known. As a matter of fact in Hungary the size of the urban population and the number of towns with town charter have quite a different meaning than in other neighbouring countries. Among the settlements with over 20 thousand inhabitants are included in reality great rural agglomerations with small urbanized quarters as local centres of services. The limit of the town in Hungary is much higher than in the neighbouring countries but is not connected with a high degree of urbanization. Therefore the percentage of urban population shown in Table 1 has not changed much within

TABLE 1. CHANGES IN URBAN POPULATION

Country		1941—1950		1960	
		%	thousands	%	thousands
Poland	1946	31.8	7424	48.1	14,112
Rumania	1941	23.6	3812	32.0	5912
Hungary	1941	38.3	3564	39.7	3962
Czechoslovakia	1950	51.2	6323	57.5	7904

the postwar years although really the progress in urbanization has been remarkable. Certainly the problem of the lower limit of the town in Hungary requires more monographic studies before any general comparative estimate will be possible.

RECENT CHANGES IN THE LIMIT OF URBAN SETTLEMENT

The administrative point of view must be supplemented by other data. Not all urban settlements receive town charter at the moment of their inception and this feature is to be observed chiefly in those countries

where urbanization has been making rapid progress. It is necessary to study facts such as the number of inhabitants, the professional structure, and the character of building for all these features introduce strange factors into the rural agricultural landscape and settlements.

Urbanisation processes connected with the period of industrialization in Central Europe started chiefly after the Second World War, although some regions such as Bohemia, Silesia and Moravia had entered this phase already in the 19th century.

Along with the development of new industrial regions new settlements grew up for working people. These transformations well known in Great Britain where they have completely changed the feudal settlement structure can be seen also in the territories under investigation. We are now at a certain stage in this evolution. The problem is to determine its progress and its characteristic features. The first fact to observe is that the network of settlements hitherto existing and the traditional division into towns and villages is no longer satisfactory.

There have arisen new industrial agglomerations which cover large parts of the countryside. The industrial centres are surrounded by zones of workers' settlements from which there is a large commuting to work. Agriculture in these zones is disappearing. The settlement patterns in these zones are becoming more dense. Rural settlements are urbanized and small towns grow into bigger units.

The wide areas are occupied by new residential quarters. A new type of settlement arises where the urban functions are not fully developed. There are no services for the wider hinterland nor is the service function for local needs fully developed. They are therefore settlements of special character. The question arises of how in these settlements connected with industrialization can the limit between town and village be drawn, and what is its relation to the historical urban limit. These problems have been studied by L. Kosiński [7] and M. Dobrowolska [8] in Poland, and by M. Lettrich in Hungary [9]. Their studies have shown the great revolution in the new type of settlement and the need of administrative changes.

In Poland and in Rumania a new kind of settlement was defined with a separate administrative status, the so called *osiedle miejskie*, that means town-like settlement which differ by rights from villages and from towns. In Poland, since 1955 when this legal form of settlement status was introduced until 1963, 198 units of this type were created, although their number has diminished lately. The more important ones already received the town charter. The town-like settlements are more strongly urbanised than the smallest towns previously described. Conditions for receiving the town-like status are as follows: 1. number of inhabitants over one thousand; 2. at least half of the population has to be non-agri-

cultural; 3. forms of concentrated urbanised housing should dominate. In creating those town-like settlements policies are much stricter than in preserving urban rights for traditional small towns. As it is characteristic for contemporary Poland that among the small towns there are the settlements without any urban functions and, on the contrary, among the town-like settlements there are many which have a more urban character than small towns. Thus a certain anomaly in the settlement classification has arisen. The majority of these town-like settlements are workers' settlements connected with industry (129), 15 are health resorts and 4 are fishermen's settlements. These settlements must be counted as urban settlements and they are introduced in the number of urban population in Table 1. The question of the lower limit of town is still open as there are demands existing to deprive the smallest towns (60—70) under 2 thousand inhabitants of their town status. At the same time there are proposals to give urban rights to all town-like settlements with over 3 thousand inhabitants (114) (Table 2). In this way the total number

TABLE 2. STRUCTURE OF TOWN-LIKE SETTLEMENTS
ACCORDING TO THEIR SCALE

Number of inhabitants (in thousands)	Number of settlements
below 3	34
3-5	66
5-10	43
over 10	5
	148

of towns would increase while the lower limit of the town would be raised. The granting or taking away of town status would, of course, not change the character of the settlement itself. In Poland with a planned economy, however, the town status implies far reaching effects. The process of the decentralization of the economy gives to town councils some rights of organising small local industry and factories. Such possibilities give greater chances to economic development depending on the initiative of the local population and its own resources. Actually all towns forming separate *poviats* (districts) have such rights but there are movements to extend these rights to all towns with town charter. Their special legal character created the necessity of more detailed and critical analyses of the settlements which are to possess town status. It will probably be a problem in all countries of East-Central Europe.

In Rumania, by decision of the Council of Ministers of 15.2.1956, 183 rural communities received the status of town-like settlements. Whole administrative units with villages belonging to them were advanced to

this rank. In this way large areas of rural territories with an agricultural population were included in town-like settlements. It is assumed that these settlements will quickly develop, losing their rural character. Compared to Poland there is a certain difference in the criteria fixed as the basis for the creation of town-like settlements. The following conditions were involved there: 1. the number of population over one thousand inhabitants and with over 50% employed in industry; 2. communities with over 35% population living from non-agricultural occupations, bordering on industrial towns within the distance not exceeding 10 km; 3. climatic stations and health resorts to which the number of visitors exceed 50% of the resident population.

Among the above mentioned criteria there is none which as in Poland takes into account the character of housing. On the other hand, in Rumania whole villages with non-urban population were included into the town-like settlements. For instance, the community of Bradulet in the Curtea de Arges region counts 3·2 thousand inhabitants but consists of 10 villages, the largest of which has only 760 inhabitants and the smallest only 16. The community of Horaz has 4898 inhabitants and consists of 10 villages, the largest of which has 1290 and the smallest 64 inhabitants. However this is not a rule; in the majority of cases there are several greater units. Most of these settlements are situated around Bucarest, in the industrial petroleum region near Ploesti and in other mining centres. The existence of this group of town-like settlements both in Rumania and in Poland makes comparisons of the processes of urbanisation in these countries possible.

In Czechoslovakia the changes introduced by industry are enormous, however the question of what to consider as an urban settlement is much more complicated there. The dense network of villages has facilitated the commuting and the transformation of whole regions into areas of worker settlements in the neighbourhood of industrial towns. Agglomerations with population working both in agriculture and industry are very frequent there and it is estimated that 1·5 million workers travel to work every day. In these conditions it is not easy to classify such settlements for they are of a mixed character. In Czechoslovakia the limit of urban and non-urban settlement lies in the class of settlements with 2 to 5 thousand inhabitants (Table 3). The geographical research undertaken for this group of settlements by M. Blažek has shown that nearly half of them (370) are of an urban character. The other half consists of a mixed but rather agricultural population. So the assumed limit of 2 thousand does not really distinguish the settlements from the functional and economic point of view. For Czechoslovakia it is necessary to add to the number of urban population of all towns a part of the population

from settlements of 2 to 5 thousand inhabitants in order to obtain the approximate level of urbanisation. This was done for the data given in Table 1.

In Hungary the postwar changes in the settlement pattern have been concentrated in the industrial regions. There are seven such areas with Budapest being most important which have created large industrial settle-

TABLE 3. SHARE OF URBAN POPULATION IN CZECHOSLOVAKIA'S SETTLEMENTS

Scale of settlements (in thousands of inhabitants)	% of urban population
10-20	98.6
5-10	93.1
2-5	35.4

ment zones with a great commuting, as the study of E. Lettrich [9] has shown. But these processes have not led to changes in the urban limit in the administrative sense until now. There are no new types of administrative units there, which could be compared with the town-like settlements in Poland and Rumania. Administrative changes have concerned the rural areas which hitherto belonged administratively to the towns, and a greater number of administrative units have been formed thus transforming the traditional Hungarian rural-urban unit. In the industrial settlements zone there are phenomena which have the same character as in the neighbouring countries but it is not possible to compare them due to the lack of statistical materials. The limit of urban settlement in Hungary cannot be drawn in relation to the new settlement pattern. On basis of official data only 63 settlements with urban status may be characterized. Therefore in Hungary the number of urban population does not appear to have grown in the postwar years, as is shown in Table 1, though the processes of urbanization are evident there.

Finally some general conclusions can be made.

1. The limit of urban and non-urban settlement depends, as has been shown, on two different factors — the historical development of town network resulting in the survival of traditional towns; the recent changes in settlement evolved in the stage of increased industrialization. The real and actual limit of urbanization fluctuates among the small older towns and the new type of settlements of urban or semi-urban character.

2. The growth of new town-like settlements and industrial settlement zones is only partly based on the feudal settlement network. This fact is similar to processes characteristic for Western Europe.

3. In general the figures of urban population, contained in Table 1, show the real state of urbanization. The differences in Rumania and

Poland are only slight, although the number of urban population given is too high. In Czechoslovakia the number of urban population is doubtful in result of the way official statistics are compiled, but it could be calculated by additional study. Only in Hungary the official data is insufficient for estimating the real degree of urbanisation either in the past or within the last few years. From these comparative remarks about the urban and non-urban settlement limit it must be concluded that these studies should be based on individual research for each country.

4. For comparative studies on a world scale the official statistics of urban population are of value. It is not good when they are neglected as for instance in the *American Atlas of economic development* edited by N. Ginsburg [10]. He presents a map of world urbanization in which only the urban population of the towns with over 20 thousand inhabitants is taken into account. As a result of such proceedings all the countries of the East Central Europe presented in this Atlas, except Hungary, are shown as very slightly urbanised coming under the world mean of 21.5%. It does not correspond to reality because the process of urbanization is based on smaller towns and urbanised agglomerations as well. Only for Hungary Ginsburg's classification is more favourable but even here it does not take into account the special character of the Hungarian towns.

It is an interesting problem to compare the state and the development of world's urbanization but it should be repeated that it must be based on individual studies of urban and non-urban settlement in each country otherwise it may lead to misleading conclusions.

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TYPOLOGICAL PROCEDURE IN ECONOMIC-GEOGRAPHICAL RESEARCH

RYSZARD DOMAŃSKI

THE SIGNIFICANCE OF TYPOLOGY

In spite of the obvious usefulness of typology in geographical research it has not been properly evolved neither theoretically not methodically. On the other hand, attempts are being fairly frequently made to determine and describe concrete types in various realms of geographical phenomena. Since there is no developed theory or method available, the attempts are usually made in an intuitive way and the results attained ultimately depend upon scientist's research experience. However accomplished that intuition may be, satisfactory results can be obtained only in as far as singling out and study of one-dimensional, rather meager of contents quasi-types, are concerned. Multidimensional types are the subject of studies of a postulative character; any attempts at a practical typology of such types are — with but few exceptions — ineffective.

Intuition, therefore, is not sufficient and what is necessary is a clearly defined theory and a method of typological research in geography. A definite method of application of typological notions will enable a more adequate exploitation of all their functions as well as cognitive possibilities that are inherent in them. Now, what functions do typological notions play? Max Weber [31] draws attention to their terminological, classificatory and heuristic functions. Interpreting those terms we find that typological notions: 1) contribute to increased notional clarity and acuity, 2) help rank and arrange notions and, 3) through comparison of concrete phenomena with types make it possible to expose facts which call for elucidation or to discover regularities thus far unnoticed. Encountering in his research work a multitude of diverse phenomena, the geographer has to single out types and describe them properly. In that way he renders his rescription easier and avoids repetition which would be quite inevitable were he describing them one by one. Then, also, by formulating

general statements about phenomena of certain type he contributes to enriching the theory of geography and to facilitating the procedure of passing down geographical knowledge to others.

BASICAL NOTIONS. AN OUTLINE OF PROCEDURE

1. *Dichotomic, gradable and measurable features*

Geographical phenomena show triple features which can be included in typological notions, namely: dichotomic, gradable (serial) and measurable (variable) ones [11]. The dichotomic or bipartite features are characterized by the fact that all that one can say about them is whether, or not, the given subject in a collection possesses them. The given town, for instance, either is a port town or it is not, the given agricultural area either has ameliorated land or it has not and so on.

What differs the gradable features from the dichotomic ones is that the former allow of a larger gradation. According to their gradable features objects can be arranged in an order by merely comparing them with each other (as ranks). In this way K. Dziewoński has managed to arrange [8] spatial forms of urban life and towns, singling out simple forms, complex forms and multiple complex forms — depending on size and extent of complexity.

The measurable features allow not only an extensive gradation but also can be precisely measured within a scale of even divisions and a zero point. Hence, it is possible to establish both distance between two points and ratio of two distances. One of the measurable features is, for instance, so called precipitation effectiveness expressed in the P/E index (ratio of rainfall to evaporation) upon which W. Thornthwaite's classification of climate in the United States is based [29]. Resorting to measurement of basic and non-basic functions J. Kostrowicki developed a system of settlement (towns and urban settlements) classification [16].

2. *Classificatory and typological notions*

Classificatory notion has a form of a simple function:

$$\Pi_x [F(x) \rightarrow G(x)]$$

The function reads: each x , if it has a feature F , belongs to G of the class of x . From the logical structure of classificatory notion it follows that with its help we can determine only whether, or not, subjects examined have the given feature without further inquiring as to what an extent they possess the feature. Most frequently however, objects examined by geography display a considerable range of grades of the given features.

Having individualized certain classes of objects by simple classificatory notions, the geographer arrives at notions of a limited scientific value, defined, in the main, by marginal points and ignoring distribution of objects within those classes. In such a situation typological notions are much more useful and only their application makes it possible to bring out what is significant for objects of various classes and, then, to arrange objects belonging to the given population (set).

Typological notions represent a peculiar case of classificatory notions [20]. Their peculiarity consists in the fact that they function as a standard. This standard character of types is emphasized both, by biological sciences and by humanities. In zoology, for instance, „type constitutes a standard which serves as a basis for the use of a given scientific name. The type acting as a nucleus of taxen (taxonomic category of any kind — R.D.) and a basis of its name is objective and does not change, whereas taxon limits are subjective and changeable” [27].

There are two types: ideal (bearing no designatory relation to any object) and empirical (bearing designatory relation to at least one object). Ideal types are not at all arbitrary notional fictions. They are composed of features scattered among real objects (exaggerated and conjunct), with a view to studying the empirical reality, whereas directives of logic — if observed — quarrantee their scientific usefulness.

3. Arranging relations. Typology and regionalization

Having established type-standards (the procedure for their establishment is discussed in the next chapter) we can compare them with real objects in order to ascertain either differences or similarities. Then, according to either differences or similarities with regard to types, we can set real objects in an arranged rank. Thanks to types we can also more fully reveal differences and similarities between real objects. Studies of this kind correspond to the essence of geography which has always concentrated its attention on differences and similarities between localities, regions and countries. Results of such studies are not only of cognitive significance but also of practical importance. Thus, having established, for instance, types of regions economically backward we can better plan for economic activization of regions that are really underdeveloped. Indeed, types singled out ought to take into account causes and character of the backwardness (unattractive geographical environment, insufficient infra-structural investment score, shortage of skilled manpower etc.). Knowing all that we can adopt proper economic measures best corresponding to the local conditions in regions which display some similarity to this or that type.

While arranging an population (set) of geographical objects we resort to what is called as arranging relations. Unlike classificatory notions serving only to establish whether, or not, the given feature is present, arranging relations enable comparison (gradation) of the feature as well as a comparative approach to the objects to which the characteristic appertains. Arranging relations, therefore, have a more involved logical structure. They have to fulfill conditions contained in this definition:

$$R \text{ e } arr(A) = A = P(R) \wedge R \text{ e } con(A) \cdot trans(A) \cdot assym(A)$$

It reads: relation R arranges set A when and only when A represents its field and when it is conjunctive, transitive and asymmetric. To precise those conditions:

$$R \text{ e } con(A) = \prod \prod [x \neq y \rightarrow (xRy \vee yRx)]$$

$x \in A \quad y \in A$

$$R \text{ e } trans(A) = \prod \prod \prod (xRy \wedge yRz \rightarrow xRz)$$

$x \in A \quad y \in A \quad z \in A$

$$R \text{ e } assym(A) = \prod \prod [xRy \rightarrow \sim (yRx)].$$

$x \in A \quad y \in A$

The relation is conjunctive in set A , therefore: if it takes place between any (non-identical) elements of the set in either direction (preceding or following); it is transitive if always, when taking place between the first and the second and then between the second and the third elements of the set it also takes place between the first and the third elements, finally, it is asymmetric if, while occurring between the first and the second elements of the set it is excluded that it could ever occur between the second and the first.

Following are some examples of arranging relations in the field of geography: slope inclination, continentalism of climate, communication distance, differentiation of town-forming functions, succession of forms of spatial development of towns or regions and so on.

As regards regionalization it belongs, strictly speaking into the group of common classificatory notions. Regionalization consists in distinguishing certain areas according to whether, or not, they have certain features which have been accepted as criteria for the distinguishing. It is a general practice, however, that in regionalization we also make use of arranging relations. It is so because there do not exist two, lest alone three, quite identical areas on the Earth. Thus, for instance, while individualizing what is called as homogenous regions one does not in fact individualize areas absolutely homogenous but areas which are approximately homogenous or — as it is sometimes worded — homogenous within the framework of accepted criteria which allow of some differentiation. Well, it may appear advisable to examine the extent of differentiation of areas regarded as homogenous within the framework of the accepted criteria.

In such a study arranging relations are most useful. But that's not all. Individualization of regions according to whether, or not, they have certain features can yield results of little interest, insufficient to arrive at the research objectives expected. In such a case application of arranging relations which allow of further differentiation and multiple gradation of regionalization makes it possible achieving more worth while results.

Regionalization can be carried out in two ways, depending on character of types. Because of dissimilarity of regionalization the author proposes to single out unlocalised and localised types which can be regarded as derivatives of the ideal and the empirical types. In the first case typological procedure is a two-stage one and it runs from types to regions, that is to say, we first determine types and later, studying their distribution, distinguish areas which have features of types, that is regions. In this instance region plays the role of a unit of classification system (regional system in J. Kondracki's [14] terminology) and not a typological notion. This procedure is best illustrated by Z. Laznicka's work concerning types of village settlements in Czechoslovakia [23].

In the second case, typological procedure is a single-stage one and type determination is equivalent to region determination as it consists in combination of features inherent in definite territorial units, which are being regionalized. So, in this case, region is both a unit of classification system and a typological notion. This procedure is illustrated by J. Fierich's work on regionalization of agricultural systems in Kraków voivodship [9].

It would be a wain to argue which of the two procedures is better. Both are admissible and which of them is selected depends solely on the purpose of research, on the number of observation units (for which source material is gathered) and the indices which characterise them. Methods of regionalization, of course, differ in both cases. Two kinds of classification methods are known to statistics and they can be employed as methods of regionalization for either non-localized or localized types. In the process of regionalization of non-localized types standard methods are useful such as, for instance, R. A. Fisher's discriminative analysis [10] or A. Kuikliński's method of indices [19] whereas in regionalization of localized types the non-standard methods are more suitable, as, for instance factor analysis [2, 30] or J. Czekanowski's method of differences and similarities [4, 5].

DETERMINATION OF TYPES

In the course of type determination one can take into account one or more features of the objects examined. Types which are distinguished on the basis of one feature are called one-dimensional types or quasi-types

whereas those picked out on the basis of several features are called multidimensional types. The latter ones represent combinations of features with much ampler content but, then, their construction is much more difficult than that of the one-dimensional types. The definition of types given by S. Kalesnik in his *General Physical Geography* refers to multidimensional types [12]. S. Kalesnik writes rightly that: "Type represents a generalization which includes characteristic features of a certain group of objects and phenomena".

Many geographers, especially Polish, were aware of limitations of one-dimensional typology. J. Kostrowicki tries to break through those limitations reinforcing his functional typology of towns with an extensive historical analysis [16]. Apart from function, his typology implies another dimension — time. In the author's new work on geography of agriculture the typology is multidimensional of the very assumption [18]. S. Leszczycki made a multidimensional classification of the geographical sciences [25]. The arrangement of practical applications of geography has an identical character [26]. K. Dziewoński spoke in favour of the multidimensional typology on many occasions; he praised in his works J. Kostrowicki's "attempt at combining functional typology with historical one" while he himself tried to link functional with morphological typology [8]. K. Dziewoński links together "divisions into zones of complex economy and nodal regions" and emphasizes that the best device in the study of region "have always been conjunct criteria" [6].

Those "conjunct criteria" or, in other words, correctly selected diagnostic features constitute a substantial element of typological procedure. Under the term of diagnostic features one understands those properties of an object owing to which it differs from an object belonging to another type or is similar to an object belonging to the same type. The establishment of a correct set of diagnostic features is a difficult and a responsible task since the final results of typology depend entirely on the way it is solved. The task itself requires considerable knowledge about the assemblage of objects arranged. It also requires familiarity with the postulates of statistics with regard to the diagnostic features. Requirements of biological taxonomy have relation to geographical objects to ensure that the diagnostic features are: 1. constitutional, unincidental (the importance of features, however, must be relative, depending on the viewpoint from which typology is approached), 2. not too numerous (taking into account too many features may not only complicate procedure but it may also obscure the differences between various types, whereas typology seeks to make clear-cut distinctions between them), 3. spatially scattered (to ensure sufficiently representative types), 4. not too closely correlated (addition of a correlated feature does not necessarily add to distinctness

of types and does not enrich their content; the issue, however, has not been univocally settled, for, as regards so called natural systems, biologists agree that the necessary condition is that the diagnostic features are dependent upon each other, and then all of them — upon one and the same cause).

Once diagnostic features are selected the next step is an operation of linking them appropriately. Indeed, whatever is the definition of type a group of features or their combination will always be an important element of it. Combination of features is possible through multidimensional classification and index determination (remarks on this subject are based on the work of P. F. Lazarsfeld and A. H. Barton [21]). As regards measurable features there are various methods of combining them. In geography, however, we also deal very frequently with dychotomic and gradable features. The point, therefore is, how geographical typology should take into account the dychotomic and gradable features apart from the measurable ones.

The operation of feature combination consists in establishing and reduction of feature (attribute) space. The following example will perhaps clarify the sense of the notion of feature's space. Let us assume that while looking for types of agricultural areas among a large number of them, we have selected three diagnostic features: property of climate expressed in *P/E* index (measurable feature), soil fertility (gradable feature), and land amelioration or its absence (dychotomic feature). Now, appropriate values for those features can be plotted into the system of coordinates. Thus, for instance, on axis *x* one can mark values for *P/E* index expressed in natural numbers, on axis *y* — classes of soil fertility that were previously set in an arranged rank 0—1, where 1 stands for top fertility, on axis *z* — land amelioration. Since land can be either ameliorated or not, we mark this (+ or -) plotting points arbitrarily on either side of the origin. Therefore, if an area shows a wide margin of rainfall over evapotranspiration, if it has good soils and if it is ameliorated — we mark all that for instance, by putting down 65 on axis *x*, 0·8 on axis *y*, and sign + on axis *z*. It is known from analytical geometry that any three arranged figures *x*, *y*, *z* have one precisely corresponding point in space coordinate with them. Hence, any area in our case (generally speaking — object) is also represented by a point in feature space, although, because of the combination of dychotomy and gradation, not every such point has a corresponding area. In this case the feature space is three-dimensional since there are three coordinate features in space according to which we classify areas. With four features given — we deal with a four-dimensional feature space, with five features — five-dimensional, and so on.

The term of reduction is understood as grouping of particular features combinations, as putting various combinations into classes. P. F. Lazarsfeld and A. H. Barton distinguish three types of reduction: functional, arbitrary numerical and pragmatic one. The functional reduction is employed when two features have some relationship to each other, which, in effect, reduces the number of possible combinations; some types of combinations, at that, will not appear at all or will appear so seldom that distinguishing a special class for them will not be necessary. The arbitrary numerical reduction can be carried out, among other things, by means of indices (complex indices). In this case, the indices represent sum total of the weight carried by the values of particular features. Certain combinations may well get indices of identical values (the same index number). Thus, one index may stand for two or more combinations. There are various ways of establishing weights in the reduction procedure. A technique of so-called latent structure analysis has been developed recently and it makes it possible to draw the weight from mathematical models, when empirical data are the variables [22]. In the case of pragmatic reduction, certain groups of combinations are, in a way, squeezed into classes whose kind is predetermined by the purpose of study.

SYSTEMS OF ECONOMIC-GEOGRAPHICAL TYPES

Objects examined by economic geography are arranged according to similarity and difference. From the viewpoint of similarity and difference between objects it is possible to distinguish (compare: conclusions from Russel's antynomy): 1. types of sets or properties of individual objects, 2. types of relations which may occur between individual objects and, also, higher grades of the two types, that is to say: 3. types of relation properties (sets of relations), 4. types of relations between sets or between individual objects and sets, 5. types of relations between set and relation.

The type of set can be expressed symbolically: $x \in X$ or $X(x)$. Those expressions read: x belongs to set of X , or, x has the property of being X . For instance: Poznań belongs to the set of industrial towns or Poznań is entitled to the property of being an industrial town, or, humus soil belongs to the set of fertile soils and humus soil is entitled to the property of being a fertile soil. So, types of sets express qualitative separateness of objects accurately characterised. In this group fall such types as, for instance; specialised towns, electrified railways, uniform regions, industrial areas, agricultural areas, service rendering centres, scattered systems, elongated shapes, rational methods of capital investment, crop rotation agriculture, spontaneously developing rural settlements [13], industrial complexes developing around coal base [3] and so on.

Relation (R) which occurs between individual objects (x, y) has the form: xRy or, $R(x, y)$. Function—the fundamental mathematical notion—which is also applicable in quantitative geography is an example of relation. Economic geography takes particular interest in the following relations: situation (location) with regard to each other, succession in time, gradation, structure, causality.

The types of relation properties include: reversibility, transitivity, symmetry, synonymity, multivocality. Types of relations between sets include: equality, inclusion, exclusion, equinumber, isomorphism; ecological relations (they are analysed by F. Barciński [1]) are characteristic for economic geography. Types of relations between set and relation include: transition, lasting (permanence, inheritance), hierarchy.

AXIOMATISATION

Diagnostic observations which are used to construct types can be presented in various coordinate systems. On one occasion this system may be found useful, then, on another occasion, some other system may be found useful. Also, one can go over from one system to another by means of an operation known as transformation. The transformation of feature's space is important as a logical basis for interpretation of statistical results. It is possible to prove that such an interpretation consists in substructure the given system of types with a feature's space other than that from which the system has been derived (deduced) and in looking for such a reduction which would lead to a system of types in this new space [21].

Axiomatisation of typological procedure would represent a higher order of generality. Its significance would consist in the fact that in an axiomatised form the procedure would be applicable to various sections of economic geography as well as physical geography and even other sciences with a similar structure. In mathematics, it is possible to transfer theorems referring to objects of one definite theory on to objects of another theory, under a condition, that there exists a relation, which establishes isomorphism of both sets of objects. Relation R which establishes isomorphism of sets X and Y , on account of relations S and T has the form:

$$\langle X, S \rangle \text{ iz}_R \langle Y, T \rangle = R \epsilon 1 - 1 \wedge D_l(R) = X \wedge D_p(R) = \\ = Y \wedge \prod_{x \ y \ z \ u} [xRz \wedge yRu \rightarrow (xSy = zTu)]$$

Thus, isomorphism takes place when the following conditions are fulfilled: 1. relation R is synonymous, 2. set X represents the field of relation S and set Y — field of relation T , 3. the left and the right field

of relation R is equal to the field of relation S and the field of relation T , respectively, 4. whenever two objects are in relation S , objects appended to them by relation R always stay in relation T .

This involved problem should be analysed from the viewpoint of feasibility of its application to geography. In this way, perhaps, it would be possible not only to axiomatise the typological procedure but also to solve the fundamental dilemma of geography — the dilemma of its unity and duality.

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PROBLEMS OF POST-WAR INDUSTRIAL CONCENTRATION AND DECENTRALIZATION IN POLAND*

STANISŁAW LESZCZYCKI

PURPOSE AND BASES FOR THE STUDY

It is the purpose of this article to present the methods applied in studying the changes in the industrialization of a country, seen from the point of view of trends towards further concentration or decentralization. As an example illustrating these phenomena, we have taken changes in the location of industry in Poland after the Second World War.

To avoid the difficulties encountered in collecting various data, representing the growth of industry, only one index was applied — the number of workers employed in industry. Although this index is imperfect in many respects, especially for comparative studies dealing with different branches of industry it still has the advantage that in all statistics it is unequivocal; it can be used, therefore, for comparisons in both time and space (for instance, for different countries).

The statistical data for Poland was taken from the Statistical Yearbooks of the Central Statistical Office. As this statistical data for the first post-war years was incomplete, this paper takes into account only data referring to the 1946—1962 period, but for comparison the figures for 1937, 1946, 1949, 1955, 1960 and 1962 have been used. In order to investigate the changes taking place in time, the data were compiled for the periods corresponding to the long term economic plans: 1. the 3-Year Economic Plan (1947—1949), 2. the 6-Year Plan of Development (1950—1955), 3. the first 5-Year Plan (1956—1960), 4. the second, current 5-Year Plan (1961—1965).

For analysis, the above statistical data were calculated and checked within the framework of the present administrative division of Poland into 22 voivodships (5 urban voivodships included)¹.

* This article was read on the XX International Geographical Congress in London 1964 as a paper in the Section of Applied Geography.

¹ Here and there afterwards, we use the term "urban voivodship" for a city possessing the legal status of a voivodship, which is the highest order unit of the administrative division of the country.

The present paper consists of two parts: a) the first deals with the changes in the distribution of industry which took place in Poland during the successive economic plans; b) the second part is an attempt to synthesize the changes which occurred during the entire period from 1946 to 1962.

UNEVEN DISTRIBUTION OF INDUSTRY IN POLAND

As in most industrialized countries, the distribution of industry in Poland is uneven. This can be explained not only by the distribution of natural resources, density of population and of towns, but, above everything else, by the historical development of Polish lands in the first phases of capitalism. At that time, the territory of Poland was partitioned between foreign powers, each developing industry according to its own economy, and favouring least these regions, which were peripheral and were inhabited by an alien, Polish population.

Up to the First World War, in the Prussian part only Upper and Lower Silesia were industrialized, and the areas situated along the rivers Odra and Warta as well as the ports of Gdańsk and Szczecin were more intensively developed. In the Russian part, industrialization was concentrated in the district (*Gubernia*) of Piotrków (the Dąbrowa Coal Basin, textile town of Łódź and towns of Piotrków, Tomaszów, etc.), and around Warsaw. Some textile industry was also developed in the area of Białystok. In the Austrian part an industrial economy was never strongly developed. In the western part of Galicia some industrialization occurred on the basis of coal deposits; in the Carpathians, oil and salt were produced. Apart from these, only minor industries have grown along the two main west-east railway lines running in the foothills and in the foreland of the Carpathians. Thus the general outlines of the spatial structure of industry were already formed in Poland before the First World War.

Following the First World War, the present territory of Poland belonged to two countries: Poland and Germany. In spite of efforts and investment outlays made by both countries, the spatial structure of industry, on the whole, remained unchanged until the outbreak of the Second World War.

Figure 1 shows the distribution of industry in 1937 by percentage of industrial employment in voivodships, according to the present administrative division. In 1937, employment in industry was 1,408,800 people. Most of these worked in 3 voivodships — 22.5% in Katowice, 13.1% in Wrocław and 7.1% in the city of Łódź. Next in order were: the city of Warsaw 6.3%, voivodship of Zielona Góra 5.3% and the voivodships: of Opole 4.5%, Szczecin 4.3% and Gdańsk 4.0%. In the remaining voivod-

ships, the percentage of industrial employment was below 4%, in the eastern voivodships even less than 2%.

The Second World War and the German occupation brought enormous destruction in industry which amounted to 40% of the fixed assets. The changes which took place between 1937 and 1946, cannot be examined

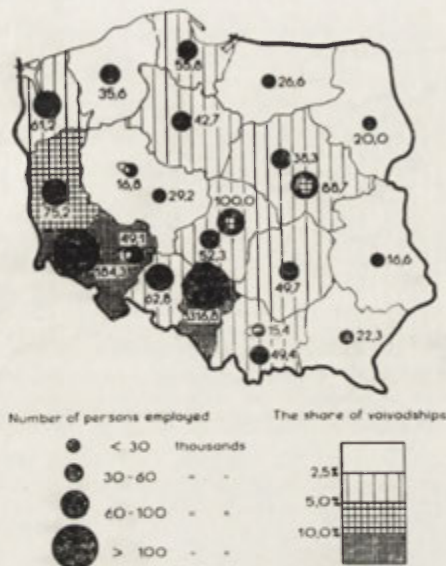


Fig. 1. Number of persons employed in industry in 1937

with any degree of accuracy because of the lack of reliable data. These changes comprised: a) the expansion of industry for war purposes in the 1937-1939 period; b) war destruction in the years 1939-1945, and c) a spontaneous reconstruction of industries in 1945 and 1946.

As the result of these changes, industrial employment in 1946 was 1,243,300 people, that is 165,600 less, and the index of employment was 91 — in comparison with 1937.

CHANGES IN THE DISTRIBUTION OF INDUSTRY AFTER THE SECOND WORLD WAR CAUSED BY THE ECONOMIC PLANS

In spite of all the changes caused by the war the spatial structure of industry did not change very much, except that industrial production in 1946 was mainly concentrated in these parts of Poland which had suffered less destruction, that is in Upper and Lower Silesia and in Łódź. As for other voivodships, their proportional share in production was similar to

that before the war. Figure 2 illustrates the distribution of industry in Poland in 1946.

During the 3-Year Plan (1947—1949), the main effort was directed towards the resumption of industrial production at lowest investment costs; consequently, industrial plants were reconstructed principally in those voivodships that had suffered the least war damage. As a result,

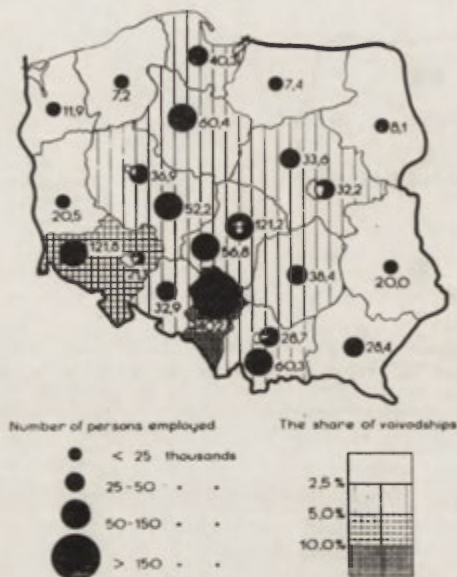


Fig. 2. Number of persons employed in industry in 1946

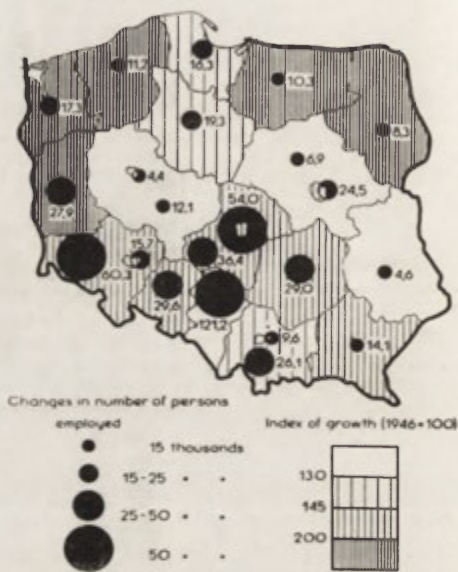


Fig. 3. Increase in industrial employment in the years 1947-1949

by 1949, there were 559,900 new jobs in existence, and the index of increase of employment was 145. The greatest increase of employment has taken place in the traditional, well developed industrial regions, such as the voivodships of: Katowice — 121,200, Wrocław — 60,300, and the town of Łódź — 54,000. The lower increase of employment has been noted in the voivodships of: Łódź — 36,400, Opole — 29,600 and Kielce — 29,000. The spatial results of the industrial investments of this 3-year period are represented in Figure 3. The relative increase of employment in various voivodships is presented on the background of the map. It was the highest in those voivodships which hitherto had been least industrialized, principally those in the north and west of Poland.

Figure 4 shows the changes which occurred in the 1947—1949 period according to the percentage share of individual voivodships in the total industrial employment. Eight voivodships recorded a decrease in their proportional share in employment, which, in the voivodship of Katowice, was by 3.3%. All the remaining 14 voivodships show slight increase.

As the result of the implementation of the 3-Year Plan, employment in industry had risen to 1,803,200, by 1949. Even so, in spite of this considerable increase, no major changes occurred in the distribution of industry, as indicated in Figure 5.

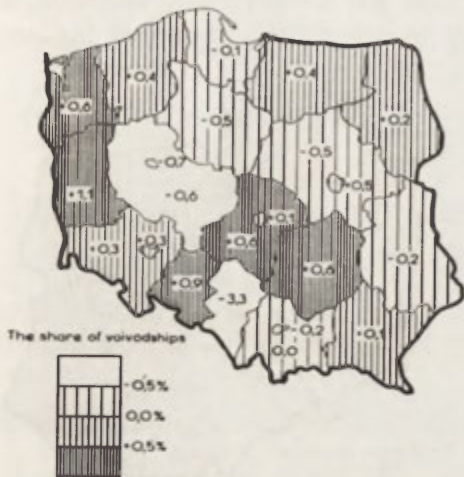


Fig. 4. The changes in the percentage share of individual voivodships in industrial employment of the country in the years 1947-1949

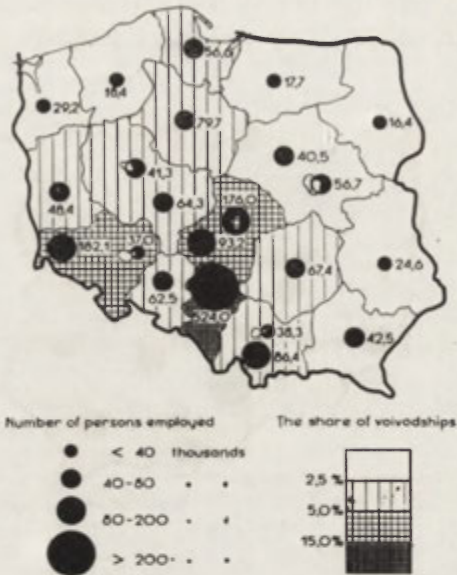


Fig. 5. Number of persons employed in industry in 1949

The 6-Year Plan (1950—1955) anticipated a considerable expansion of industry, by modernizing many existing factories and erecting numerous new plants — not only in old industrial regions, but also in areas hitherto little industrialized. The implementation of the 6-Year Plan caused an increase of 898,500 in industrial employment. This increase was distributed more evenly than before, all over the country, as illustrated in Figure 6. This map shows that, while a large increase of employment was achieved in the older industrial regions, the highest relative increase was achieved in areas so far most retarded in industrialization. Thus, the implementation of the 6-Year Plan yielded the first distinctly noticeable diminution of the disparities in the distribution of industries in Poland.

This fact is also confirmed by the changes of percentage of the relative share of individual voivodships in the global industrial employment in the 1950-1955 period. These changes are illustrated in Figure 7, showing that, at the expense of the 5 voivodships hitherto most highly industrialized-

zed, all the remaining voivodships increased their shares. On the average, this increase was rather uniform, usually not exceeding 1% except for the city of Warsaw, where the share in the country's global increased by 1.9%.

As the result of the implementation of the 6-Year Plan, employment in industry by 1955 had risen to 2,701,700. The distribution of industry

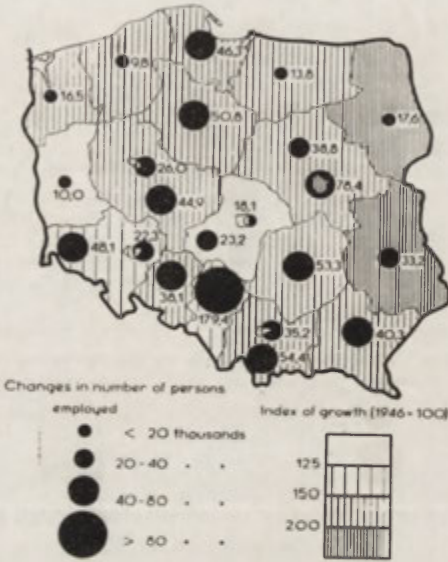


Fig. 6. Increase in industrial employment in the years 1950-1955

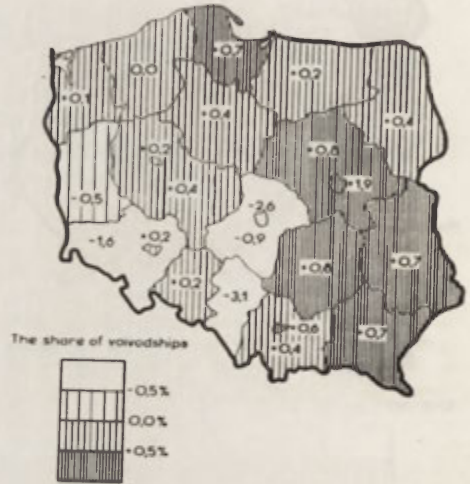


Fig. 7. The changes in the share of individual voivodships in industrial employment of the country in the years 1950-1955

maintained its traditional spatial structure but the proportional share of the three most industrialized voivodships (Katowice, Wrocław, town of Łódź) declined from 51.9% to 41.7%. The distribution of industry in 1955 is illustrated in Figure 8.

The characteristic feature of the subsequent 5-Year Plan (1956-1960) was the completion of investments started in the 6-Year Plan and an increase in industrial potential, not only by means of new investments, but principally by rising the effectiveness of work and by modernizing techniques of production. This 5-Year Plan resulted in a further increase of employment in industry, by 310,400. The index of increase was 111. This increase of industrial employment was rather evenly distributed over the whole country, as is shown in Figure 9, but again the highest relative increase occurred in areas previously least intensively industrialized (Fig. 10).

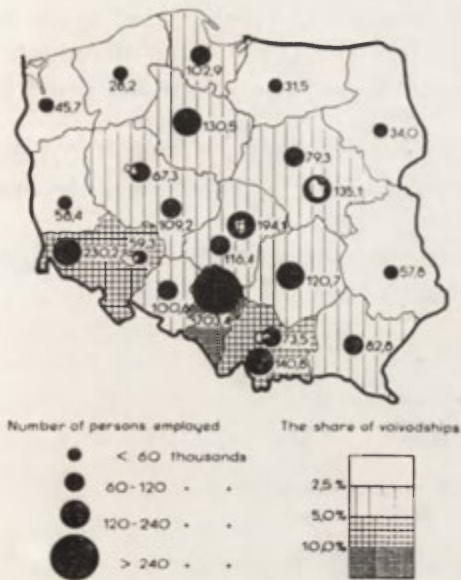


Fig. 8. Number of persons employed in industry in 1955

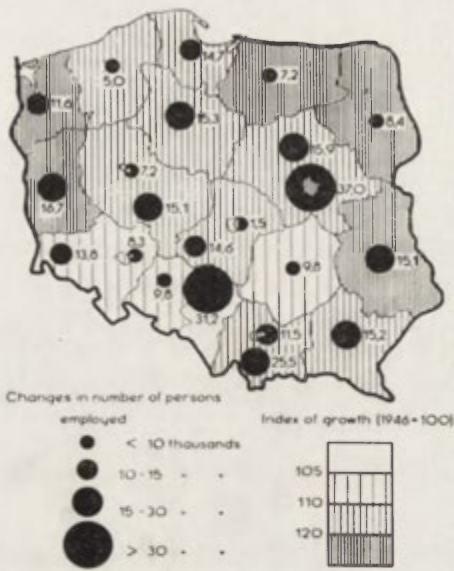


Fig. 9. Increase in industrial employment in the years 1956-1960

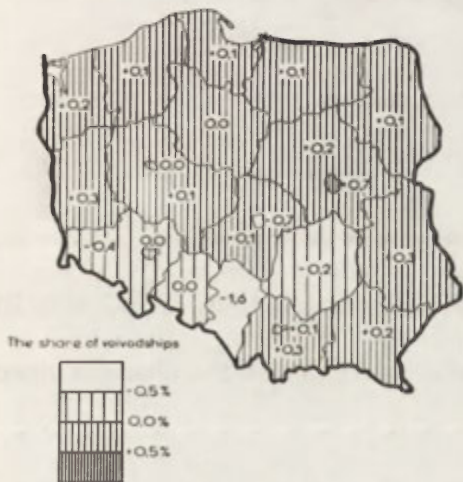


Fig. 10. The changes in the share of individual voivodships in industrial employment of the country in the years 1956-1960

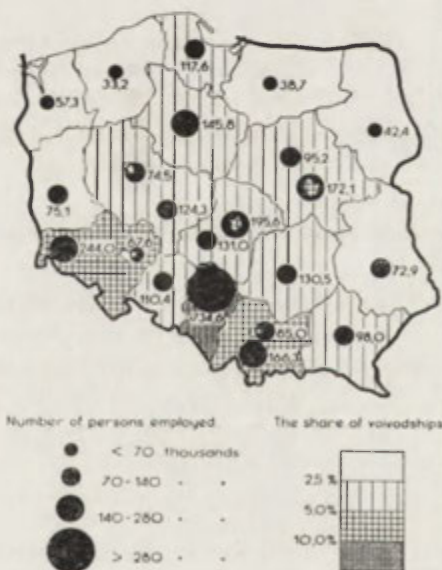


Fig. 11. Number of persons employed in industry in 1960

As the result of this 5-Year Plan, industrial employment grew to 3,012,000 persons in 1960. On the whole, the spatial structure of industry remained rather unaltered, excepting some minor alterations indicated in Figure 11.

During the first three years of the current 5-Year Plan (1961-1965) the number of persons employed in industry increased by 380,000 people, and the index of increase was 120.

In 1962, the distribution of industry showed no essential changes apart from minor adjustments illustrated in Figure 12.

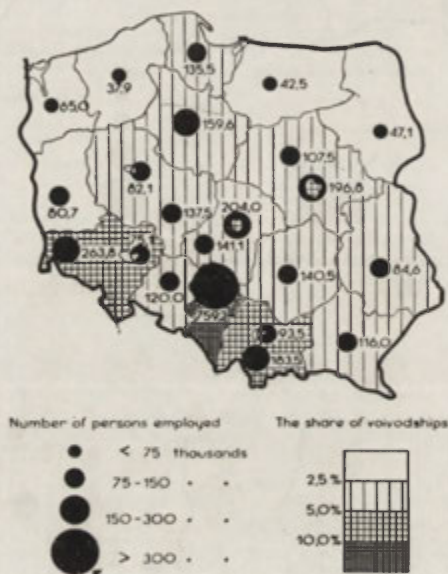


Fig. 12. Number of persons employed in industry in 1962

Thus I have presented the changes in the distribution of industry in Poland which occurred in the periods of particular plans.

Now I shall try to synthesize the characteristics of the changes since the Second World War.

CHANGES IN THE DISTRIBUTION OF INDUSTRY IN THE 1946-1962 PERIOD

I have based the synthetic characteristics of these changes on the following four indices calculated for the voivodships:

1. the increase of employment in industry, in absolute figures,
2. the increase of employment in industry, in relative figures and the deviations from the mean relative increase for the whole country,

3. the percentage changes in the share of individual voivodships in the national total of industrial employment,
4. cumulative curves and indices of spatial concentration.

The increase in the number of persons employed in industry

The increase in the number of persons employed in industry, in absolute figures, indicates that in the period under investigation a further concentration has taken place in employment in the old industrial regions. Investment outlays located there have been economically most profitable. Such a location corresponds to the principle of optimization of the national economy. Investments made outside the old industrial regions, while contributing to the evolution of the regional economy, do not always yield the highest degree of effectiveness, nor do they always conform to the demand of optimization of national economy. That is the reason for the

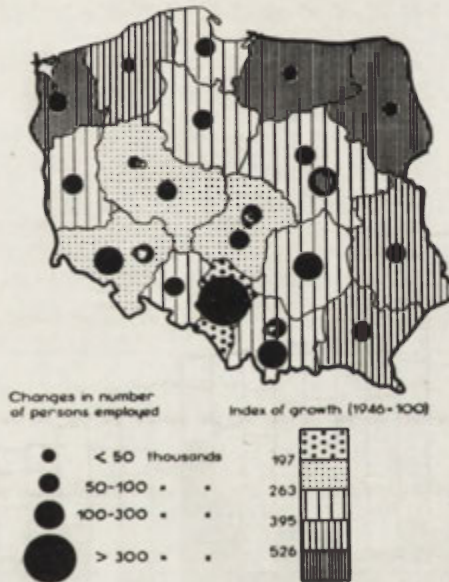


Fig. 13. Increase of industrial employment in the years 1946-1962

preferential treatment of old industrial regions. Figure 13 illustrates the absolute increase in employment in industry marked by symbols. The highest increase is noted in the most important concentrations of persons employed in industry, particularly in the following voivodships of: Katowice — 356,400, city of Warsaw — 164,600, Wrocław — 142,000, and Cracov — 123,200. The increase in employment in the northern voivodships is the smallest.

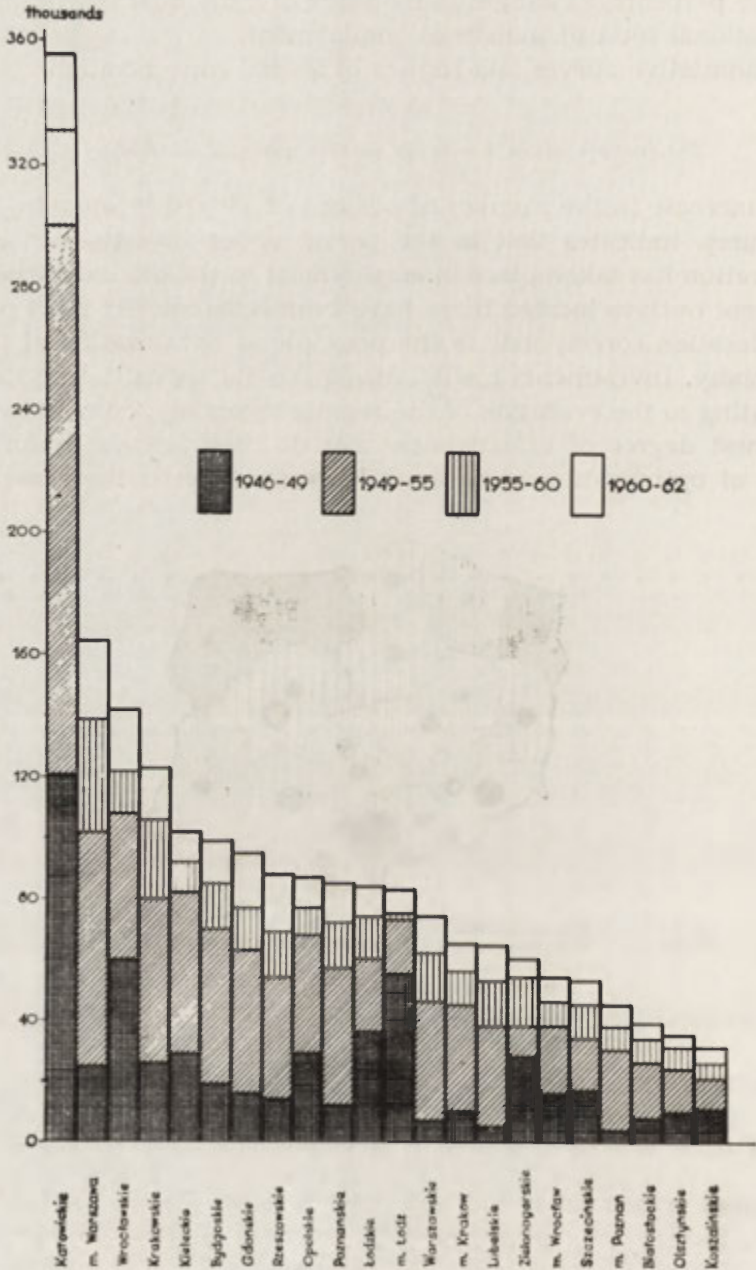


Fig. 14. Increase in industrial employment in the periods of implementation of subsequent national plans

Figure 14 illustrates, even more distinctly, the dynamics of this increase; it indicates that in the first economic plans the increase of industrial employment was less uniform in the individual voivodships. In the periods of subsequent plans, this increase became more uniform, and because of this we are witnessing a slow but constant reduction of the disproportionate distribution of industry.

The areal differences in the increase of industrial employment are accentuated by the index of the differences between maximum and minimum increase in every voivodship, which amounts to 11.6 for the 1946-1962 period.

In order to determine the part played by individual voivodships in the country's industrialization, their increase of employment in relation to the national figure (100%) was calculated. From Figure 15, plotted on

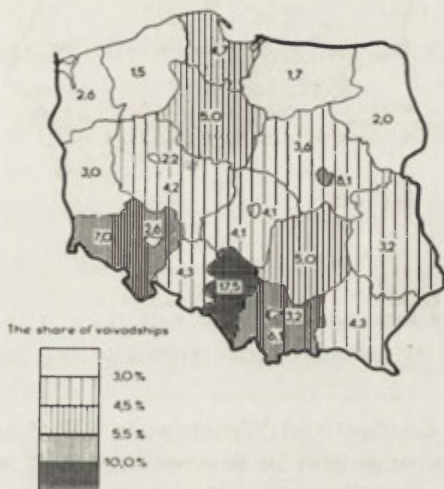


Fig. 15. Increase of industrial employment in the years 1946-1962. The changes in the percentage share of individual voivodships

the basis of these data, it appears that in this period the highest concentration of industrial workers has taken place in the following voivodships: Katowice — 17.5%, city of Warsaw — 8.1%, Wrocław — 7.0%, Cracow — 6.1%, etc. The expansion of industry in the northern voivodships, both in the eastern and the western parts of the country (less than 4%) has been the lowest.

A further analysis has been based on the index of the increase in the number of people employed in industry per 100 km² — in order to eliminate the differences between the voivodships from the point of view of

their area. The index of spatial concentration has been presented in Figure 16.

The spatial concentration is highest in the urban voivodships, in which employment per 100 km² is many times higher than the mean for the whole of Poland. Even the voivodship of Katowice reveals an increase in employment, per 100 km², 5.5 times higher than the mean. Increases higher than the national mean have been shown by the following voivod-

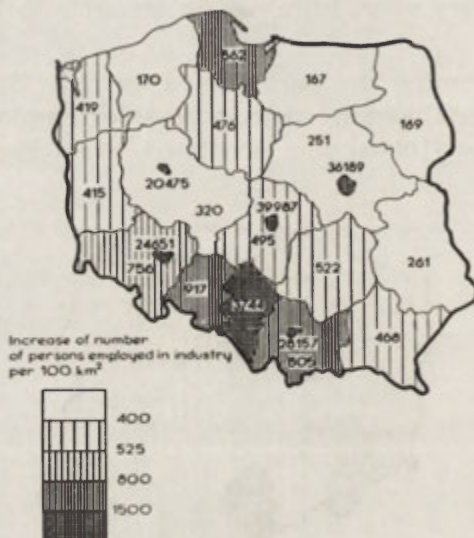


Fig. 16. Increase of industrial employment in the years 1946-1962

ships: Opole, Gdańsk, Cracow and Wrocław, in all of which industrialization proceeds at a vigorous rate. In the remaining 12 voivodships, on the other hand, increases per 100 km² are lower than the national mean, and in the north-eastern voivodships as well as in the voivodship of Koszalin this increase is below 50% of the national mean. Figure 16 shows that the spatial concentration, that is, the increase in the number of employed in industry per 100 km² has been very uneven in the 1946-1962 period.

In order to obtain data fully comparative in order to eliminate the differences between the voivodships from the point of view of their population, the increase in industrial employment per 1000 inhabitants has been calculated. In that way the index of the social importance of industry has been obtained; the results of this analysis are given in Figure 17.

From Figure 17 we may distinguish 4 degrees of intensity, taking the national mean values as a starting point, and 20% deviations above and below this starting level. It appears from Figure 17 that the highest in-

creases in industrial employment per 1000 inhabitants occurred in all urban voivodships (except Łódź) and in the voivodships of Katowice, Opole and Wrocław, where the increase was higher than the national mean (> 55). The second group comprises, the central-southern voivodships and the Bydgoszcz and Gdańsk voivodships, where the increase in industrial

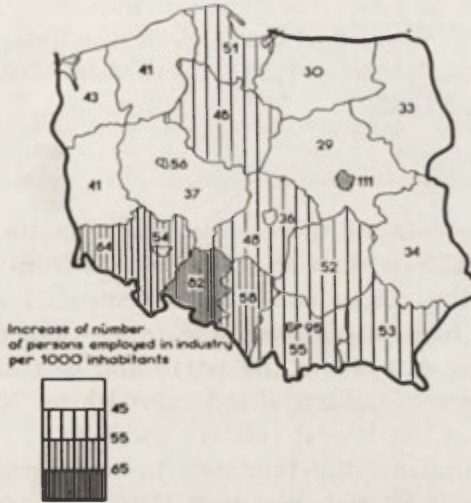


Fig. 17. Increase of industrial employment in the years 1946-1962

employment per 1000 inhabitants was close to the national mean (48-55). The third group consists of four north-western voivodships, where the increase is below the national average (37-43). The last group includes four north-eastern voivodships, where the increase is the lowest (< 35). By and large it may be asserted that the intensity of industrialization decreases from the south-western towards the north-eastern parts of Poland.

When comparing the maximum and the minimum increase in industrial employment per 1000 inhabitants, we see a considerable fall in the index of differences; this index is 4.6, and therefore lower by more than a half compared with the index mentioned above (11.6) resulting from the differences in the increase of industrial employment in the two extreme voivodships.

In spite of the fact that throughout the 1946-1962 period the further concentration of employed in industry took place in the old industrial regions, some changes in the spatial structure of industry may be observed. These changes — slow as they are — prove clearly that some reduction of the unevenness of the distribution of industry has occurred.

Among other facts, the index of differences between the maximum and the minimum number of employed in industry in the individual voivodships testifies this. This index in the period investigated, was successively: in 1946 — 56.0; in 1949 — 32.0; in 1955 — 25.0; in 1960 — 22.0; in 1962 — 20.0.

Thus the differences are definitely diminishing proving to almost a threefold decrease in areal imbalance of industrial distribution in the years 1946–1962. For purposes of comparison, the index of these differences has also been calculated for 1937; it was then 20.6, that is, similar to the index reached by 1962.

The relative increase in industrial employment in the 1946–1962 period

Figure 13 also reveals the increase in employment in relative figures (in the background). These data show deviations from the national mean and, at the same time, an increase when compared with 1946. We see in this map that the highest relative increase took place in the least industrialized voivodships situated in the north and east of the country, and that the most intensively industrialized voivodships: Katowice, Wrocław, Łódź and Poznań had the lowest relative increase.

Figure 13 also confirms the tendency towards greater uniformity in the industrialization of Poland. We may, therefore, accept as a criterion that if the successive long-term planning periods are meant to diminish the disproportions in industrialization, each plan should set aside relatively higher industrial investment outlays for the industrially retarded areas. Also the index of relative increase of employment in industry should be higher in industrially retarded voivodships, at any rate higher than the national mean.

Index of changes in the percentage share of the individual voivodships in the total of industrial employment

The tendency to reduce the disproportions in the distribution of industries is even better illustrated by Figure 18 which shows the changes in the percentage share of the individual voivodships in the total of industrial employment in Poland. Only three voivodships: Katowice (9.2%), Wrocław (1.8%) and Łódź (0.3%) and two urban voivodships: Łódź (3.5%) and Poznań (0.5%) show a decrease in their percentage share. This decrease amounts to 15.3% in total. It was caused by the more rapid increase in industrial employment in the remaining 15 voivodships. Only the voivodships of Bydgoszcz and Poznań show no changes. All the others raised their share, especially the south-eastern voivodships (Rzeszów, Kielce, Lublin) where the increase exceeded 1%. In the remaining

voivodships this increase was lower. The city of Warsaw is an exception which after reconstruction and expansion of its industries, shows an increase of 3.4% of its share. Altogether, the results pictured in Figure 18 clearly show the tendency towards a more even distribution of industry.

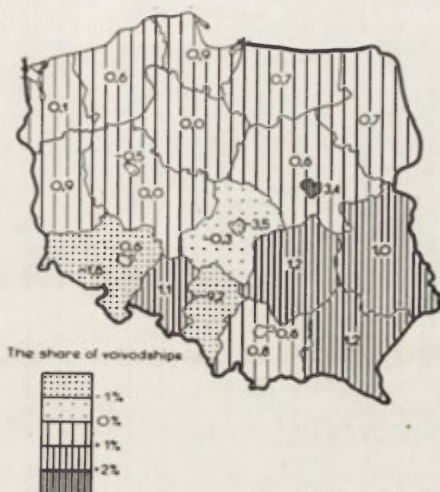


Fig. 18. The changes in the percentage share of individual voivodships in industrial employment of the country in the years 1946-1962

The same problem is dealt with in Figure 19. Here, two lines were plotted: a full line for 1962 and a broken line for 1946. On the horizontal coordinate there are marked in descending order all the voivodships according to their 1962 share in the total industrial employment in Poland. The difference between both lines indicates the changes which have taken place in the distribution and structure of Polish industry during the 1946 to 1962 period. They indicate that, up to 1962, the share of persons employed in industry has been on the increase in many voivodships, especially in those which hitherto had been retarded in industrial development. Only the voivodships at the highest level of industrialization show any decrease. This diagram also shows the reduction of differences in the spatial structure of industry in Poland.

Another test of whether the long-term economic plans tend to diminish the disproportions in the distribution of industry is given by the index of changes in the percentage share of the individual voivodships. Any plan may achieve this if it succeeds in producing an increase, even a minor one, in the percentage share of those voivodships which are most retarded in their industrialization.

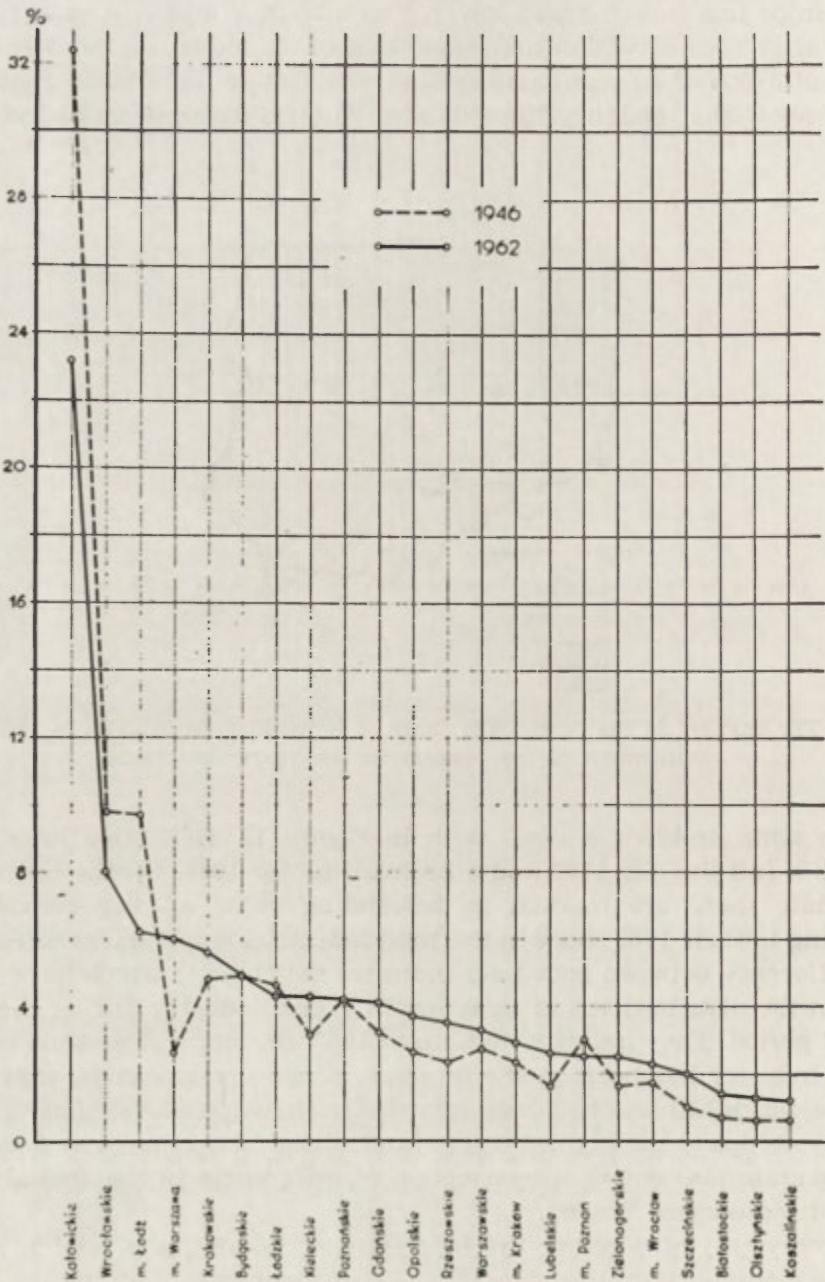


Fig. 19. The share of individual voivodships in industrial employment in the years 1946-1962

Cumulative curves as a method of synthesizing the changes in the distribution of industry in Poland

In order to produce a synthesis of the changes in the distribution of industry in Poland, a number of cumulative curves were plotted for various years according to S. Florence's concept². The more a cumulative curve deviates from the line of ideal dispersion, represented by a straight line connecting zero of the coordinate system with the end of the curve, the greater are the differences in the spatial distribution of industry.

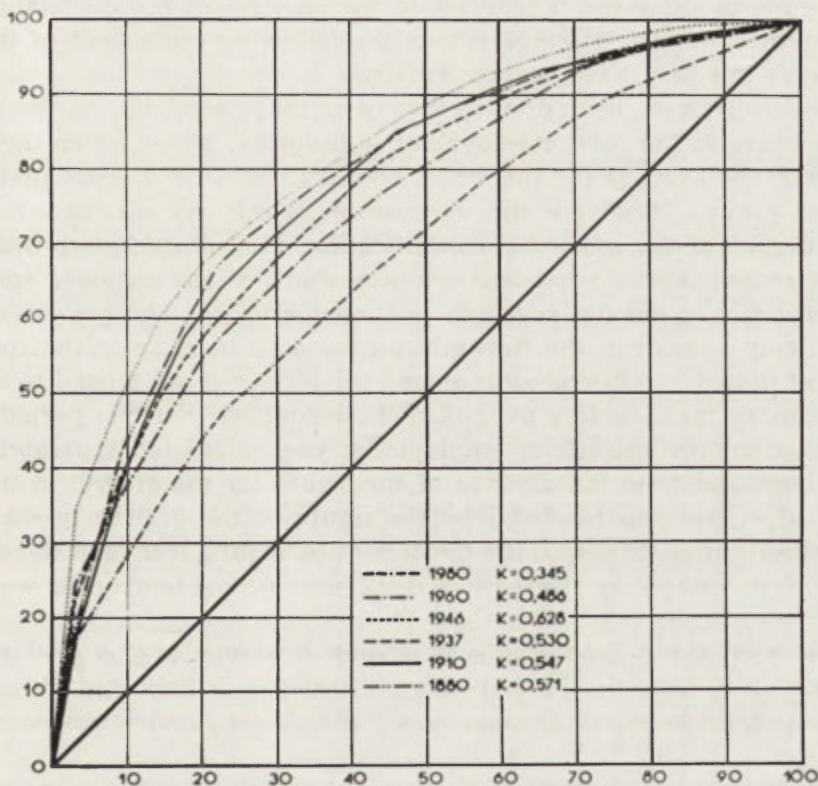


Fig. 20. Cumulative curves of spatial concentration of industry

The coefficient of industrial concentration, calculated on the basis of this cumulative curve, is a comprehensive measure of this phenomenon. When full decentralization exists, this coefficient is 0; when full concentration, it is 1. The coefficients of spatial concentration were in 1946 — 0.628; in 1960 — 0.486; in 1980 — 0.345. For the pre-war period, they were: in 1880 — 0.571; in 1910 — 0.547; in 1937 — 0.530.

² Calculations have been made by A. Kukliński and M. Najgrakowski.

The above figures indicate that the concentration of the Polish industry was the highest in 1946. From then on it shows steady decrease. In the years preceding the First World War, and in the interwar period, this index was lower than in 1946. This is clearly seen from Figure 20. If the trend towards dispersal in the distribution of industry is maintained in the future economic plans, Poland's industry may reach a fairly high degree of decentralization by 1980.

COEFFICIENT OF THE DISPERSION OF INDUSTRY

In order to show the tendencies in the changes of the distribution of the growth of industrial employment the following coefficient of the dispersion of industry have been calculated.

Voivodships have been divided into two groups according to their percentage share in the total employment in industry. Those which included more than the average for the whole country, i.e. 4.55%, were placed in the first group. These are the voivodships which are distinguished by higher degree of the industrial concentration. The second group included the less industrialized voivodships whose share of the national employment in industry did not reach the national average. The growth of industrial employment in the first group caused an increase in the concentration of industry, while growth among the second group tended to distribute industry more widely over the whole country. For the periods under discussion the growth of employment was calculated separately for both groups and from the division of the figure for the growth in the second group (less industrialized) by the figure of the growth in the first group (highly industrialized) the coefficient indicating trends in the distribution of industry, i.e. its further dispersion or concentration was obtained.

If the coefficient is 1 there is no obvious tendency to change, but if it exceeds 1 an increase in the dispersion of industry is indicated. When the coefficient falls below 1 the tendency it towards a further concentration of industry.

The coefficient calculated on the basis of statistical data for the period 1946–1949 was 0.761, thus showing that in the period of rebuilding the spatial concentration of industry occurred. For the period 1950–1955 the coefficient was 1.777, clearly indicating a tendency to dispersion, but in the following period the coefficient fell and for the years 1956–1960 it was 1.497. For the whole period 1946–1962 it was 1.287, showing that, on balance, there was a tendency for the dispersion of industry which exceeded the tendency to concentration by one fourth since in the less industrialized voivodships the number of employed rose by one third more than in the 5 most industrialized ones.

The results obtained seem to indicate that, while the highest increase in the number of industrial employment continues to occur in the old highly industrialized regions — and this corresponds to the principle of the optimum effectiveness of national economy — at the same time, there is a distinct tendency towards a slow but continuous diminution of the disproportions in the total distribution of industry in Poland. These facts must be considered as positive results of the planned economic policy.

It is a matter of comparative studies, to be carried out for other countries, whether the results achieved in our reflections are characteristic for Poland only, or whether they also apply to other countries expanding their industry or working on the basis of planned economies.

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THE INTERREGIONAL DIFFERENTIATION OF POLAND'S NATIONAL ECONOMY

ANTONI KUKLIŃSKI

In recent years we find a growing number of publications analyzing the problem of regional economic development of different countries¹.

This article presents some empirical material describing the case of Poland and trying to add a few general remarks on the methodical framework of this analysis². The article is divided into two basic parts in which the static and dynamic approaches are used respectively.

STATIC APPROACH

To create a starting point for our discussion we have chosen six indexes which represent data of gross national product, industrial employment and urban population (see Table 1). This group of indexes considers not only the per capita and structural relations but also the "areal" relations, the indexes recomputed per 1 km². We do not agree with the opinion of those economists who argue that we can limit our discussions only to the application of per capita indexes³. We can quote many examples of situations when behind an optimistic picture created by the application of per capita indexes we meet difficult problems of overconcentration in one region of the country and depopulation in the others. Presenting this point of view we are not overlooking the basic fact that migrations of popula-

¹ Compare H.S. Perloff and others, *Regions, Resources and Economic Growth*, Baltimore 1960; A. Rodgers, „Regional industrial development with reference to Southern Italy”. In: *Essays on geography and economic development*. University of Chicago, Dept. of Geography, Research Paper No. 52, Chicago 1960; M. Tachi, Regional income disparity and internal migration of population in Japan. *Economic development and cultural change*, Vol. XII, Jan. 1964.

² Compare S. Leszczycki, Problems of post-war industrial concentration and decentralization in Poland, *Geographia Polonica* 7, pp. 29—47.

³ Compare J. Pajestka, Overall economic planning and regional planning in Poland. A paper submitted to the Third Meeting of Senior Economic Advisers, Geneva Nov. 1964.

tion are a necessary element of regional economic growth in every country. But at the same time we have to recognize the arguments of many geographers and regional planners indicating different types of social costs created by overconcentration on the one extreme of the regional scale and depopulation on the other. Naturally, using the concept of overconcentration and depopulation we have to stress the economic and technological

TABLE 1. THE INDEXES OF REGIONAL DIFFERENTIATION OF POLAND'S NATIONAL ECONOMY IN 1961

Number of the index	Name of the index	Extremes in relation to the country average = 100		Relative standard deviation
		minimum	maximum	
	A. Per capita and structural indexes			
1	G.N.P.	65.5	138.0	19.1
2	The share of employment in industry and handicraft in total population	40.4	208.3	46.2
3	The share of urban population in total population	50.5	156.1	31.2
	B. Areal indexes (per 1 km ²)			
4	G.N.P.	30.2	502.9	93.3
5	Employment in industry and handicraft	18.2	727.3	136.8
6	Urban population	31.9	568.1	105.4

relativity in the application of those concepts in different historical and geographical conditions. We can add to these arguments a more general remark. The density of population and the density of economic activity are important factors in comparative evaluation of different regions. There exists a basic difference in problems that should be solved and investment solutions which could be applied between two regions having similar per capita indexes and quite different areal indexes. Therefore, in interregional comparisons we should apply two basic indices: G.N.P. per capita and G.N.P. per one km². The last index may be called the index of areal density of economic activity.

The next step of our analysis was the computation of the relative levels of those six indexes for 17 provinces taking the average for the country as 100 (see Table 2). This point is very important. We are analyzing the regional differentiation of Polish national economy divided into 17 regional units. The statistical average amounts to 1.8 millions of population and 18.5 thousand km² for each unit. Analyzing the regional differences in a given country we have to consider the size of the basic areal unit.



GNP per 1sq km



Industrial Employment per 1sq km



Urban Population per 1sq km



GNP per capita



The share of Industrial Employment in total population



The share of Urban Population in total population

The relative levels of indexes Poland = 100

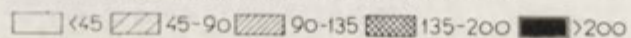


Fig. 1. The interregional differentiation of Poland's national economy, 1-17 — provinces as in table 2.

TABLE 2. THE INTERREGIONAL DIFFERENTIATION OF POLAND'S NATIONAL ECONOMY IN 1961

Province	G.N.P. per capita	The share of employment in industry and handicraft in total population	The share of urban population in total population	G.N.P. per 1 km ²	Employment in industry and handicraft per 1 km ²	Urban population per 1 km ²
1. Katowice	138.0	208.3	156.1	502.9	727.3	568.1
2. Opole	111.8	113.8	79.2	116.2	118.2	83.0
3. Łódź	111.3	136.7	108.7	156.9	181.8	153.2
4. Wrocław	108.5	133.5	127.0	135.2	154.5	157.4
5. Kraków	107.3	100.9	86.2	180.3	163.6	144.7
6. Gdańsk	102.9	96.3	137.3	122.3	109.1	163.8
7. Poznań	102.1	85.3	96.9	96.6	81.8	91.5
8. Szczecin	101.2	74.3	128.9	64.4	45.5	80.8
9. Warszawa	101.0	79.8	112.0	124.1	90.9	138.3
10. Bydgoszcz	95.0	84.4	99.4	82.9	72.7	87.2
11. Zielona Góra	94.6	91.7	101.4	53.9	45.5	59.6
12. Rzeszów	81.8	62.4	50.5	73.7	54.5	44.7
13. Olsztyn	74.7	45.0	74.6	33.1	18.2	34.0
14. Lublin	74.5	42.2	51.5	57.2	27.3	40.4
15. Koszalin	74.5	49.5	93.4	30.2	18.2	38.3
16. Kielce	74.4	69.7	56.9	73.4	63.6	55.3
17. Białystok	65.5	40.4	62.9	32.7	18.2	31.9
Average for Poland	100.0	100.0	100.0	100.0	100.0	100.0

In most cases the following regularity will be valid. The diminishing scale of areal units is associated with the growing scale of regional differences. In other words, the regional contrasts in the Polish national economy would be much bigger if we could consider the division of the country not into 17 provinces but into 400 counties. Indicating the statistical relativity of the concept of regional contrasts we are not denying the objective existence of this phenomenon. We only stress that the objective relativity of a given country can be analysed and computed in various ways, among others using the different sets of areal units.

We have to consider these general remarks in the interpretation of the materials presented in Fig. 1 and 2. The following conclusions can be drawn:

1. the per capita and structural indexes produce a less differentiated pattern than the areal indexes;
2. the regression and correlation analyses present a quantitative evidence that in Poland, as in many other countries, the interregional differentiation of G.N.P. is closely associated with the level of industrial and urban development.

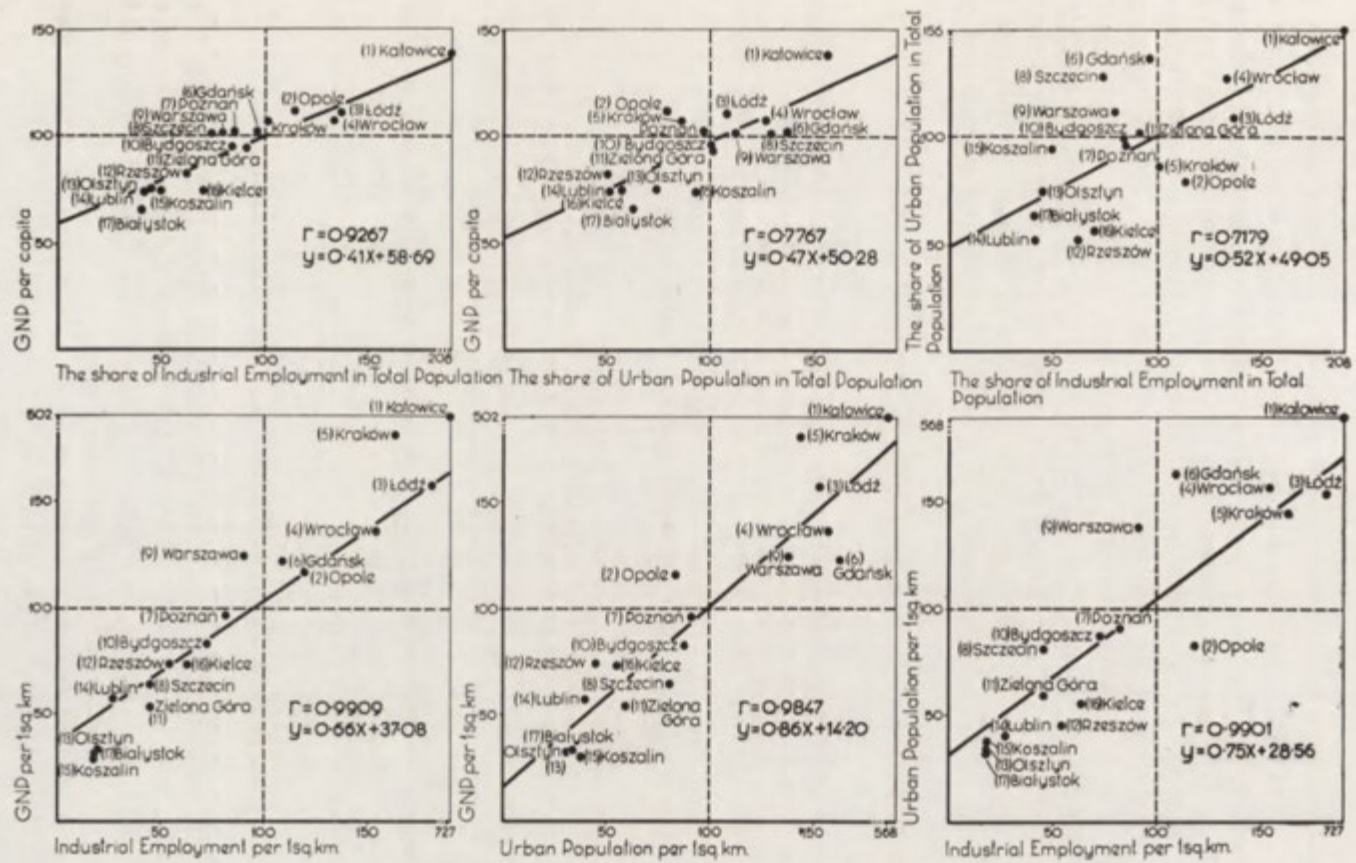


Fig. 2. The regression analysis of the indexes presented in Fig. 1

DYNAMIC APPROACH

There exists a basic difficulty in crossing the boundary between the static and dynamic analysis in this case. The computation of regional cross-sections of G.N.P. and national income were started in Poland in 1958. Therefore it is impossible to use these indexes in historical comparisons. In order to overcome this difficulty we will use the well known regularity stressing the association between the general level of economic development of a given country or region and the level of its industrial and urban development. The regularity as applied to the case of Poland is demonstrated in Fig. 2. So we will analyse the changes in the distribution of urban and industrial population assuming that they represent the basic factor in the interregional differentiation of the Polish national eco-

TABLE 3. THE INTERREGIONAL EQUALIZATION PROCESSES
IN POLAND 1946-1980

	Population	Urban population	Employment in industry and handicraft
	1. Absolute figures in millions of persons		
1946	23-930	8-185	1 444
1960	29-731	14-112	3-182
1980	37-363	22-172	5-650
	2. Coefficient of areal concentration		
1946	0-282	0-432	0-580
1960	0-266	0-392	0-481
1980	0-259	0-340	0-343
	3. Coefficient of per capita concentration		
1946	X	0-207	0-383
1960	X	0-180	0-258
1980	X	0-122	0-131
	4. Coefficient of areal equalization		
1946-1960	1-337	860	461
1960-1980	4-161	819	345
	5. Coefficient of per capita equalization		
1946-1960	X	520	197
1960-1980	X	247	144
	6. Absolute growth in millions of persons		
1946-1960	5-801	5-927	1-738
1960-1980	7-632	8-060	2-468

nomy. The empirical materials are presented in Table 3 and in Fig. 3. and 4. Data for the years 1946-1960 were taken from the publications of our Central Statistical Office, and data for 1980 — from the last version of the regional cross section of our perspective plan.

Two coefficients were computed in order to determine the basic trends of interregional equalization processes in Poland.

1. The coefficient of concentration limited to values from 0 to 1. The value of the coefficient is equal to 0 in case when the analysed phenome-

non is equally distributed among regions — equally in relation to the area (coefficient of areal concentration) or equally in relation to the population (coefficient of per capita concentration). The value of this coefficient is equal to 1 in case when the given phenomenon is concentrated in one

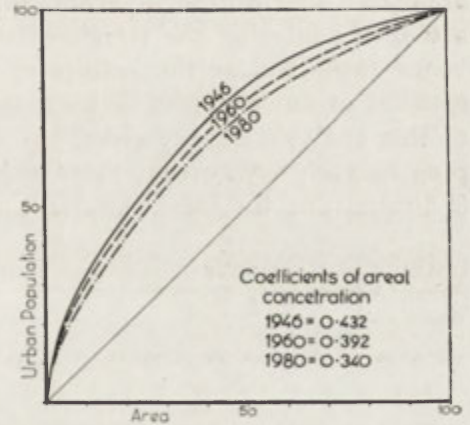
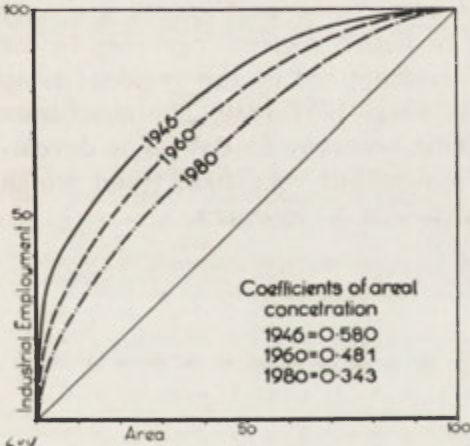
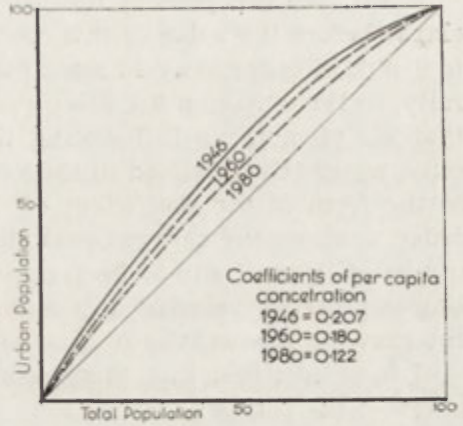
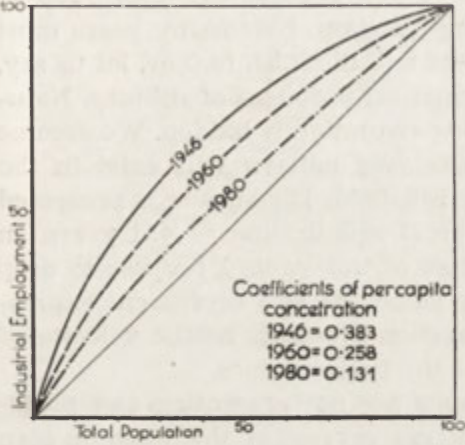


Fig. 3. The concentration of industrial employment

Fig. 4. The concentration of urban population

point. Therefore the diminishing value of both the areal and per capita coefficients of concentration are reflecting the trends of diminishing interregional differences between the levels of industrial and urban development in Poland in the years 1946–1980⁴. The same analysis is presented graphically in the form of cumulative Lorenz curves (Figs. 3. and 4).

⁴ Comparing the coefficients of concentration presented in Table 3 and the coefficients presented by S. Leszczycki. The reader should bear in mind the fact that this article takes into account the employment in industry and handicraft while the article of S. Leszczycki only takes account of the employment in industry.

2. The second coefficient — the coefficient of equalization⁵ — is an attempt to introduce the dynamic measure of change. Let us use the following example to explain the methods of the computation of this coefficient. The value of the coefficient of areal concentration of industrial employment for the year 1946 was = 0.580 and for the year 1960 = = 0.481. We can present the following question: how many years must elapse before the value of this coefficient will diminish to 0 or, let us say, to 0.001, in order to avoid some mathematical problems of infinity. Naturally, in this question the *ceteris paribus* assumption is hidden. We assume that all phenomena influencing the analysed pattern will exist in the same way as they existed in the years 1946–1960. The answer is presented in the form of the coefficient of the areal equalization = 461 years. In order to stress the conventional character of this value I propose to drop the word “years” and to keep only the value 461 as a coefficient expressing the relative velocity in the equalization processes or the velocity of the growing inequalities in case we get the minus values.

I have to stress that these coefficients are not presenting any projections of the future of 500 or 1000 years, nor expressing the desire to plan an equal distribution of economic activity. These coefficients are only a tool in analysing the trends existing in Polish regional economy in the years 1946–1960 or the results of the assumptions of the regional cross sections of our perspective plan for the years 1961–1980. The conclusion of this analysis is very clear: the socialist economy in Poland is developing in such a way that there exists a slow but very firm trend which is diminishing the interregional inequalities in our country.

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⁵ The coefficient of equalization was designed by J. Żurkowski in the framework of the activity of the Department of Space Economy and Regional Planning of the Institute of Geography of the Polish Academy of Sciences.

SOME PROBLEMS OF FORMATION AND DEVELOPMENT OF THE WARSAW INDUSTRIAL DISTRICT

STANISŁAW MISZTAŁ

Polish geographers have been dealing with problems of industrial districts since the last ten years nearly. The methodological conference of Polish geographers, held at Osieczna near Leszno in November 1955, which — among others — established research directions in the field of geography of industry, was an important stimulus towards undertaking geographical research on industrial districts. The problem of primary interest for the geographers have so far been Poland's three largest industrial districts: 1. the Upper Silesian Industrial District, 2. the Łódź Industrial District and, 3. the Warsaw Industrial District.

This article is based on results of several years of studies on problems pertaining to development of the Warsaw Industrial District. The objects of those studies were: 1. to clarify the causes which led to development of this large industrial agglomeration on the middle Vistula, 2. to examine the trends in its present development, 3. to analyse the outstanding, current spatial problems and, 4. to draw appropriate conclusions for the planning of the future industrial development in this area.

The Warsaw Industrial District's boundaries are outlined fairly distinctly on the industrial map of Poland as it is encircled from all sides by agricultural areas which so far have been poorly industrialised. In the process of the Warsaw Industrial District's boundary delimitation, made for the sake of research, P.S. Florence's¹ localization quotient was employed with reference to *poviats* (the administrative units for which statistical data are compiled) while taking into account — at the same time — the productive and electric power connections existing between particular industrial establishments as well as commuting in industry.

Thus determined boundaries of the Warsaw Industrial District embrace an area of 6918 km², that is 2.2% of the country's total area. In 1960 this

¹ P.S. Florence, *The Logic of British and American industry*, London 1957.

area was inhabited by about 2 million people, i.e. 6.6% of Poland's total population. To the significance of the Warsaw Industrial District points the fact that in 1960 its industry and industrial trade employed 265 thousand people, a figure amounting to about 8% of the country's total employment in this branch of economy. The share of the Warsaw Industrial District in the country's total industrial production amounts to the same percentage. The Warsaw Industrial District ranks third, after the Upper Silesian and Łódź Industrial Districts, as regards employment figure and the worth of its total industrial production.

The studies undertaken in order to clarify causes of emergence of the Warsaw Industrial District started with an analysis of the conditions of geographical environment. The analysis has revealed, however, that development of the Warsaw Industrial District cannot be possibly explained only with geographical factors. The area in question is outstanding for its exceptional destitution of natural resources of which only some raw materials for the ceramic industry are represented (clays and ceramic loams, sands, base sands and gravels suitable for production of building materials, and glasswork sands). On the other hand, the fairly favourable river network played some role in the early stage of industrial production in the region (mostly as a source of mechanical power and as waterways). The significance of rivers considerably declined around 1870 as steam engine was becoming a more common feature along with expansion of the railway network. Because there were not sufficient grounds to explain the causes of emergence of the Warsaw Industrial District with geographical factors it became expedient to examine and see how other factors affected the process of formation of the industrial agglomeration over the years. This, in turn, called for the use of a historical method in the studies.

In an effort to secure a more clear historical analysis the whole period of development of industry in the area in question was divided into 5 periods, according to the periodisation of Poland's economic development as accepted by Polish historians: (1) until 1815, (2) 1815–1870, (3) 1870–1918, (4) 1918–1945, (5) since 1945.

The historical analysis has shown that the Warsaw Industrial District had been formed under the influence of various political, economic, geographical, technological and other factors that played considerable role during historical development of this part of Poland. However, the most immediate cause to which the development of the Warsaw Industrial District may be ascribed is the fact of existence here, long before the advent of factory type industrialisation, of a major urban centre, Warsaw, which being the country's capital city displayed the most dynamic rate of growth of all Polish towns. At a time when the appearance of the first

steam engine is reported to have taken place in this area back in 1818. Warsaw was a large city with a population of about 100,000. The local Warsaw market which was continuously growing along with the city's expansion was, therefore, one of the most important — if not actually the most important — factors at first contributing towards development of industry in this region. Since the sixties of the last century, in a period of a more rapid development of industry of the Polish Kingdom, other factors began to exert the decisive influence upon industrial agglomeration, both, in Warsaw and throughout its environs. Those factors were, first of all: 1. development of the Warsaw railway junction which until the First World War was the largest re-loading station in railway-handled goods exchange between West European countries and Russia² and which was providing a convenient transport connection to the raw material and fuels resources of the Upper Silesian Basin as well as to markets inside Russia. 2. existence in Warsaw of a major concentration of cheap manpower which, following the abolition of peasants' serfdom in 1864, kept immigrating in large numbers from the countryside. 3. concentration in Warsaw of numerous enterprises and commercial organizations which facilitated both, purchase of raw materials and sale of industrial products, and then Poland's largest grouping of banking organisations which made credits easily available. 4. benefits resulting from agglomeration of industry.

The Warsaw sub-urban industry grew owing to Warsaw serving as its primary sale market. It also benefited from the concentration of skilled manpower, concentration of the above mentioned banking and commercial institutions and expanded in a close productive relationship with the industrial potential of Warsaw, still concentrating 50—70% of the total number of industrial workers of the investigated area. According to J. Chardonnet's³ classification system, those facts fully corroborate classification of the Warsaw Industrial District as an industrial complex of urban type.

In the course of analysis of spatial development of the Warsaw Industrial District the cartographic method was extensively used. There were two series of maps specially prepared for this purpose, one presenting location of industrial establishments employing over 100 workers at 11 various cross-sections, namely: 1827, 1847, 1863, 1879, 1893, 1903, 1913, 1921, 1938, 1946 and 1960, and the other presenting — at identical cross-sections — the industrial establishments which employed over 20 wor-

² Goods transported in freighter waggons of the normal-gauged West European railways had to be re-loaded in Warsaw into waggons of the wide-gauged Russian railways.

³ J. Chardonnet, *Les grandes types des complexes industriels*, Paris 1953.

kers. Two maps of the former series are enclosed herewith, as an example (Figs. 1, 2).

The two series of maps indicate that spatial development of the Warsaw Industrial District was taking place through a peculiar "gemination" of Warsaw industry. High wages of the workers and shrinking area of sites available for building, were followed by soaring prices for land within the limits of the city, account for the fact that larger industrial establishments manufacturing for the local Warsaw market, or linked with the Warsaw industry by ties of cooperation, were willingly moving to erect their branch factories at Warsaw suburbs, mainly along-side railway lines which outlined directions of that "gemination". New plants were springing up particularly at localities situated on what was then known as Warsaw-Viennese railway line which was the supply route for raw materials and fuels transported from the Upper Silesian Basin. It was along this railway line that the largest number of industrial centres emerged in the region under examination. Żyrardów became the largest of them and although its emergence is closely linked with Warsaw market, in the years 1870–1913, it kept developing almost independently of Warsaw, manufacturing mostly for the Russian market and working chiefly on Russian imported raw materials.

Some bearing upon the formation of the present day picture of the spatial structure of the Warsaw Industrial District had the difference between railway gauges on either side of the Vistula which was in existence until the First World War. Since fuels and raw materials transported by train mostly from Upper Silesian Basin to localities on the right bank of the Vistula required re-loading in Warsaw from the normal to the Russian, wide gauge freight waggons, industrial establishments seeking to avoid incurring the extra cost usually chose locations on the left bank of the river. This is what accounts for the major disproportions in industrialization of Warsaw suburban areas on both banks of the Vistula. The disproportions have survived until now, although after the First World War railway gauge was standardised on both banks of the Vistula. The general spatial outlines of the Warsaw Industrial District became distinct as early as at the turn of the century. As of that date relatively small changes only have taken place in the network of industrial centres.

Foremost among factors which had an adverse, restraining influence upon development of industry of the Warsaw Industrial District are some of political nature. The fact that Warsaw was the country's capital and that it was located on the main roads linking countries of Eastern and Western Europe greatly contributed to the fact that in the constantly changing political scene in this part of the world Warsaw became strate-

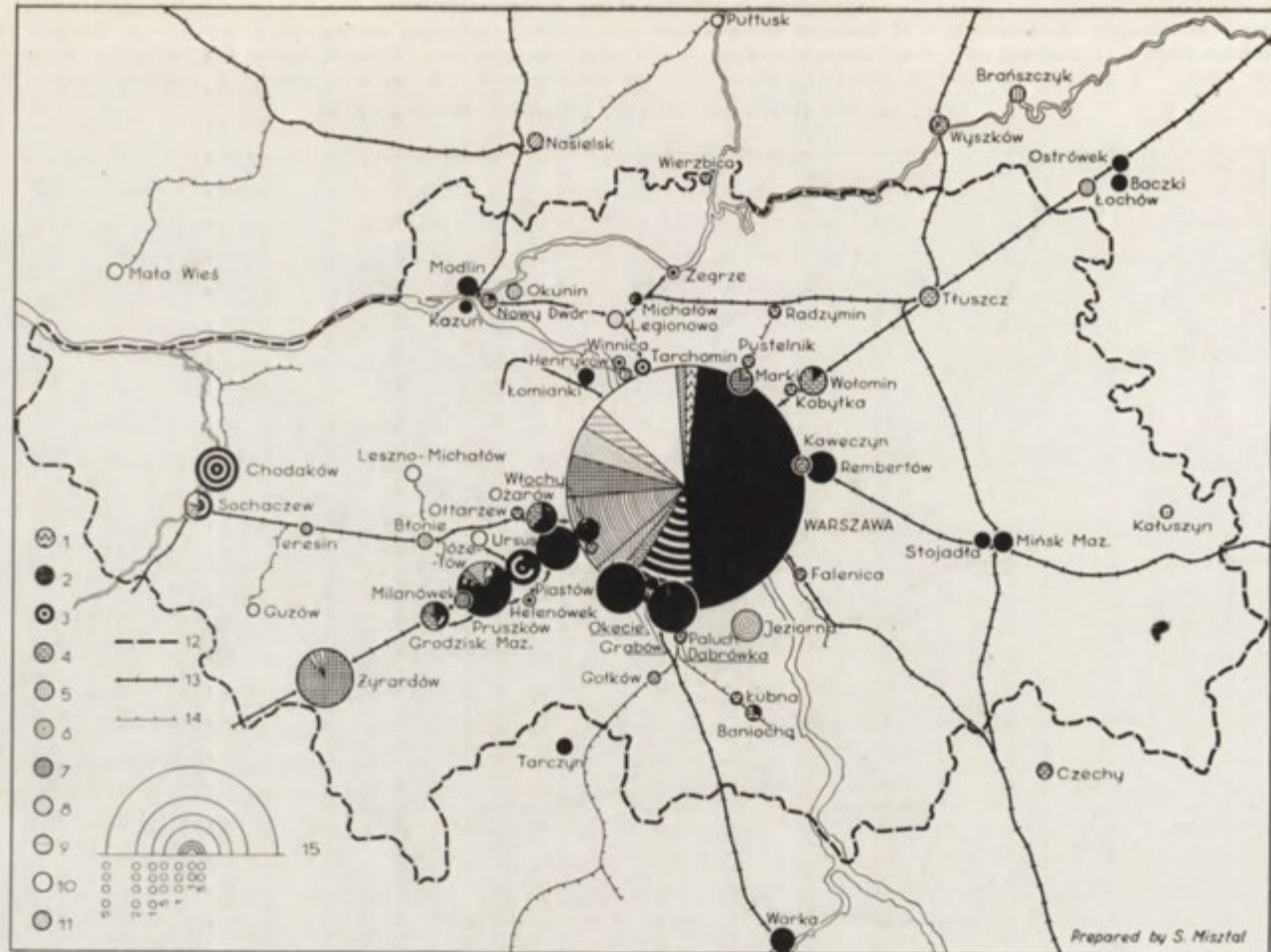


Fig. 1. Warsaw Industrial District. Industrial centres 1938

1 — power industry, 2 — metal industry, 3 — chemical industry, 4 — mineral industry, 5 — timber industry, 6 — paper and printing industries, 7 — textile industry, 8 — clothing industry, 9 — food industry, 10 — food industry, 11 — other branches of industry, 12 — limits of the Warsaw Industrial District, 13 — normal-gauge railways, 14 — narrow-gauge railways, 15 — scale of industrial centres in number of employees

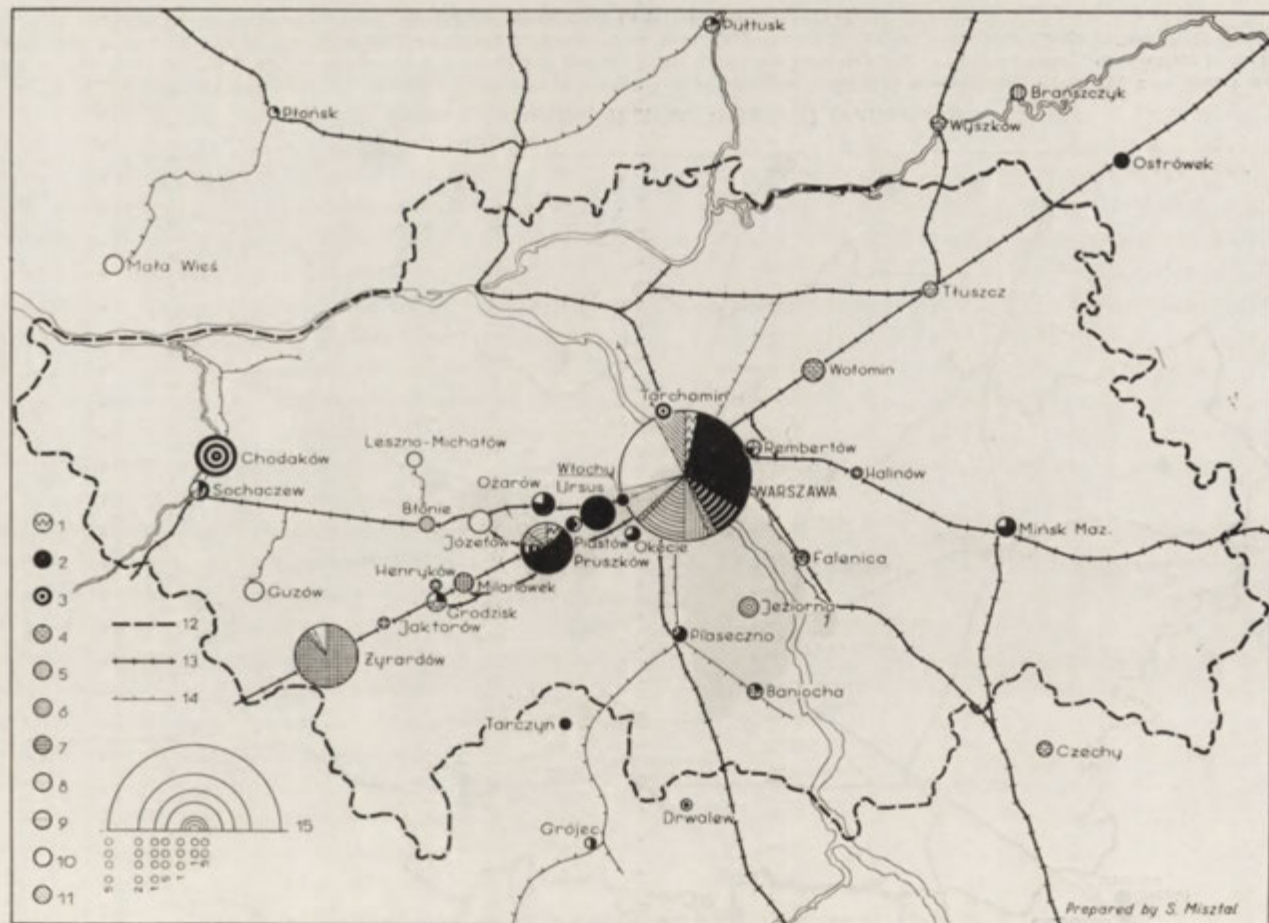


Fig. 2. Warsaw Industrial District. Industrial centres 1946

1 — power industry, 2 — metal industry, 3 — chemical industry, 4 — mineral industry, 5 — timber industry, 6 — paper and printing industries, 7 — textile industry, 8 — clothing industry, 9 — leather industry, 10 — food industry, 11 — other branches of industry, 12 — limits of the Warsaw Industrial District, 13 — normal-gauge railways, 14 — narrow-gauge railways, 15 — scale of industrial centres in number of employees

gically important. This, too, explains why — in wartime — the city was one of the top attack targets of belligerents. Apart from this Warsaw was the centre of several armed national risings against the occupant forces.* In the course of fighting and hostilities the area's industry was usually destroyed to a larger or smaller extent. It was during the Second World War that it sustained the most extensive and devastating destruction and after the war it was necessary to build it in fact from the scratch. Economic effects of war and national risings, which manifested themselves in loss of markets necessitating substantial alterations of the productive profile, also had an adverse bearing on development of industry in the Warsaw Industrial District. One can hardly think of another major industrial region in the world in whose development such political factors as wars and national rising should have played a greater role than they have in Warsaw.

Ever since the very beginnings, branch structure of industry was extremely varied in the area examined and this is a clear reflection — to a considerable measure — of the manifold requirements of the Warsaw market. The fact that sources of raw materials were to be found quite far away made that there had developed first of all such industries which did not require much raw materials but a lot of labour.

The way the branch structure of industry was shaped in the Warsaw Industrial District is shown on the table enclosed to this paper, giving the number of employees in particular branches of industry in the area covered by this study at 10 various cross sections, namely: 1862, 1879, 1893, 1903, 1913, 1921, 1938, 1946, 1956 and 1960 (Table 1). The choice of appropriate time sections depended almost entirely on availability of the relevant statistical data. The table illustrates also to some extent the dynamics of almost a century of Warsaw Industrial District's industrial expansion expressed by the number of workers employed.

In the process of industrial development over the investigated area the most decisive role, as far as the branch structure is concerned, was played by textile, foodstuffs and metallurgical industries. From 1815 to 1831 the textile industry was relatively prevalent over other industries, its output being largely oriented for export to Russia. Following the introduction in 1831 of customs barriers on the Polish Kingdom-Russian frontier as a reprisal for the rising against the Russian rule, the textile industry declined almost completely, particularly the woolen industry. It was not until after abrogation of the customs barriers in 1850 that the textile industry regained better possibilities of expansion and in the years 1884 to 1896 this industry became again the dominating feature of the area in question. From 1831 to 1884 the position of the relatively dominant industry went to foodstuffs processing which worked mostly for the local

TABLE 1 CHANGES IN THE INDUSTRIAL STRUCTURE OF THE WARSAW INDUSTRIAL DISTRICT 1862/63-1960

Industrial branches	1862/63		1879		1893		1903		1913		1921		1938		1946		1956		1960	
	E	%	E	%	E	%	E	%	E	%	E	%	E	%	E	%	E	%	E	%
Power industry	60	0.6	255	0.9	921	2.6	710	1.0	1755	1.7	1578	2.6	2199	1.6	1498	3.0	3700	2.0	5986	2.5
Metal industry	2193	20.7	7291	26.8	8890	24.7	22,769	34.4	32,750	32.4	19,724	32.2	63,346	46.0	14,684	29.3	86,028	47.0	115,680	47.8
Chemical industry	257	2.4	565	2.1	858	2.4	1764	2.6	3735	3.7	3249	5.3	14,122	10.3	5760	11.5	16,788	9.2	23,202	9.6
Mineral industry	438	4.1	2940	10.8	2100	5.8	4739	6.9	8479	8.4	4252	6.9	7441	5.4	2698	5.4	11,673	6.4	15,405	6.4
Timber industry	114	1.1	781	2.9	1609	4.5	3620	5.2	5146	5.1	3110	5.1	3802	2.8	2447	4.9	6249	3.4	7252	3.0
Paper industry	321	3.0	354	1.3	1056	2.9	2144	3.1	3298	3.3	1817	3.0	4388	3.2	1167	2.3	2501	1.4	4026	1.7
Printing industry	59	0.6	156	0.6	184	0.5	2527	3.7	4929	4.9	3210	5.2	7611	5.5	2869	5.7	12,982	7.1	11,250	4.6
Textile industry	1047	9.9	5193	19.1	12,181	33.8	16,634	25.1	17,521	17.4	8032	13.1	11,048	8.0	6047	12.1	9763	5.3	12,087	5.0
Clothing industry							2907	4.2	6989	6.9	3357	5.5	4403	3.2	1740	3.5	8010	4.4	11,599	4.8
Leather industry	605	5.7	1290	4.7	1716	4.8	3030	4.4	5963	5.9	4015	6.6	3758	2.7	1148	2.3	3932	2.1	5942	2.4
Food industry	5323	50.3	8223	30.2	5998	16.6	7345	10.6	9607	9.5	7820	12.8	13,678	10.0	8684	17.3	19,355	10.6	22,693	9.4
Other branches	175	1.6	177	0.6	515	1.4	795	1.2	801	0.8	1051	1.7	1834	1.3	1332	2.7	2016	1.1	6701	2.8
Total	10592	100.0	27,225	100.0	36,028	100.0	68,984	100.0	100,973	100.0	61,224	100.0	137,630	100.0	50,074	100.0	182,997	100.0	241,823	100.0

E— number of people employed, % — percentage of the total industrial employment

market. In 1887 the leading position in the branch structure of the Warsaw Industrial District was taken over by metal processing industry which has retained its leading position until present while ever increasing its prevalence over all other industries.

The remaining industries played far more modest rôle in the region's industrial structure and their aggregate employment figures practically never exceeded 10% of the total.

Until the outbreak of the Second World War a relatively low level of production concentration had been characteristic for the Warsaw Industrial District's industry (Fig. 1).

As regards the number of employees, the dominating role in industry *sensu largo* was played by the small-scale industry (factories employing up to 100 workers and trade workshops) whose development was enhanced by the extensive and complex Warsaw's market. A substantial change in this respect took place only in the course of reconstruction of the industry from the ravages of the Second World War, at a time when the bulk of investment outlays — to the detriment of the local market — was oriented for the rebuilding and expansion of the large-scale industry of nationwide significance. As a result large industrial establishments employing over 500 workers became the dominant factor in the industrial picture of the Warsaw Industrial District, while, at the same time, the local demand for a number of small sundry manufactured articles is not fully met. The situation is singularly bad in the field of services of industrial character. It should be stressed, too, that the limitations imposed upon development of the small-scale industry, which constituted a basis of existence of a score of small towns and localities all over the examined area, were among the major factors which led to slowing down their growth and, often, their decline as well.

The present day industrial branch structure in the Warsaw Industrial District, which has been shaping up over the past 20 years of post-war reconstruction, reveals a good many disproportions which give rise to many problems that call for an immediate attendance and solution. The disproportions are firstly reflected in an inadequate development of productive capabilities of the industries working for the local market and producing from the locally available raw materials. This, first of all, goes for the mineral (building materials) and foodstuffs industries. In consequence it is now necessary to bring to Warsaw at a considerable cost large quantities of building materials from distant areas of the country while they could have well been manufactured from the locally available loam, ceramic clay and sand deposits which abound within the limits of the Warsaw Industrial District. Similarly, a good many farm products (vegetables, fruits, livestock and so on) are dispatched from the Warsaw Indu-

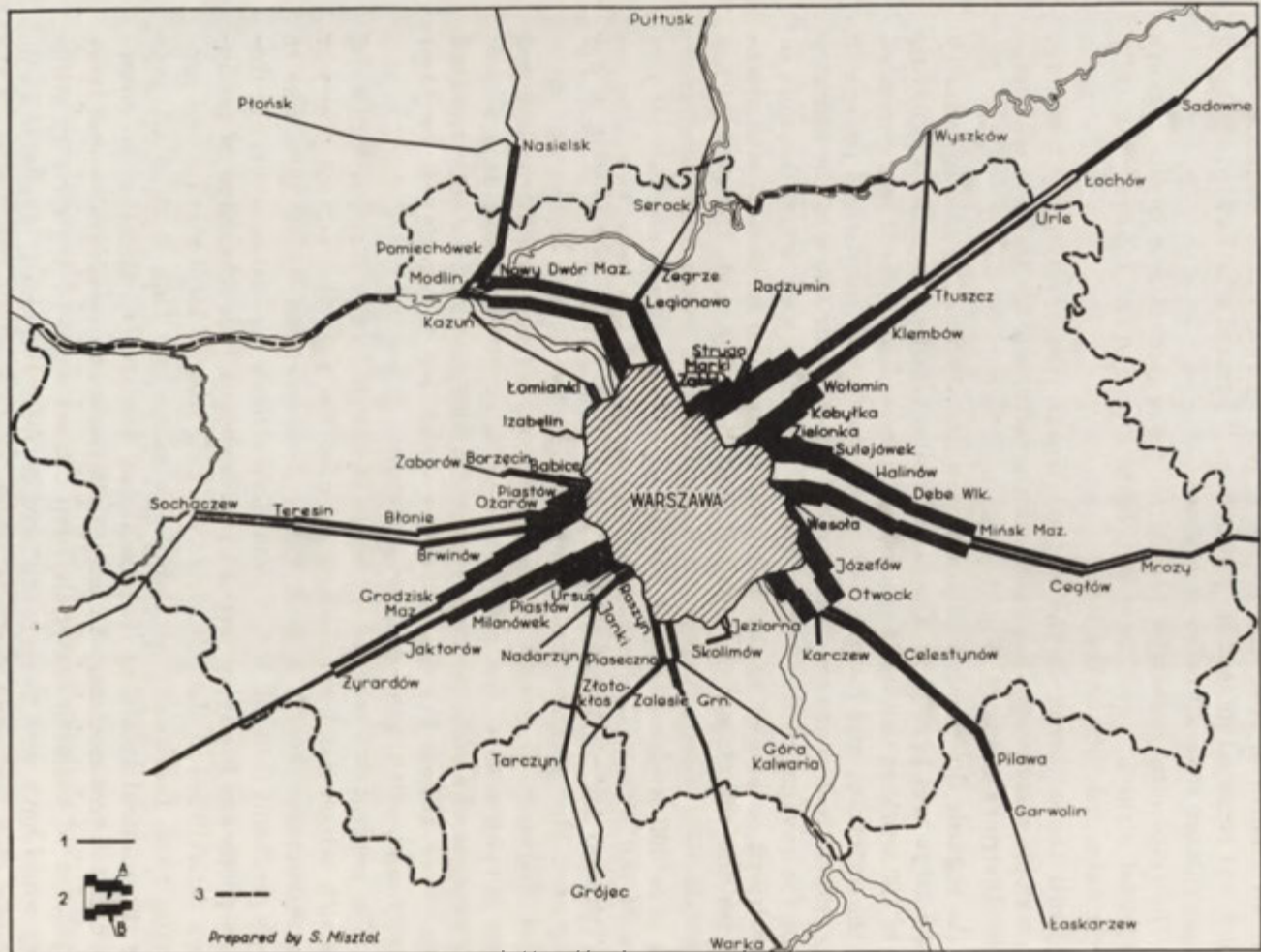


Fig. 3. Daily commuting to work in industry and other branches of capital's economy as recorded on 1. January 1959
 1 — 300 commuters, 2A — daily commuting to work in industry, 2B — daily commuting to work in other branches of, the eco-

strial District's area and the adjoining regions of Warsaw voivodship to processing plants in other voivodships and then are brought back again as ready products for marketing at Warsaw Industrial District's foodstuff shops.

Another important disproportion in branch structure of industry in the Warsaw Industrial District has been underdevelopment of the light industry, particularly the clothing industry, which accounts for the fact that there are difficulties in providing employment for women.

There are also major disproportions in as far as the present spatial structure of industry in the Warsaw Industrial District is concerned. The disproportions manifest themselves mostly in spatial over-concentration of industry within the boundaries of Warsaw and in the traditional industrial centres on the left bank of the Vistula as compared with the poorly industrialised areas of the Warsaw Industrial District on the right bank of the Vistula and the extremely poorly industrialised parts of Warsaw voivodship adjacent to the Warsaw Industrial District. Since the rapid rate of reconstruction and development of both, industry and service facilities in Warsaw after 1945 failed to be followed by a corresponding rate of housing construction, the city housing conditions ranking, anyway, among Poland's worst on account of the atrocious devastation sustained during the Second World War, kept on deteriorating until 1954. In that year, seeking to remedy this deteriorating tendency, the Warsaw municipal authorities introduced regulations to control the influx to Warsaw of new residents from the outside. Among the consequences of those measures was stepping up the mass-scale commuting to Warsaw, which greatly exceeded any rational isochrone and also over-straining Warsaw suburban transport system. Most of the people commuting to Warsaw reside at the poorly industrialised areas of the Warsaw Industrial District located on the right bank of the Vistula and in the neighbouring agricultural areas of Warsaw voivodship. An illustration of this situation will be found on map 3 enclosed to this paper.

Any attempt at solution of this involved problem of irrational and onerous commuting calls for a far-going reduction and checking of the rate of development of industry in Warsaw. This should be simultaneously followed by a further expansion of industry in the areas of the Warsaw Industrial District located on the right bank of the Vistula and in Warsaw voivodship outside the confines of the Warsaw Industrial District, in centres which abound in potentially favourable conditions for industrial development.

The first of these is the fact that the Wisconsin Geographical Society has been organized for the purpose of promoting the study of the geography of Wisconsin and the adjacent states and territories. It is a society of men and women who are interested in the physical and human geography of the region, and who are desirous of exchanging views and information with one another. The society is organized on a non-profit basis, and its funds are derived from the contributions of its members. It is a society of men and women who are interested in the physical and human geography of the region, and who are desirous of exchanging views and information with one another. The society is organized on a non-profit basis, and its funds are derived from the contributions of its members.

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CHANGES IN THE DISTRIBUTION OF POPULATION IN POLAND IN 1950-1960*

KAZIMIERZ DZIEWOŃSKI, LESZEK KOSIŃSKI

I. METHOD APPLIED

In order to analyse the distribution of population in a given area it is necessary to locate numerical data pertaining to the population. The simplest cartographic representation is a dot map which depicts the distribution of population by dots representing a given number of people. Decision as to how many people a dot should represent depends on the scale of a map, on the exactness of the data but also on the distribution of population and in particular on the degree of its concentration. Great variety in the degree of the concentration, characteristic for a modern society requires the utilization on the map of a diversified scale of dots or rather circles, spheres and other signs — otherwise a map would be illegible in the most densely populated areas or else in the areas scarcely populated it would not be accurate.

All the dot maps can give a picture of a real distribution of population which is most accurate, extremely clear and easy to grasp. However, they cannot be applied to any comparisons of the degree of concentration and they give no quantitative approach. For this reason it is necessary to introduce the relation of the number of population to the occupied area, e.g. the notion of population density. All the population data is collected according to the administrative units, whose area is as a rule well known. Hence computation of localized densities is quite easy. However those are average densities for given areas. If the area has a great variety of concentration of population then they are eliminated by the averages. In each administrative division there occurs great variety of size of units both as

* In this study prepared for the Committee for the Space Economy and Regional Planning of the Polish Academy of Sciences and for the IGU Commission on World Population Map also participated Elżbieta Iwanicka-Lyra, Krystyna Pudło-Palotka and Genowefa Ozga.

far as their area and population number is concerned — as a result maps of population density are very often deformed and are lacking uniformity. It is obvious that the defects are reduced once the smaller administrative units are taken into account — *poviats* or *gromadas* but the deformations caused by inconsistency of administrative division and using the average values cannot be avoided.

Further difficulty in the analysis of the distribution of population is caused by the changes of political and administrative divisions. Population data and densities computed for a given division cannot be compared with another division and adjusting them to the same comparable pattern requires very laborious estimates and very often yields doubtful results.

All the mentioned difficulties were discussed on the international *forum* and in particular by the IGU Commission on World Population Map. The former chairman of the Commission, a well known Swedish geographer, Professor W. William-Olsson, during the meeting of the Commission in Zürich, June 1958 suggested that a density map be based on a dot map of population and a uniform, equiareal division of the space. Owing to the fact that the Earth is a sphere, such a division should be associated with the network of regular hexagons. The size of units 1, 10, 100 or 1000 km² would depend on the scale and accuracy of a map. On such a map it would be possible to compare densities and read the numbers of population within given units. Consequently it would combine the advantages of a density map and a dot map.

The method suggested by William-Olsson was used to compare the densities of population in the present territory of Poland during 20th century. This paper is limited to the discussion of changes in the distribution of population during the decade 1950–1960. A full analysis of changes during 1900–1960 was also completed and published in Polish [1].

This study is based on the results of two population censuses of 3rd December, 1950 and 6th December 1960. During both censuses part of population was not divided according to administrative units¹. In this analysis that part of population was ignored. Detailed dot maps of population for 1950 and 1960 were prepared according to the recommendation of the IGU Commission on World Population Map which were made available in 1961 [2]. The map was drafted on the scale 1 : 500,000 and then photographically reduced to 1 : 1,000,000. The examples of both maps are shown (Fig. 1). One dot represented 200 rural inhabitants and each town was represented by circles — projections of the spheres whose volume was proportional to the number of inhabitants according to the formula

¹ In 1950 Census this part of population amounted to 394,000 (1.6% of total population) and in 1960 — 370,000 (1.2%).

$r = 0.5 \sqrt[3]{10 \text{ population}}$. Distribution of dots and circles was based on the map of built-up areas which belongs to the series of General Land Use maps compiled in 1947–1955 under F. Uhorczak and was based on the topographic sheets of 1930. The population data was available for 1950 for *gminas* (administrative division of 31.XII.1950) and for 1960 for *gromadas* (administrative division of 31.XII.1960). The hexagonal networks with cells equal to 100 km² each were superimposed on the dot maps and population density for each hexagon was computed. Density maps were finally prepared on the scale 1 : 2,000,000 and the method applied makes possible a further great reduction of maps.

Finally, by comparing density maps of 1950 and 1960, a map of changes has been compiled. Since the surface of each hexagon is equal to 100 km², density per 100 km² indicates the number of population in each hexagon. Difference in density is then also a difference in absolute figure of population.

The compilation of the map of changes in population density created certain technical difficulties. Even a small displacement of dots could cause and indeed caused changes in number of population in a given hexagon. Analysis of the results and appropriate corrections made it possible to eliminate more serious deformations. Generally speaking, the method of William–Olsson proved to be very well suited to the analysis of data pertaining to different periods when the changes of basic units were frequent. The results achieved are certainly clearer and more accurate than those of previous studies.

2. DISTRIBUTION OF POPULATION IN 1960 AND ITS CHANGES FROM 1950 TO 1960

In 1960, an average density of population in Poland amounted to 95 persons/km² (in 1962–98). However average densities vary from 38 to 156 among voivodships and from 12 to 326 among *poviats*. In this comparison the densities of the 5 largest city–voivodships and 74 city–*poviats* were excluded, since they pertain to smaller areas but relatively uniform. Consequently they tend to characterize differences in density of buildings in towns whereas the averages for voivodships or *poviats* reflect variations in the distribution of population (Table 1).

In terms of the hexagonal network (each hexagon representing 100 km²) average densities vary from 0 (in some eastern parts of the Carpathians) to more than 4000 persons/km² in Warsaw and Łódź. However, regional differences in individual voivodships are very big in terms of *poviats* as well as hexagons. It indicates that one can find in Poland two quite different underlying types of differentiation of the distribution of population:

(i) national differentiation, which results directly from the intensity of economic and social life and indirectly from the different endowment as far as mineral resources are concerned as well as from different quality of soils and differences in invested capital, especially of the so-called infra-structure, of structure and growth of population and history of economic, social and political changes;

(ii) regional differentiation resulting from present and past intensity of urbanization.

TABLE 1. EXTREME VALUES OF POPULATION DENSITY IN 1960
(persons/km²)

Voivodships	Average density	<i>poviats</i> extreme values*	hexagons		
			minimum	maximum	
				rural areas	urban areas
Warsaw (including city)	117	44-215	26	300	4430
Bydgoszcz	82	38-100	8	150	1330
Poznań (incl. city)	89	38- 94	6	190	1530
Łódź (incl. city)	135	58-112	32	160	4000
Kielce	93	58-112	27	130	750
Lublin	72	30- 95	13	120	970
Białystok	47	25- 65	0	80	690
Olsztyn	42	23- 56	4	45	640
Gdańsk	111	32- 98	6	160	2100
Koszalin	38	22- 56	4	35	360
Szczecin	59	28- 57	2	40	890
Zielona Góra	53	29- 88	12	65	550
Wrocław (incl. city)	117	42-186	9	120	1800
Opole	98	51-138	21	110	630
Katowice	343	73-326	40	360	3470
Cracow (incl. city)	156	78-245	14	200	1950
Rzeszów	85	12-145	0	145	450
Poland	95	12-326	0	c. 360	4430

* Excluding cities-*poviats* and -voivodships

It should be emphasized that the pattern of the latter depends on the character of the settlement network and more specifically urban network. The patterns reflect such phenomena as the number and density of towns and differentiation in hierarchical relations of towns of a given class and size as well as the degree of concentration of urban population in one main or several practically equal centers.

All the data in the present study were assembled as average densities within the hexagonal network (Table 2). Class intervals were selected after a detailed analysis of data. Areas with densities below 150 persons/km² are those inhabited by rural population, predominantly agricultural, as well as by population of small towns with less than a half dozen thousands of inhabitants or so. Within the applied hexagonal network the small town does not influence the average density of population of

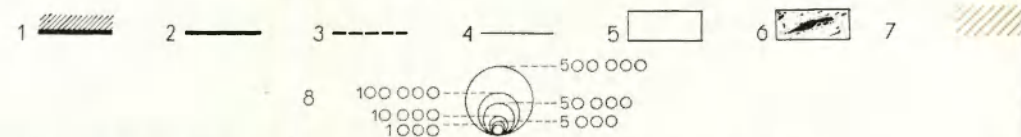
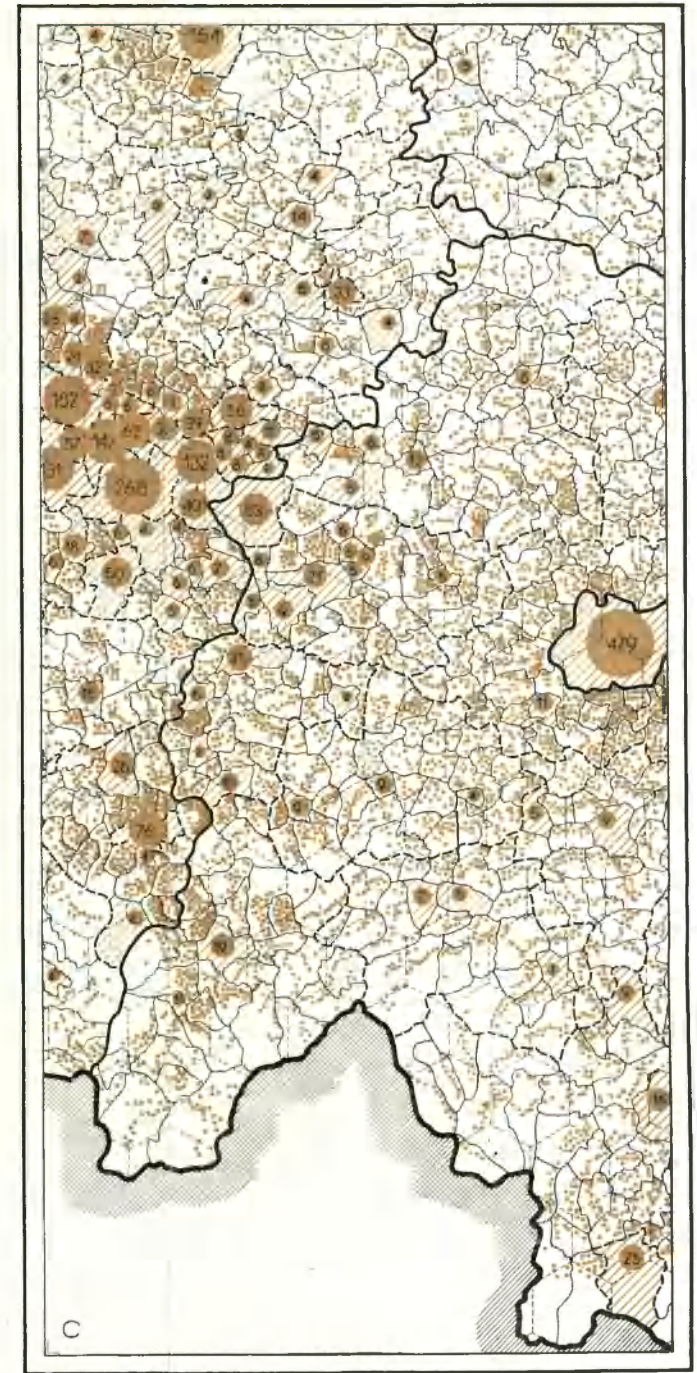
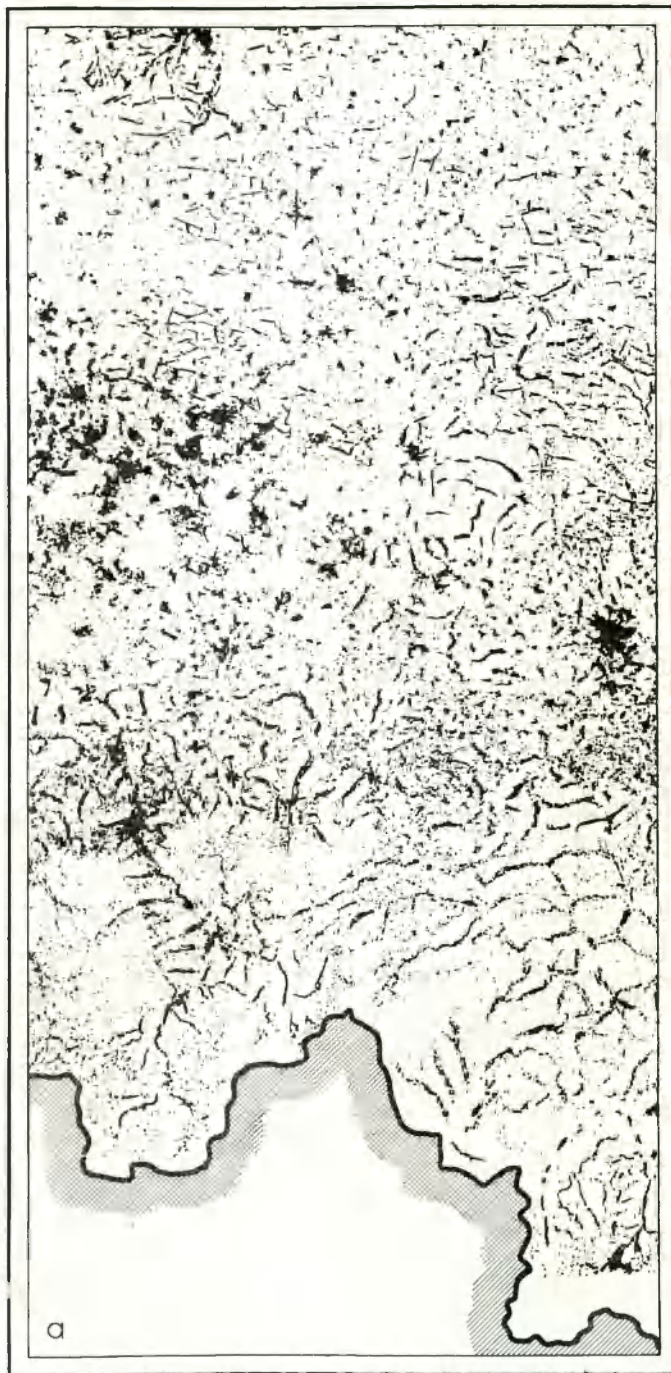


Fig. 1. Method of preparing the detailed map of population distribution

a. built-up areas according to the General Land Use Map, b. section of detailed map of distribution of population in 1950, c. section of detailed map of distribution of population in 1960
 1 — boundary of Poland, 2 — administrative limits of the I order (voivodships), 3 — administrative limits of the II order (poviats), 4 — administrative limits of the III order (gminas or gro-
 madas), 5 — area of town within administrative limits, 6 — built-up area, 7 — rural population, each dot represents 200 persons, 8 — size of towns

a hexagon to an extent to move it to the higher class and in particular to the class of above 150 persons/km². Thus the accepted network and a degree of generalization eliminate from within the range of our vision small towns and settlements. Internal division of areas of a density below 150 persons/km² into four classes enables us to select sparsely settled areas (as a rule with large water bodies especially in lake districts and

TABLE 2. AREA AND POPULATION IN DIFFERENT ZONES OF DENSITY IN 1960

Population density persons/km ²	Area		Population	
	km ²	%	thousands	%
0- 29	54,550	17.5	1071	3.6
30- 59	105,900	33.9	4583	15.6
60- 89	77,350	24.9	5478	18.7
90- 149	43,100	13.8	4805	16.4
150- 299	18,350	5.9	3653	12.4
300- 599	7600	2.4	2934	10.0
600-1199	2850	0.9	2277	7.7
1200-2399	1450	0.5	2456	8.4
2400 and more	600	0.2	2104	7.2
Total	311,750	100,0	29,361*	100,0

* Excluding population centrally recorded (not divided by territorial units)

large wood and moor areas) with average densities below 30 persons/km²; areas normally saturated with agricultural population (30-59 persons/km²); areas with intensive agriculture (60-89 persons/km² and with larger wooded areas also 30-59 persons/km²); and, finally, areas with a surplus of labour characteristic for agricultural overpopulation or more intensively industrialized (90-149 persons/km²). On the other hand, all the areas of density higher than 150 persons/km² (or more precisely 15,000 per 100 km²) are as a rule of urban or of highly industrial character.

Areas with a density of more than 150 persons/km² are however also differentiated depending on the size of town or city within a given hexagon or extent of the use of the land for housing. On the whole, average densities of more than 300 persons/km² are associated with cities of several scores of thousands; densities of above 600 persons/km² are associated with towns of one hundred thousands or more inhabitants; densities of more than 2000 persons/km² characterize large agglomerations like Cracow, Wrocław, Poznań, the complex of Gdańsk Bay, Bydgoszcz, Częstochowa, and more than 2400 persons/km² occur in centres of complexes of a million or so (Upper Silesian Industrial Region, Warsaw Urban Complex, Łódź Industrial District). Local densities within individual towns can in fact differ very much from the averages computed for hexagons of 100 km² (Fig. 2).

In Poland apart from highly industrialized and urbanized areas, one can define four distinct zones of the distribution of rural population.

A. In the lake districts in the north of the country, in wooded areas in the center and, in particular, in the west and finally, in the mountainous south-eastern parts of the country, the average density very rarely exceeds 60 persons/km² and in general does not exceed 30. These are areas of low acreage of agricultural land and extensive agriculture.

B. In the central part of Poland extends a zone of densities 30–89 persons/km² with those of 30–59 dominating. In the west of the country greater intensity of agriculture is associated with a higher share of rural non-agricultural population. In the east great fragmentation of farms and relatively low intensity of agriculture occur. Consequently, the same density there indicates the existence of considerable labour surplus.

C. In the southern part of this country the average densities amount to 90 and sometimes to 150 persons/km², and the most typical is 60–89. These are the areas with a very high intensity of agriculture, partly caused by the neighbourhood of large agglomerations of industry and population, and partly associated with the existence of very good soils. Sometimes these areas have very high latent labour surpluses, higher than in the zone B.

D. Some islands in the south (in Silesia, in Cracow, Rzeszów and Kielce voivodships), where densities 90–149 dominate, sometimes 150–299 or even 300–599. In the western part of this zone this is a result of strong industrialization and in the east of considerable fragmentation of farms and still important labour surpluses in rural areas.

The highest densities, however, characterize the urban or urbanized areas (Table 3). As far as the absolute size of agglomerations is concerned it is possible to distinguish Upper Silesian–Cracow conurbation and the metropolitan region of Warsaw (Warsaw Urban Complex). From this point of view Wałbrzych and Łódź Districts are only just starting and other large towns have not created sufficient suburban zones to enable us to consider them as conurbations or metropolitan regions. However, the Carpathian Piedmont and the Holy Cross Mountains are certainly interesting examples of areas where there is a strikingly and incommensurably numerous population in comparison with the present development of productive forces.

A very interesting comparison of average, median and modal densities for voivodships is presented on Figure 3. The map of average densities gives a generalized picture of population distribution in the whole country, and map of median values improves the picture in some voivodships with greater intensity of urbanization processes by emphasizing the existence of larger agglomerations which derange the regular pattern of po-



Fig. 2. Density of population in 1950 and 1960 and changes of density between 1950 and 1960
 a. density of population per km², b. changes in the density per km², c. national average



Fig. 3. Comparison of population densities in 1960 by voivodships (persons/km²)
 a average density of population, b. median density of population, c. modal (typical) density of population

TABLE 3. GROWTH OF THE LARGEST URBAN CONCENTRATIONS IN POLAND, 1950—1960

Urban concentration	Area km ²	1950		1960		1950—1960	
		Population		Population		Increase of population	
		thousands	%	thousands	%	thousands	index of growth
Upper Silesian Industrial Region	5500	2665	10.8	3187	10.7	522	119.6
Warsaw Urban Complex	2100	1300	5.3	1612	5.3	1612	123.9
Cracow Urban Complex	2000	620	2.5	831	2.8	211	134.0
Łódź Industrial District	900	661	2.7	777	2.6	116	117.4
Urban and Port Complex of Gdańsk Bay	600	479	2.0	627	2.1	148	130.9
Poznań Agglomeration	600	372	1.6	470	1.6	98	126.2
Wrocław Agglomeration	600	349	1.4	455	1.5	106	130.4
Mining and Industrial District of Wałbrzych (Lower Silesia)	1100	306	1.2	397	1.4	91	129.9
Urban and Port Complex of Szczecin	500	185	0.8	270	0.9	85	145.6
Total of the largest urban concentrations	13,900	6937	28.3	8626	28.9	1689	128.6
Urban population of Poland	x	9605	39.0	14,112	48.1	4507	146.9

pulation distribution. The most interesting map is that showing the typical (most frequent) values. It gives a relatively good picture of the above mentioned main zones of the distribution of rural population (Fig. 3).

The map of changes in the period of 1950–1960 (Fig. 2c) indicates first the existence of areas with population losses (18.5% of the area of the country), secondly areas of moderate growth (70%), strong growth (8.5%) and a very strong growth (3%). Thus the areas of depopulation and of strong concentration of population are about equal as far as their surface goes. The situation is quite different when population numbers are taken into account. Population losses from depopulated areas amount to 280,000 persons (c. 5% of total growth during that period) and the total increase in the areas of strong and very strong growth amounts to c. 3,500,000 persons (c. 2/3 of total growth). The increase in the areas of moderate growth included 1,675,000 persons (c. 1/3 of total growth). These figures prove that increase in the latter area was lower than natural increase. Thus part of the population emigrated from there to the areas of stronger concentration of population. Let us assume in view of the lack of possibilities of any other estimate that the total growth of population (c. 20% during the decade) was originally evenly distributed over the country. In order to obtain the changes as shown by the analysis of data for 1950–1960 it was necessary to move c. 3,150,000 people from the areas of increase below the average into the areas of increases above the average. In fact, the numbers were much higher since they occurred in multiple stages. All the largest agglomerations of population were characterized by the increase above the average (Table 3) with the exception of Łódź (below the average) and the Upper Silesian Industrial Region (near to the average). It should be emphasized that all the data in the Table 3 is given for hexagons. Consequently it is independent of changes in administrative divisions. The area of urban agglomeration is always defined as a compact area with average density in 1960 exceeding 150 persons/km².

3. CONCLUSIONS

The growth of population 1950–1960 was higher in the western territories and slower in the remaining parts of the country. It is caused both by changes in natural increase and by immigration. Nevertheless a zonality in the density pattern continues to exist, with the highest values in the south of the country and the lowest ones in the north. The character and scope of urbanization was mainly regional in character. The last decade did not change in any major degree a general picture of the distribution of urban population. However, the growth of the largest urban concentration (Upper Silesia) and of all the other main urban agglome-

rations (17.4–34.0%) was not higher than that of medium-size and small towns (46 and 36% respectively), Szczecin being the only exception (45.6%). This indicates that the principles of planned industrialization and directed urbanization of the country were realized, that is to say, the planned economy was in over-all results successful.

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STUDIES ON THE STRUCTURE OF CHANGES, POTENTIAL AND CONCENTRATION OF POPULATION OF POLAND IN 1950-1960*

LESZEK KOSIŃSKI

1. INTRODUCTION

The results of two last censuses of 1950 and 1960 and data of the current registration of population made it possible to deepen the analysis of population changes during that decade. This article reports on three different studies which have been or will be published in full in Polish [3, 4, 5]. The last two studies were made under the auspices of the Committee for Space Economy and Regional Planning of the Polish Academy of Sciences.

2. STRUCTURE AND TYPES OF POPULATION CHANGES

The method applied here was similar to that used by J. Webb in his study on population of England and Wales [9]. All the units under discussion (in this case 396 *poviats*) were classified according to the ratios of natural increase and migrational change.

Each *powiat* was represented by a point on a "Cartesian co-ordinate" graph. Its location depended on the size of the ratio of natural increase ($+y$) or decrease ($-y$) and ratio of migrational gains ($+x$) or losses ($-x$). On the same graph one diagonal axis indicates total population growth or decline ($R = x+y$) and the other diagonal the relative importance of the ratios of migrational and natural changes ($\alpha = x-y$) (Fig. 1).

Eight sectors, indicated by the letters help to classify the units under discussion into eight types. To the right of the diagonal $y = -x$ there are units characterised by population growth (A, B, C, D). The difference between them consists in the dominance of natural increase which exceeds

* Thanks are due to those who contributed to the technical part of all the studies — to Krystyna Pudło-Palotka, Agnieszka Wojciechowska, M. Jerczyński, A. Imiołczyk and A. Piotrowski, and especially to Krystyna Choińska who prepared the programme and supervised the calculation at the Computer Centre of the Polish Academy of Sciences.

out-migration (A), or in-migration (B). In both cases α is negative. Type C represents these units where in-migration exceeds natural increase and type D those where in-migration exceeds natural loss. In both types C and D the value for α is positive. The remaining four sectors include types

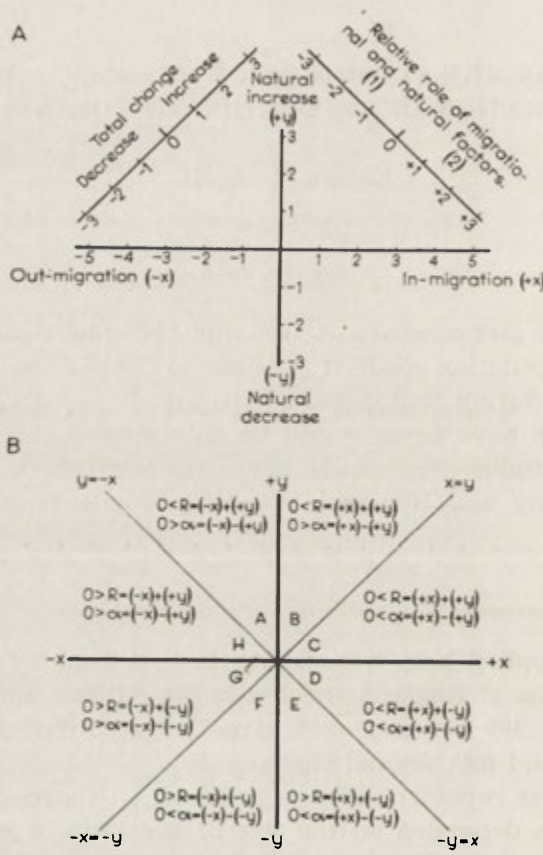


Fig. 1. Method of classification of areas based on the important of natural and migrational components of population changes

A. Total change. Decrease, Increase, $R = x + y$; Relative role of migrational and natural factors; $\alpha = x - y$; ratio of migrations lower than ratio of natural change $x < y$, $0 > \alpha$; ratio of migrations higher than ratio of natural change $x > y$, $0 < \alpha$; B. In-migration (+x), Out-migration (-x), Natural increase (+y), Natural decrease (-y)

with population losses caused by the natural loss exceeding in- (E) or out-migration (F) or else out-migration exceeding natural loss (G) or increase (H). The value of α is respectively positive (E, F) or negative (G, H).

The basic material for this study was obtained from results of population censuses of 1950 and 1960 recomputed for comparable aerial units according to the administrative division of January 1, 1962. By comparing

both numbers it was possible to establish the total population change in the units under discussion. Moreover the data of civil registers, pertaining to births and deaths were utilized. These data was given for the administrative units as they existed in different periods of time; since the divisions changed several times it was necessary to make appropriate estimates in order to obtain comparable data. By comparing total change with natural increase the balance of migration was established. Eventually ratios were computed as compared with the average number of the population.

The total growth of population during the last decade was equal to 17.2% in relation to the total population. At the same time natural increase amounted to 18.2% leaving an out-migration balance of 1%¹. Natural increase occurred in all the *poviats*, its size varying as a rule between 10 and 20% sometimes exceeding 30 or even 40% (recently settled *poviats* of northern and western territories). Migration balances were much more diversified. Losses occurred in 266 *poviats* while gains in the remaining 130 rarely exceeded 20%.

All *poviats* in Poland can be classified according to the 4 types, but the majority of them belonged to A and B which were characterised by total gain depending mostly on natural increase. Type A includes *poviats* where total growth occurred despite out-migration more than compensated by natural increase. In the types B and C natural increase was accompanied by in-migration, with natural increase dominating in the type B and in-migration in the type C. The number of *poviats* with population decline caused by heavy out-migration was limited to 7 (type H).

Towns and cities belong as a rule to the types B or C, whereas the majority of rural *poviats* was classified as A. *Poviats* of northern and western territories stand out with their higher natural increase (Fig. 2).

Out-migrational *poviats* of type A are the most numerous (c. 64% of investigated units), covering 80% of the area of the country and representing 57% of national population. We can find them in all the parts of Poland but especially in the centre. They can be found also in the west and north but there indices of growth are much higher which proves that high natural increase in a much greater degree compensates for migrational losses there than in the central and eastern *poviats* where natural increase and total growth are much lower.

¹ In fact migrational loss was probably smaller, since the comparison of the data of the 1960 census with the estimate based on 1950 and current registration reveals a difference of 130,000 or c. 0.5% as compared with the mean number of population. If we attribute the difference to the overestimation of natural increase (underestimation of emigration is rather unlikely) then natural increase should be estimated at 17.7% and migrational loss at 0.5%. Total growth would remain unchanged — 18.2%.

TABLE 1. TYPES OF *POVIATS* ACCORDING TO THE STRUCTURE OF POPULATION CHANGES BETWEEN 1950 AND 1960

<i>Poviats</i>	Total	Types of <i>poviats</i>							
		A	B	C	D	E	F	G	H
Cities — voivodships	5	—	3	2	—	—	—	—	—
%	100	—	60	40	—	—	—	—	—
Towns- <i>poviats</i>	74	8	48	18	—	—	—	—	—
%	100	11	65	24	—	—	—	—	—
Rural <i>poviats</i>	317	251	56	3	—	—	—	—	7
%	100	79	18	1	—	—	—	—	2
Total	396	259	107	23	—	—	—	—	7
%	100	65	27	6	—	—	—	—	2
Population, thousands	29361*	16727	9384	2815	—	—	—	—	435
%	100.0	57.0	32.0	9.6	—	—	—	—	1.4
Area, thousands of km ²	311.7	248.2	53.3	4.0	—	—	—	—	6.3
%	100.0	79.6	17.1	1.3	—	—	—	—	2.0

* In addition this figure includes 307 000 not divided into territorial units

Much less numerous are *poviats* classified as B. Almost half of those are towns and cities. Consequently although these *poviats* represent merely 17% of the area, they concentrate almost one third of the population. *Poviats* of this group with the growth often exceeding 40% mainly due to the high natural increase are located as a compact belt along the we-

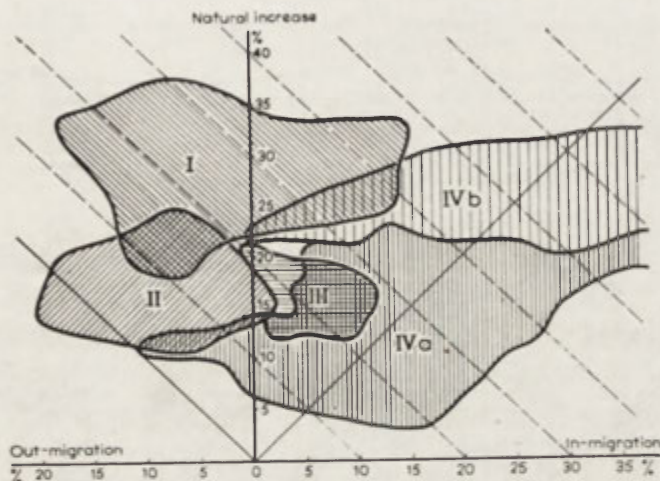


Fig. 2. Types of population changes in Poland in 1950—1960

I — rural areas in western and northern territories; II — rural areas in central and eastern territories, III — rural areas in highly industrialized parts of central and eastern territories, IV — urban areas, a. in central and eastern territories, b. in northern and western territories

stern boundary of Poland. Some groups can also be found around large cities, especially around Warsaw and Upper Silesia. Finally this type includes several cities from all over the country.

As type C only 21 units were classified, out which cities constitute 86%. They represent only 1.3% of the total area but c. 10% of population. Cities of this type are concentrated especially in south-eastern part of the country. Here intensive in-migration exceeds natural increase and as a result total growth amounted to very high values exceeding 50 or even 70% (Ustrzyki Dolne, town Stalowa Wola, town Koszalin, Wolin, town Tychy).

Finally the small group of declining *poviats* where out-migration exceeded natural increase, represented in 1960 hardly 1.3% of population.

The map of types shows the existence of concentric patterns, with the most distinctive around Warsaw. Warsaw in the centre is characterized by the excess of in-migration over natural increase (C), in 9 surrounding *poviats* natural increase dominates over in-migration (B), these being circled round by the out-migration area (A). Similar patterns though on

a smaller scale occur around Gorzów, Częstochowa, Lublin and Cracow. In the last case there is also a fourth zone — that of depopulated *poviats* (H). Remaining great cities as Gdańsk, Bydgoszcz, Poznań, Wrocław have not created a three-level pattern. Even in the central part of those urban areas natural increase dominates. In-migration zones are in many cases



Fig. 3. Distribution of types of population changes in Poland in 1950—1960 by *poviats*.
 A — natural increase > emigration, B — natural increase > immigration, C — immigration > natural increase, H — emigration > natural increase

limited only to the towns. It may be of some interest to point out that in less developed areas of eastern Poland one can find more contrasting proximity of active type C with out-migrational type A or even H (Białystok, Rzeszów and others).

The situation is different in the Upper Silesian Industrial Region. On the whole, the area is characterized by in-migration (B and C), its central part however can be divided into two different types. In the eastern part

the most active towns of type C occur, whereas western cities grew mainly as a result of natural increase while the balance of migrations was negative. It is most likely caused by the emigration of the late 1950's which also affected Racibórz and Strzelce (type A). Towns and cities with strong in-migration are located on the fringe of an industrial area (Dąbrowa Górnicza, Jaworzno, Tychy), thus reflecting the deglomeration policy applied in the Upper Silesian Industrial Region. (Fig. 3).

During further research the types distinguished will be analyzed against the background of the changes in the economic structure and urbanization of the country.

3. POPULATION POTENTIAL

The concept of population potential based on the concepts applied in physics and astronomy was introduced into geographical studies by J. Q. Stewart [6] and is further developed by W. Warntz [7, 8]. Potential in a given place varies directly with the size of population in this and all the other points of a system and inversely with the distance between this and other points.

Maps of population potential of Poland in 1950 and 1960 were based on 271 and 326 control points. These were *poviats* and the largest concentration of population in each *powiat* was considered as a point of reference. Time consuming calculations (about 180,000) were made on the Danish computer G.I.E.R. in the Computer's Centre of the Polish Academy of Sciences in Warsaw according to the formula:

$$V_i = \frac{P_i}{A_i} + \sum \frac{P_j}{D_{ij}}$$

- where: V_i potential at a point i ,
 P_i population at a point i ,
 P_j population at any other point j ,
 A_i constant index for every point, depending on the compactness of the territory, from which it is possible to calculate the potential of a given group "on itself",
 D_{ij} distance between point i and any other point j .

Distance was calculated by the computer which was given the location of all the reference points within the "Cartesian co-ordinates" superimposed on the map of Poland on the scale of 1 : 1,000,000. The area of the country was thus divided into 2500 squares with a side of 13 km. The size of squares was dependent on the size and spacing of the characters used by the typewriter of the computer. Results of calculations were typed by the computers in places previously indicated (Fig. 4).

As a result of the limited width of paper sheets it was necessary to glue together five sheets in order to obtain an area of sufficient size for a map. The resultant map was used as a base to draw the isolines of the potential. They were drawn 50,000/km apart and on the map of changes 10,000/km apart.

In both years 1950 and 1960 the highest potential occurred in the centre and south of the country with top values around the Upper Silesian Industrial Region and Warsaw. Also the other big cities — Łódź, Wro-



Fig. 4. Basic data for the population map printed by the computer

claw, Poznań and Gdańsk were characterized by the high potential values. During the last decade isolines moved outwards. At present, the majority of the country is included within the isoline of 150,000/km, and areas of less than 100,000 are limited to two strips in the northwest and northeast (Fig. 5, 6).

A very interesting map is that of potential changes. It indicates that the greatest increase occurred around cities, which reflects processes of urbanization. The major part of Poland experienced an increase of



Fig. 5. Potential of population in 1950

1 — *powiats* borders, 2 — voivodship towns

20,000–30,000. The lowest increase was located along the eastern, and only to a limited extent, along the western boundaries of the country (Fig. 7).

4. CONCENTRATION OF POPULATION

The study of the concentration of population was based on the Lorenz curve. Its application to demographic–geographical research was recently discussed by O.T. Duncan [1]. However, as compared with the classical method, a certain modification, proposed by R. Jedut [2] was introduced. This was the use of a modified index k according to the formula:

$$k = \eta \frac{a_1}{a_2}$$

where η standard index of concentration resulting from comparing the area limited by the diagonal and the curve with the total area of a triangle,
 a_1, a_2 upper and lower parts of the area limited by the diagonal and the curve.



Fig. 6. Potential of population in 1960
 1 — *poviats* borders, 2 — voivodship towns

From the modified index k it is possible to determine additionally which factor influences the phenomenon of concentration more — the existence of large underpopulated areas ($a_2 > a_1$, hence $\eta < k$), or considerable agglomerations of population ($a_2 < a_1$, hence $\eta > k$).

An analysis was made for 260 *poviats* or groups of *poviats* in 1950 and 280 in 1960 (Fig. 8).

The index of concentration increased between 1950 and 1960 from 0.395 to 0.410 and the modified index k from 0.473 to 0.519 (in both cases the maximum is equal to 1). This means that the increase of concentration was mainly due to the growth of the largest agglomerations since range between k and η expanded (the relation $\frac{a_1}{a_2}$ in 1950 was equal to 1.198 and in 1960 1.264).

The concentration of population was also shown by dividing total population into five virtually equal groups ranging from those of the lowest densities to those of the highest (Table 2). During the decade under analy-

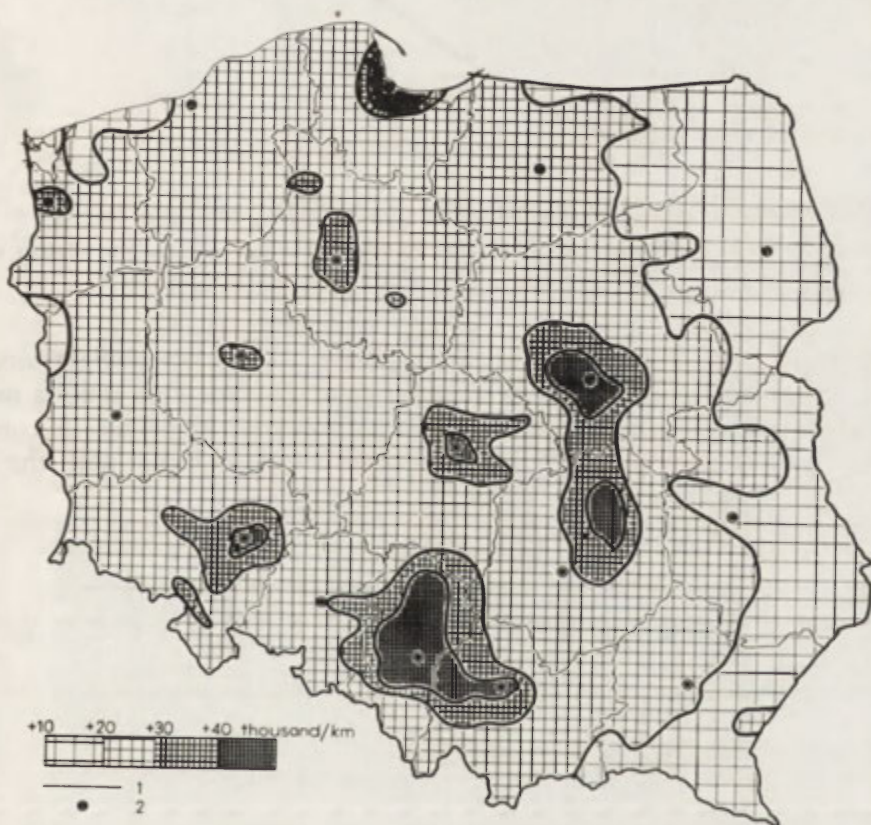


Fig. 7. Changes of population potential between 1950 and 1960
1 — poviats borders, 2 — voivodship towns

sis the area of lowest densities has expanded while that of higher densities has shrunk. At the same time density increased in all groups. In poviats with the lowest densities the density increased by 20% while that in the highest densities grew by 37%. The distribution of the five groups of concentration is shown on the map (Fig. 9).

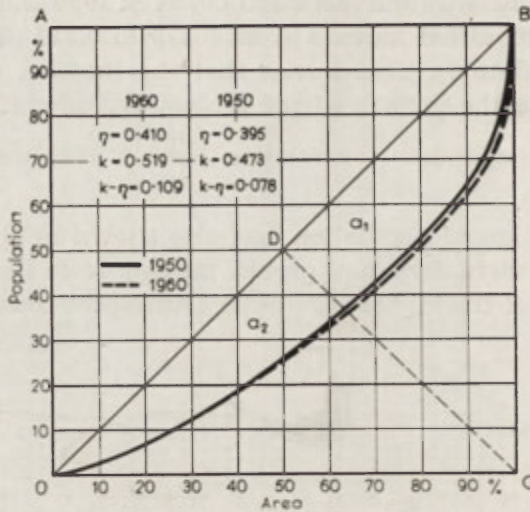


Fig. 8. Concentration curve of population in 1950 and 1960
Percentage of population (cumulative array), OA, CB; Percentage of area (cumulative array), OC, AB.

A wide zone of lowest densities represented by 123 *poviats* extends along the western and northern boundaries of Poland. This zone is narrower along the eastern boundary. The next group of 80 *poviats* is concentrated in the centre of the country. It forms a type of circle with the cen-

TABLE 2. CHANGES OF CONCENTRATION OF POPULATION BETWEEN 1950 AND 1960

Population %	Area (%)		Average density of population per sqkm.	
	1950	1960	1950	1960
c. 20	42.0	42.5	36	43
c. 20	25.5	27.1	63	73
c. 20	18.6	18.3	87	102
c. 20	11.2	9.6	142	187
c. 20	2.7	2.5	570	772
100	100.0	100.0	79	94

tre near Łódź. The third group of 63 *poviats* forms a broken letter V with concentration in the midsouthern part and two branches extending to the north and west. The fourth group of 39 *poviats* is divided into several islands usually surrounding the 9 *poviats* of the fifth group which represent the main industrial and urban centres of the country.

5. CONCLUSIONS

This paper presents the results of studies in which more exact statistical methods were applied in order to investigate the demographic spatial phenomena. The results are satisfying especially where a longer series of comparisons has been made. It should be noted that studies of population potential and concentration were made for four periods (1910, 1931, 1950

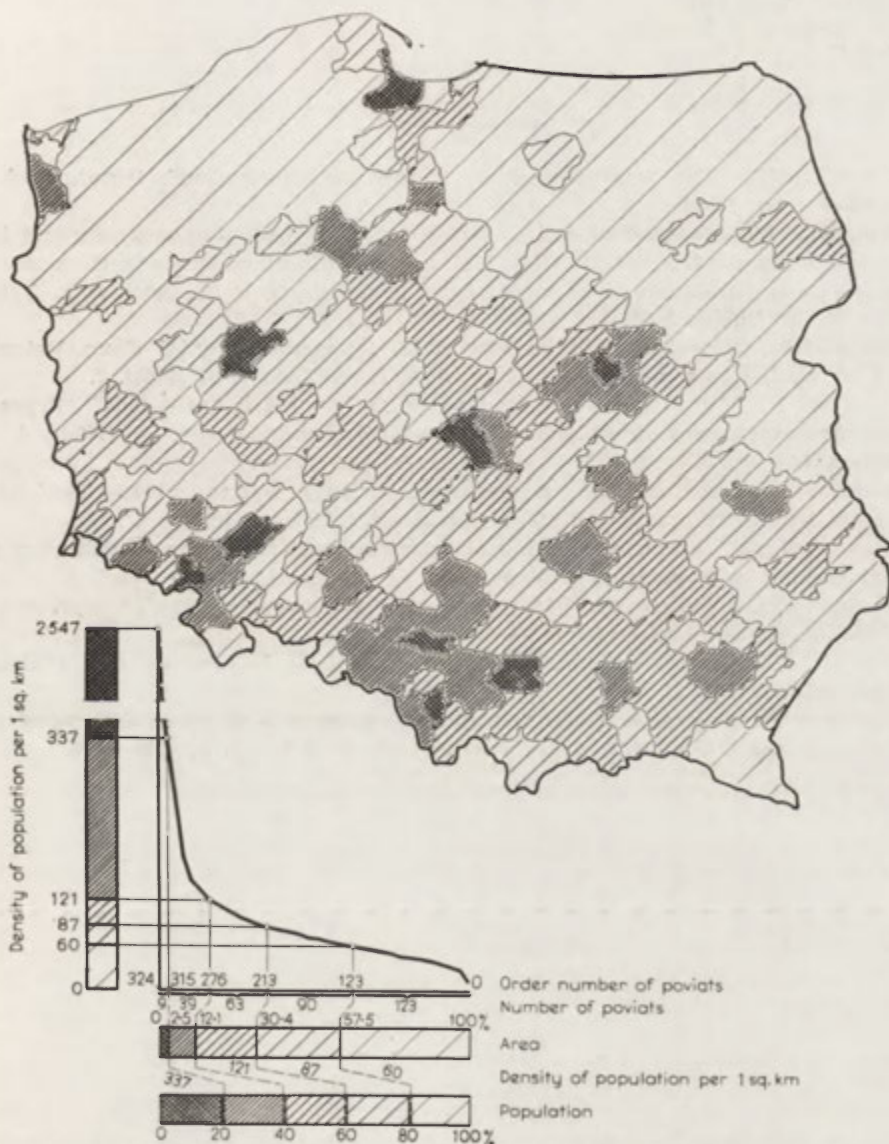


Fig. 9. Map of population concentration in 1960

and 1960). The possibilities of the application of statistical methods is obviously much more extensive. In particular the application of correlation measures seems to be especially rewarding.

On the other hand, the precise statistical arrangement of the data and the more exact analysis do not free the geographer from the need to interpret the analysed phenomena.

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CHANGES OF TYPES OF TOWNS¹

STANISŁAW LEWIŃSKI

In Poland, the use of the population's professional structures for research on municipal types and functions has a long standing tradition; for example the works of Kostrowicki and Kosiński might be enumerated here². As a result of such research, both the method of calculating the professional structures of the population and of their functional structures has been elaborated, and the basic types of Polish towns have also been described. The contributions mentioned above were based on census data coming from one single period only, and, therefore, had a static character.

In continuing research in this field, one must ask the question whether the municipal functions and types of towns described have a permanent and unchanging character, or whether the functions of towns undergo changes and transformations. The process of the transformations of the functions of towns over longer periods, e.g. periods of several hundreds of years, does not produce any doubts. There can be no question that contemporary towns do differ from the towns of the period of early capitalism, let alone from the towns of the feudal period. The character of the transformations which occur in contemporary towns, however, has not yet been adequately explained. It is a relatively easy matter to observe physiognomic changes, e.g. changes in the type of the building, or the increase in the importance of traffic. On the other hand, the character of purely economic changes has not yet been sufficiently elucidated.

Quite a number of Polish publications which approach the subject in an evolutional way have a monographic character, and limit themselves

¹ Research on the changes in the functions of towns has been carried out in the Institute of Town Planning and Architecture in the years 1961—1964. The full results of such research are contained in S. Lewiński, *Zmiany struktur zawodowych ludności w dużych i średnich miastach polskich* (The changes in the professional structure of the population in the large and medium-sized Polish towns).

² J. Kostrowicki, "O funkcjach miastotwórczych i typach funkcjonalnych miast" (Sum. Basic functions of towns), *Przegl. geogr.* 24 (1952), 1-2, pp. 7-64.

to analysing the changes which occur in one single city or town, or else on a certain definite area of the country, and do not make it possible to draw conclusions of a more general character³. The present article reports some of the results of the investigations in an attempt to answer the question above.

SOURCES AND METHOD OF RESEARCH

The investigation included eighty cities and towns administratively independent of the surrounding *poviats*. This group included all the Polish cities and towns which, in 1950, had more than thirty thousand inhabitants, as well some of the towns with twenty-five to thirty thousand inhabitants. The group under investigation may be described as the large and medium-sized Polish cities and towns.

The research was based on the data of the structure of the population's employment, contained in the General Censuses. During the period of time which interests us here, four censuses were carried out on the territory of Poland: in the years 1921, 1931, 1950 and 1960. Among the eighty towns investigated there were twenty towns which belonged to Germany in the inter-war period of 1918 to 1944. Information concerning employment in those towns in the inter-war period has been obtained from the German General Censuses of the years 1925 and 1933.

The method of dividing the employed population into categories differed between one census and another. All the material available has been recalculated into the group of categories of employment which was used in the censuses for the years 1950 and 1960. There are ten sections:

- I — Industry and handicrafts
- II — Construction
- III — Agriculture and forestry
- IV — Transport and communication
- V — Commerce
- VI — Communal economy
- VII — Education and culture
- VIII — Health protection and social welfare
- IX — Administration
- X — Miscellaneous

³ A. Chramiec, *Zagadnienia struktury zatrudnienia ludności miast na przykładzie województwa rzeszowskiego* (Problems of the structure of the employment of the population as exemplified in the voivodship of Rzeszów), *Prace Inst. Urban. Archit.* 65, 1962; L. Kosiński, *Procesy ludnościowe na ziemiach odzyskanych w latach 1945—1960* (Sum. Demographic processes in the recovered territories from 1945 to 1960), *Prace geogr. IG PAN*, 40, Warszawa 1963, pp. 128; A. Werwicki, *Przemiany funkcji osiedlotwórczych w okręgach Wałbrzycha, Świdnicy i Dzierżoniowa* (The changes in the basic town functions in the districts of Wałbrzych, Świdnica and Dzierżoniów), Doctoral Thesis, Institute of Geography of the Polish Academy of Sciences, typescript, Warszawa 1962.

In the course of an introductory analysis, employment in agriculture and forestry was eliminated, as it was not typical of towns of that size with which this study is concerned. The indices of employment in the several sections have been calculated per thousand of town inhabitants, including only those who earned their livelihood in non-agricultural trades.

The overall employment index in all the sections varied between 300 and 400 persons per one thousand inhabitants, which bears witness to a considerable differentiation of the professional activities among the inhabitants of various towns. An analysis of such professional activities, carried out with a division into age and sex groups, has indicated that the principal source of the differences which appear as between one town and another were the differences in the professional activities of women in the "productive" age, i.e. between the ages of eighteen and fifty-five.

The highest professional activity has been found to exist in the towns which were centres of the textile industry, and in the largest cities, which have highly developed services. In both groups of towns the high index of professional activity has been achieved owing to the large participation of women.

When comparing employment in the pre-war, and in the post-war, periods, it has been found that essential changes have taken place in the sphere of unemployment. The unemployed, in the nineteen-thirties, constituted, in some towns, nearly thirty per cent of the total number of the so-called "employed", but in the post-war period, and after the introduction of the planned economy, they ceased to be a social problem. The changes which occur in the proportions of employment between the various sections, have been presented in Table 1.

The most characteristic features are:

1. The permanent and particularly strong increase in the post-war period in socio-cultural services, health protection and education. This is undoubtedly connected with the widening of education and the introduction of free general medical attention.

2. A very strong increase was found to have occurred in the section of construction, which is undoubtedly a manifestation of the processes of industrialization and urbanization.

3. Between the pre-war period and the year 1950 a tremendous increase was also found to have occurred in the section of administration. In the period of 1950 to 1960, however, the proportion of those employed in this section has decreased.

4. Equally clear are the decreases in the proportion of commercial employment, and in the numbers of domestic servants, which constitute the main component of the miscellaneous group.

Both phenomena are undoubtedly connected with the constitutional and social changes which occurred in Poland in the post-war period.

After describing the general tendencies of change, the analyses proceeded to deal with the changes which had occurred in the separate

TABLE 1. CHANGES IN THE INDICES OF EMPLOYMENT FOR THE PERIOD 1921-1960 IN THE TOWNS INVESTIGATED

Section		Year			
		1921/25	1931/33	1950	1960
Industry indices	1	162	176	194	194
	2	100	108	120	120
	3	42.7	41.7	43.8	45.9
Construction	1	15	23	44	40
	2	100	154	294	265
	3	4.0	5.4	9.9	9.5
Transport	1	34	28	32	32
	2	100	82	94	94
	3	9.8	6.6	7.2	7.6
Commerce	1	68	69	55	43
	2	100	102	82	63
	3	17.9	16.3	12.4	10.2
Communal economy*	1	14	17	15	15
	2	100	121	107	107
	3	4.1	4.1	3.4	3.6
Education*	1	12	15	26	30
	2	100	125	225	250
	3	3.5	3.6	5.9	7.1
Health*	1	6	9	15	20
	2	100	150	250	330
	3	1.8	2.2	3.4	4.7
Administration*	1	27	28	51	37
	2	100	103	193	140
	3	7.6	6.9	11.5	8.8
Miscellaneous	1	39	53	11	11
	2	100	168	34	31
	3	10.3	12.8	2.5	2.6

* The indices in the 1921/1925 and 1931/1933 columns refer to the towns which both-before and after the war were Polish

1-employment per 1000 inhabitants, 2-rate, 3-per cent

groups of towns. In order to analyse the types of towns and their municipal functions, a division was made into dominant and specialized functions.

The name of a dominant function has been given to the section of employment, in which the largest number of the inhabitants of the town

in question worked. The dominant function defined the relations inside the town.

The name of a dominant function has been given to the section of employment, in which the index of employment in the town under investigation was higher than the indices of employment in the same section in other towns. Therefore the specialized function defined the role of the town with regard to the neighbouring towns.

The introduction of this division was indispensable, because the specific weight of employment in various sections was not the same. For example those employed in industry were often more numerous than those employed in transport. The section of industry was, in the majority of towns, the most numerous and the dominant section.

At the same time, however, the indices of employment in transport varied considerably. In some towns they were several, and even more than ten times higher than in others. Thus the index of employment in transport might, in one town be the second section of employment in terms of numbers, but, at the same time, it might also be many times higher than the index of employment in transport in any other town. Such situations were given the name of specialized functions.

After calculating the indices of employment (i.e. the number of people employed in a given section per 1000 inhabitants of the town), such indices of employment were divided into seven classes within each section. Class I included the towns with the lowest indices of employment, and Class VII — those with the highest indices (Table 2).

TABLE 2. THE ACCEPTED INDEXES OF EMPLOYMENT IN TOWNS BY CLASSES NUMBER OF EMPLOYED PER 1000 INHABITANTS OF THE TOWN ACCORDING TO SECTIONS OF THE ECONOMY

Class	Industry	Construction	Transport	Commerce	Communal economy	Education	Health	Administration
I	50—99	1—9	1—14	10—29	1—4	1—9	1—7	1—14
II	100—139	10—19	15—24	30—34	5—6	10—14	8—12	15—24
III	140—179	20—29	25—34	40—49	7—9	15—19	13—17	25—34
IV	180—219	30—39	35—44	50—59	10—14	20—24	18—23	35—34
V	220—259	40—49	45—59	60—69	15—19	25—29	24—29	45—54
VI	260—299	50—59	60—79	70—79	20—24	30—39	30—39	55—74
VII	over 300	over 60	over 80	over 80	over 25	over 40	over 40	over 75

Those sections of employment, in which the index has reached the level of Class VI or VII have been described as basic specialized functions.

Those sections, in which the index of employment has reached the level of Class V have been described as additional specialized functions.

All the cities and towns under investigation have been divided into the following groups:

1. towns specializing in one basic function;
2. towns specializing in one basic function, and having, at the same time, additional functions,
3. towns specializing in several basic functions,
4. towns without specialization (or: towns with mixed functions).

This division has a static character. A similar division has been carried out four times, on the basis of the specialization indices obtained from the years 1921–1925, 1931–1933, 1950 and 1960.

As a result, for each town four pieces of information have been obtained, each of them from a different period of time. Such information has determined whether the town in question did, in a given period, possess any specialized function, and if so, its name was given. On the basis of such static sequences the basic types of changes were then established.

These were as follows:

- o—o the town neither had nor has any specialization
- o—X the town is gaining a specialization
- X—X the town maintains its previous specialization
- X—Y the town is changing its specialization
- X—o the town is losing its specialization

The symbols X and Y may mean specialization in one or in several sections of employment (I, C, Tr, T, A, E and H⁴).

The five variants mentioned above have served to define the basic trends in the transformations of municipal functions. We shall discuss such transformations in turn, according to the sections of employment.

THE INDUSTRIAL TOWNS (I)

Among the industrial towns the most typical form of development of changes is the (I—I) sequence.

Nine pre-war industrial towns have maintained their specialization unchanged in the post-war period. They were: five towns of the Łódź region, viz: Łódź, Pabianice, Zgierz, Zduńska Wola and Tomaszów, as well as: Żyrardów, Czeladź, Zawiercie and Bielsko.

A further nine towns have gained an industrial specialization since the war. Among such towns, however, two different groups should be distinguished:

The first group includes those towns which figured in the previous periods under the heading of “non-specializing”. Consequently, such towns vary according to the (o—I) variant. They comprized two towns of the Upper-Silesian Industrial Region, Kalisz and Ostrowiec.

⁴ I — industry, C — construction, Tr — transport, T — commerce, A — administration, E — education, H — health.

The second group includes those towns, which have received the rights of *poviats* independent from the surrounding *poviats* only after the war, and have been introduced into statistics at once as strongly industrialized towns; they were: Skarżysko, Starachowice, Jaworzno, Stalowa Wola and Świętochłowice.

Another group includes those industrial towns which are losing their industrial specialization (I—o).

Seven industrial towns have become transformed into towns with mixed, non-specialized functions. They were, before the war: Zabrze and Będzin, and after the war: Bytom, Chorzów, Sosnowiec, Częstochowa and Wałbrzych.

The changes within this group of towns are of special interest, because all of them, excepting only Będzin, are large towns, of over one hundred thousand inhabitants. The changes described seem to bear witness to the fact that there does exist an upper limit of town size, above which towns lose their specialization, and gain a number of other functions, and also that there exists a tendency for this limit to be falling.

The only exception to that regularity is Łódź. With a population of 700-thousand, the centre of the textile industry, in spite of a strong increase in the functions of administration, education and health (since the war five higher schools have been created in Łódź), continued to maintain its specialized industrial function. This is probably due to the high rate of professional activity of the women employed in the textile industry.

Among the industrial towns there have been but two cases of change from one function to another, (I—X) or (X—I).

Zielona Góra, which had been an industrial town before the war, has been transformed since then as the seat of the voivodship authorities into a town with a specialized function of administration. Świdnica was a commerce and service town before the war, has been transformed since then into a town with a specialized industrial function.

COMMERCIAL TOWNS (T)

In the pre-war period the most numerous group consisted of towns with a specialized commercial function.

This function appeared either as an independent function (in the case of ten towns), or else accompanied by another additional function, most frequently that of administration or industry (nine towns), or else as a function parallel to another specialized function (Gdańsk and Opole: T+Tr, Olsztyn: T+AE).

The later development of the commercial towns is interesting. Only in Olsztyn and Koszalin, has the specialized commercial function made its appearance in the post-war period again (T—T). Among the remaining twenty towns, in four cases the pre-war commercial towns did not have any specialized functions after the war (T—o). These were two towns in the old territories, Zamość and Tarnów, and two towns in the western territories: Legnica and Jelenia Góra. Only in one instance (Świdnica) did a pre-war specialized commercial town gain after the war, a specialized industrial function (T—I).

The most typical development sequence was the transformation of a pre-war commercial town into an administrative function, which was often accompanied by a specialized function of education (T— $\frac{A}{E}$).

This was the trend which appeared in the majority of the towns of the western territories, in Wrocław, Opole, Koszalin and Olsztyn (all of which are seats of voivodships administration), as well as in non-voivodship towns, such as Brzeg, Słupsk and Nysa.

There has appeared a difference between the two groups mentioned above. The voivodship cities (with the exception of Wrocław) have maintained the specialization in administration throughout the whole of the 1950 to 1960 period (T—T—A—A), while the three non-voivodship towns have gained a specialization in administration in the year 1950, but since lost it and in 1960 were already towns with mixed, non-specialized functions (T—T—A—o). It would be difficult, at the present moment, to judge whether this is a form of primary activation of the towns through the intermediary of the administrative apparatus, specific for the western territories. Nevertheless the fact remains that this was precisely the kind of evolution cycle exhibited by the majority of the towns situated in the western territories.

Apart from the variant described above (T—A), a number of towns which before the war, specialized in commerce, have been transformed since the war into towns with a specialized function of education (T—E). The educational function appeared either in the 1950 Census, or from the most recent data of 1958–1960. Examples of the (T—E) or (T—o—E) variants are Poznań, Kraków, Przemyśl and Gorzów.

Another instance of the transformation of the commercial function are the changes which have occurred in Szczecin and Gdańsk. In the pre-war period, both towns had a strongly specialized commercial function. After the war they lost it, but at the same time in both towns there appeared a strong specialization in the field of transport. It is possible that this change has been brought about by formal reasons, e.g. by a different manner of crediting employees with employment in commercial centrals,

but it is certain that this process of change in the proportions between the number of the employees of commerce and that of sailors and port workers is one of the characteristic socio-economic processes which have occurred in our port towns since the war.

THE TOWNS WITH A SPECIALIZED FUNCTION OF TRANSPORT (Tr)

In the pre-war period a specialized function of transport appeared in nine towns. In five of them it has survived to the post-war period. In the four remaining ones it had only made a transient appearance before the war. In a further four other towns the specialized function of transport has made its appearance only after the war.

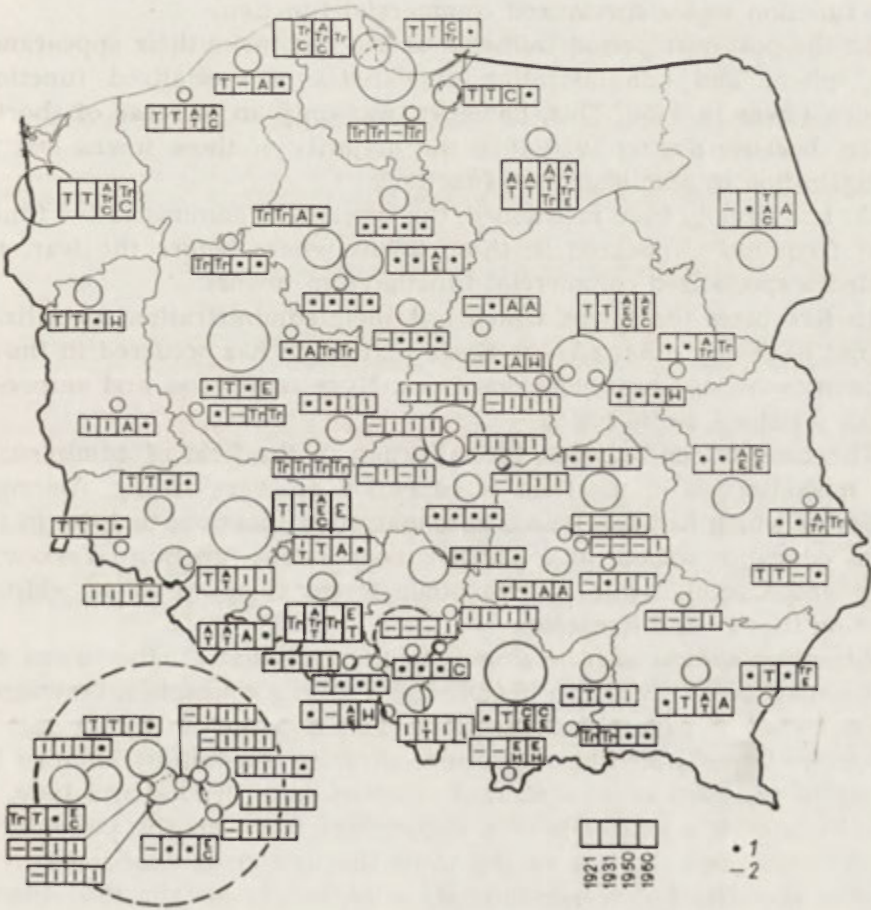


Fig. 1. Changes of the specialized functions in selected Polish towns

A — administration, C — construction, T — commerce, E — education, I — industry, Tr — transport, H — health service, 1 — no specialized function, 2 — data missing

In the pre-war period the specialized functions of transport frequently made their appearance side by side with a specialized commercial function; after the war the connection of transport with the function of administration is more frequent, but this is not a mass phenomenon.

Also no other clear patterns have appeared in the transformation of the function of transport into any other functions, or of the transformation of such functions into functions of transport (Tr—X, X—Tr).

THE TOWNS WITH A SPECIALIZED FUNCTION OF ADMINISTRATION (A)

In the pre-war period the specialized function of administration appeared in only two towns, Olsztyn and Świdnica. In both cases parallel with this function was a specialized commercial function.

In the post-war period tremendous changes make their appearance in this sphere, and administration appeared as a specialized function in sixteen towns in 1950. This, however, was only an increase of short duration, because during 1950–1960 the majority of those towns lost their specialization in administrative functions.

As has already been mentioned, the specialized administrative function most frequently appeared in those towns where before the war, there existed a specialized commercial function (ten towns).

In five cases the towns which lost their administration specialization did not have any other (A—o). Such a situation has occurred in the four western towns of Słupsk, Zielona Góra, Nysa and Brzeg, and on pre-war Polish territory, in Białystok.

The connections between specialization in the field of administration and specialization in the field of education are very strong. Among the six towns which had specialized administration functions in 1960, in three towns education appear as a parallel independent function (Warsaw, Olsztyn and Opole), while in two other towns it appeared as additional function (Kielce and Rzeszów).

Attention should also be drawn to the fact that all the towns mentioned above are voivodship towns with a strong connection between administrative and educational functions. This is borne out by the fact that in the two towns which lost their specialization in administration in 1960, education appeared as a specialized function, both in 1950 and 1960. This hypothesis of the existence of a dependence between the possibility of specialization and the size of the town in question is confirmed by the losses of specialization in administration by Wrocław in the 1950–1960 period, by Białystok and Lublin, and by its absence in other large cities such as Cracow, Poznań, Szczecin or Katowice. The numbers of persons employed in the administrative apparatus of the Voivodship People's

Councils and of the Municipal People's Councils are not sufficiently large, in relation to the total number of employed persons in a large city, to produce an employment index on the level of a specialized function.

THE TOWNS WITH A SPECIALIZED FUNCTION OF EDUCATION (E)

In the pre-war period the function of education as an independent function did not appear in any of the towns under investigation. Only in Olsztyn did it appeared, but here it was accompanied by the function of

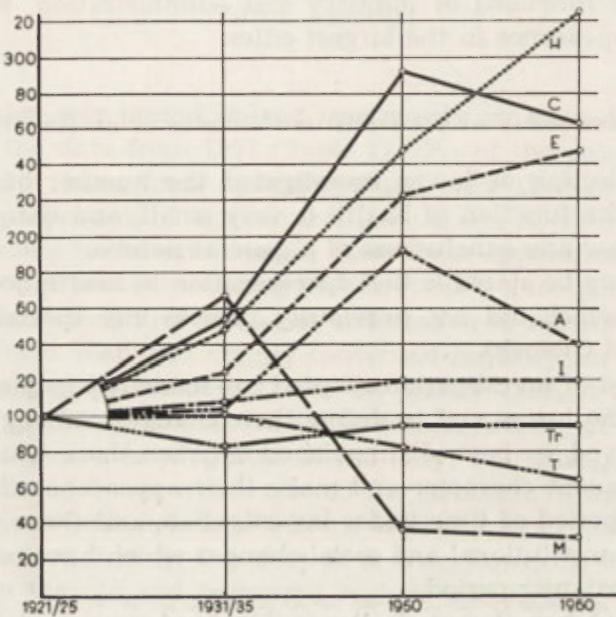


Fig. 2. Changes of the indices of employment in the towns under investigation 1921-1960

Persons employed in: H — health sevice, C — construction, E — education, A — administration, I — industry, Tr — transport, T — commerce, M — miscellaneous

administration. Since 1950 it has appeared in nine towns and in the 1950 to 1960 period the specialized function of education was gained by a further five towns.

Among the towns which had a specialized function of education in 1960, there are eight voivodship towns. A further six voivodship towns have the specialization in education as an additional function.

When investigating the trends of change, we find most frequently that the function of education appeared in those towns which had previously had specialized commercial functions (T—E), or non-specialized admini-

strative functions (A—E). In several towns a specialized function of education has emerged in the case of a town which had not previously possessed any other specialized function.

Among the towns under investigation not a single instance has been found of the development of an independent specialized function of education in a town which had previously been a specialized industrial town.

Education as an additional function has appeared in two industrial towns, i.e. in Łódź and in Świdnica. An important characteristic feature of the specialization in education is the fact that it appears most frequently in the large and largest cities. This feature distinguishes education from the functions of industry and administration, which did not make their appearance in the largest cities.

THE TOWNS WITH A SPECIALIZED FUNCTION OF HEALTH (H)

In the collection of towns investigated the number of towns which specialize in the function of health is very small, and therefore it is not possible to draw any conclusions of a general nature.

All that may be stated is that specialization in health occurs in rather small towns which did not previously possess any specialized function (Zakopane and Otwock).

The method of investigation adopted has made it possible to define the functions of the towns and to define their changes. Among the transformations observed we have distinguished between those which have a relatively permanent character and make their appearance throughout the whole of the period of time under investigation, and those which are the reflection of constitutional and social changes which have occurred in Poland in the post-war period.

This method has also made it possible to observe certain similarities as well as the specific character of the changes which take place in various districts of the country.

In the course of further research it is planned to widen the range of towns included in such research, and to differentiate more precisely the functions of the several towns.

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OVERPOPULATION IN AGRICULTURE AND THE LOCALIZATION OF NEW INDUSTRIAL CENTRES IN POLAND

TEOFIL LIJEWSKI

During the inter-war period Poland was mostly an agricultural country. According to the data from 1931 (Table 1) 60% of the population of Poland made their living from agriculture and only 12,8% from industry. Such a large proportion of agricultural population, however was not necessary. According to the estimates of those times approximately 6 million people were superfluous thus being the unrevealed unemployed. Attempts to industrialize Poland that had been undertaken in the last years before the Second World War, and mainly concerned industry for military purposes were stopped by the outbreak of the war in 1939. It was only until the post-war period, that the socialist reconstruction of the economy brought an extensive development of industry. The changes of frontiers were the additional factor which altered the structure of the country. Poland lost the least industrialized eastern territories and gained the much more industrialized ones in the west. It is true, however, that all the industry both in the old and recovered regions was largely destroyed and during the first period the whole effort had to be used for its reconstruction.

Since about the year 1950 new plants and industrial centres have been built on territories which till then had been agricultural. One of the main premises for the choice of localization of new industrial centres was to give employment to the people of the overpopulated agricultural regions. This is shown on Fig. 1. Out of 128 new industrial centres 84 are situated on territories of a density of agricultural population above the average.

The distribution of agricultural population in Poland is extremely uneven and does not comply with the distribution of land in agricultural use. In general the density of agricultural population increases from the north-west towards the south-east. It is connected with the process of dividing farms which in the south-east reaches its extreme. On the contrary, the number of big farms and estates, mainly state owned ones is largest

in the northern and western voivodships. Table 2 shows several indices characteristic of agriculture in these 2 groups of voivodships.

The number of people who make their living from agriculture still varies, in spite of the post-war process of industrialization, between 30 people to 100 hectares of land in agricultural use in the voivodship of

TABLE 1. POPULATION IN POLAND ACCORDING TO THEIR CHIEF SOURCE OF INCOME (IN %)

Branch of economy	1931	1950	1960
Agriculture	60.0	47.1	38.7
Industry	12.8	20.9	25.3
Communication	3.2	5.2	6.1
Construction	1.3	4.8	6.0
Trade	4.8	5.4	5.0
Cultural and social services	1.6	3.4	4.7
Other branches	7.4	9.2	8.6
Un-earned incomes	2.9	4.0	5.6
Unemployed	6.0	—	—

Koszalin and 94 in the voivodship of Krakow (according to data from 1960), where the number of new industrial plants erected after the war was the largest. The process of industrialization of the 4 south-eastern voivodships of Poland during the post-war period exceeded by 50% the

TABLE 2. AGRICULTURE IN THE 2 REGIONS OF POLAND IN 1960

Voivodship	Farms < 5 ha		Acreage of state-owned farms in the total area of agricultural land (in %)	Number of people making their living from agriculture per 100ha of agricultural land
	number of private-owned farms (in %)	acreage private-owned farms (in %)		
North-west, of Poland:				
Szczecin	52.2	13.8	37.5	31
Koszalin	46.0	12.1	34.3	30
Zielona Góra	55.5	17.5	23.8	39
Gdańsk	50.6	10.6	22.1	41
Olsztyn	37.7	7.2	25.1	32
South-east of Poland:				
Kielce	68.1	42.3	1.1	81
Lublin	65.1	39.1	2.9	67
Cracow	84.8	60.2	1.3	94
Rzeszów	86.1	66.7	6.3	77

average speed of industrial development in Poland. Here the coefficient of increase of the population did not even reach half of the coefficient for the whole of Poland (Table 3). This is not only the result of a smaller rate of natural increase than in the north-western voivodships inhabited mainly by young people, but it is also the result of migration of a large number of people to more industrialized regions (e.g. to neighbouring

Upper Silesia) or to the recovered territories, to which majority of immigrants were families from small farms.

The region of central Poland is also remarkable for its density of agricultural population which, though not seriously high exceeds the average. The excess of agricultural population of that region found employment by migration to the two biggest Polish towns: Warszawa and Łódź or their satellite settlements¹.

TABLE 3. THE DYNAMICS OF RATES OF GROWTH IN SOUTH-EAST POLAND COMPARED WITH THE TOTAL FOR THE COUNTRY

	1946	1955	1962	% of increase 1946-1962
	in thousands			
Population of Poland	23,930	27,550	30,484	27
Population of the 4 south-east voivodships	7090	7371	7930	12
Employment in the industry in Poland	1243	2702	3274	163
Employment in the industry in 4 south-east voivodships	176	476	618	251

Newly erected or enlarged industrial plants on the overpopulated agricultural regions can be classified into several groups:

1. Plants, localized according to the existing mineral resources (e.g. sulphur processing plant at Machów by Tarnobrzeg, plaster works at Gacki by Busko Zdrój, ferrous sand processing plant at Zębiec by Ostrowiec Świętokrzyski, cement plants at Chełm, Rejowiec, Wierzbica, Sitkówka, Działoszyn and Rudniki).

2. The localization of industrial plants in which more widespread mineral raw materials are used in production, has been influenced by the local demand for ready products and also to a certain extent by the surplus of labour (e.g. numerous silica brick-kilns, concrete prefabricate plants, glassworks).

3. Plants where locally traditional production is undertaken, were erected in the vicinity or else instead of old and small plants of the same line of production (e.g. glassworks at Krosno, foundry at Końskie, metal-works in Kielce, furniture factory at Radomsko, motor-bus factory at Sanok).

4. Plants using for their production the local agricultural and forest raw materials which hitherto have not been used in the industry or have

¹ See article of the same author in *Geographia Polonica* 2, 1964: "Influence of transport lines on the concentration of population and increased commuting in the Warsaw region".

been transported to the western territories where the food processing industries are much more developed (e.g. sugar factory at Werbkowice, fat processing plant at Bodaczów, meat processing plants in Lublin, Zamość, Rzeszów, Dębica etc., fruit and vegetable processing plants at Dwikozy, Milejów, Jasło, Tymbark etc., timber industry plants at Rzepedź, Przemysł, Koniecpol).

5. Industrial plants localized in towns and on unindustrialized territories in order to give employment to the surplus of population. The production of those plants has so far not been linked with either the territory or the town (e.g. crude oil refinery in Płock, fertilizer plant at Puławy, glassworks at Sandomierz, aluminium works at Skawina, electrode works at Biegonice by Nowy Sącz, shoe factory at Nowy Targ, steel structure works at Skierniewice). The Lenin Iron and Steel Works in Kraków could also be included in this group of industrial plants though its localization, considering the great size of the plant and of the town was also influenced by other important factors.

Many of the plants could have been classified into 2 or 3 of the aforesaid groups. Having the choice of several alternatives for localization e.g. similiar supply of raw materials or sales possibilities, such locality used to be chosen which had the largest surplus of manpower. Most of the newly erected industrial plants have been localized in the existing towns or industrial centres, which reduced the cost of housing, installing of mains supplies, communication etc. This mainly concerns the western territories of Poland where towns are more densely distributed and provided with better communal facilities. In the east of Poland towns are not so densely distributed and their social facilities are often not superior to those in villages and therefore the localization of new industrial plants did not have to depend so much on the existing settlement pattern. If despite this, new plants were mainly situated in towns or in their vicinity this was because the resources of labour were not properly used in unindustrialized, often agricultural towns in the east of Poland hitherto.

Many villages in which new industrial plants have been localized were later advanced to the rank of towns or urban settlements² as soon as they have reached the required number of non-agricultural inhabitants (Czarna Białostocka, Janikowo, Kraśnik Fabryczny, Poniatoła, Rejowiec Fabryczny, Ruciane, Sarżyna, Świdnik, Ursus etc.). The localization of a new industrial plant mainly in unindustrialized localities, required the construction of a number of new houses for the personnel and above all for the building crew. As a rule, the number of new houses was insufficient and therefore apartments were given to specialists and administrative

² Urban settlement (Polish *osiedle*) is an administrative term used for town-like settlements without town charter, having the status of an urban settlement.

staff brought from outside. Local personnel was obliged to be content with their existing housing. In the majority of cases the number of local employees was not sufficient, especially during the erection so that they had to be engaged from near-by or more distantly situated localities. Those living in the vicinity used to come to work everyday from their homes and those who lived somewhat further used to live in worker's hostels, often provisionally put up, and came home only once a week or even more seldom. When the plant was finished some of the building crew returned to their former occupations (mainly agriculture) or moved to other construction sites, and some, mainly local inhabitants, found employment at the new plant.

The process of industrialization caused a considerable change of character of the professional population of villages and small towns chiefly in the south-east of Poland³. While in 1931 the non-agricultural population amounted to only 16.7% of the total of the rural population of Poland, its number nearly doubled by 1960 (31.2%) despite the fact that in the meantime many villages had been advanced to the rank of towns or urban settlements or had been incorporated by towns through territorial expansion. In general, by 1960, in Poland 38.3% of the population made their living from agriculture and 25.3% from industry which is twice as much as before the war.

Besides the rural inhabitants regularly employed outside agriculture there exists a big group which change their occupation according to the season of the year, working in turns on farms and on construction sites. There is also a group of inhabitants of villages or even of towns which combine their regular employment in agriculture with other sources of employment. These are called peasant-workers or worker-peasants depending on their main source of living. According to the 1960 census there were 648,000 people in Poland employed outside agriculture who were also employed in agriculture, of which 471,000 live in the country and 177,000 in towns. On the contrary there were 154,000 people mainly employed in agriculture having additional employment outside agriculture of which 141,000 in the country and 13,000 in towns. Altogether 802,000 people combined their occupation in agriculture and elsewhere not including those who only do so occasionally or during the season (the aforesaid census took place in December). Those who combined their work in agriculture and elsewhere, must in the majority of cases travel to the non-agricultural place of employment. Also inhabitants of villages employed outside agriculture in majority of cases work outside the place in

³ See M. Dobrowolska, "Functions of industries in shaping socio-economic regional structure", *Przegl. geogr.* 32 (1960), Suppl., and "The influence of industrialization on the formation of regions", in: *Problems of Economic Region*, Prace geogr. IG PAN, 27, Warszawa 1961.

which they live. This is the results of bigger concentrations of non-agricultural places of employment compared with that of the places of residence of the workers. In 1960 90.2% of industrial employment was available in towns and urban settlements which were inhabited by only 48.1% of the total population and 74% of the non-agricultural population. As a result of the separation of places of residence and places of work, a great number of people are obliged to travel, mainly from villages to towns, though also frequently from town to town (mainly from smaller to bigger ones), from village to village and even from towns to villages. This problem, which did not exist, on the present scale before the war, became serious at the time of the erection and expansion of numerous industrial centres, which were related to the dispersed pattern of rural labour supplies. The following factors have mainly contributed towards this increase in commuting:

1. The great destruction of Polish towns during the last war which limited the number of inhabitants.

2. The slower tempo of housing as compared with the development of industry.

3. The different forms of ownership of apartments and as a result different rents make the exchange of flats more difficult.

4. The large number of people employed per family; often 2—3 per family, which in case of the areal dispersion of places of employment necessitates much travelling.

5. The low fares of public transport⁴ and the possibility of using buses at larger plants offered to the employees as a means of transport.

The areal distribution of that part of rural population which is travelling to places of non-agricultural employment is extremely varied (Fig. 2). This is a result of both overpopulation in agriculture and the number and distribution of industrial centres, mainly the new ones, which still have insufficient local labour force. The majority of commuters from villages are to be found in the voivodships of Katowice and Opole, the south-east voivodships, the district of Warsaw and the voivodship of Poznań.

Approximately 400 thousand commuters from villages i.e. circa 35% of their total number in the country is concentrated in the 4 voivodships of south-eastern Poland. These voivodships are inhabited by 35% of the rural population of Poland but only by 26% of her total population and represent 25% of her total area. In contrary to this are the voivodships of the north-west. Five of the voivodships mentioned in Table 2 account

⁴ E.g. a commuter on a distance of 30 km pays 27 zł. for a monthly ticket i.e. approx. \$ 1.1. Other expenses are borne by the employer.

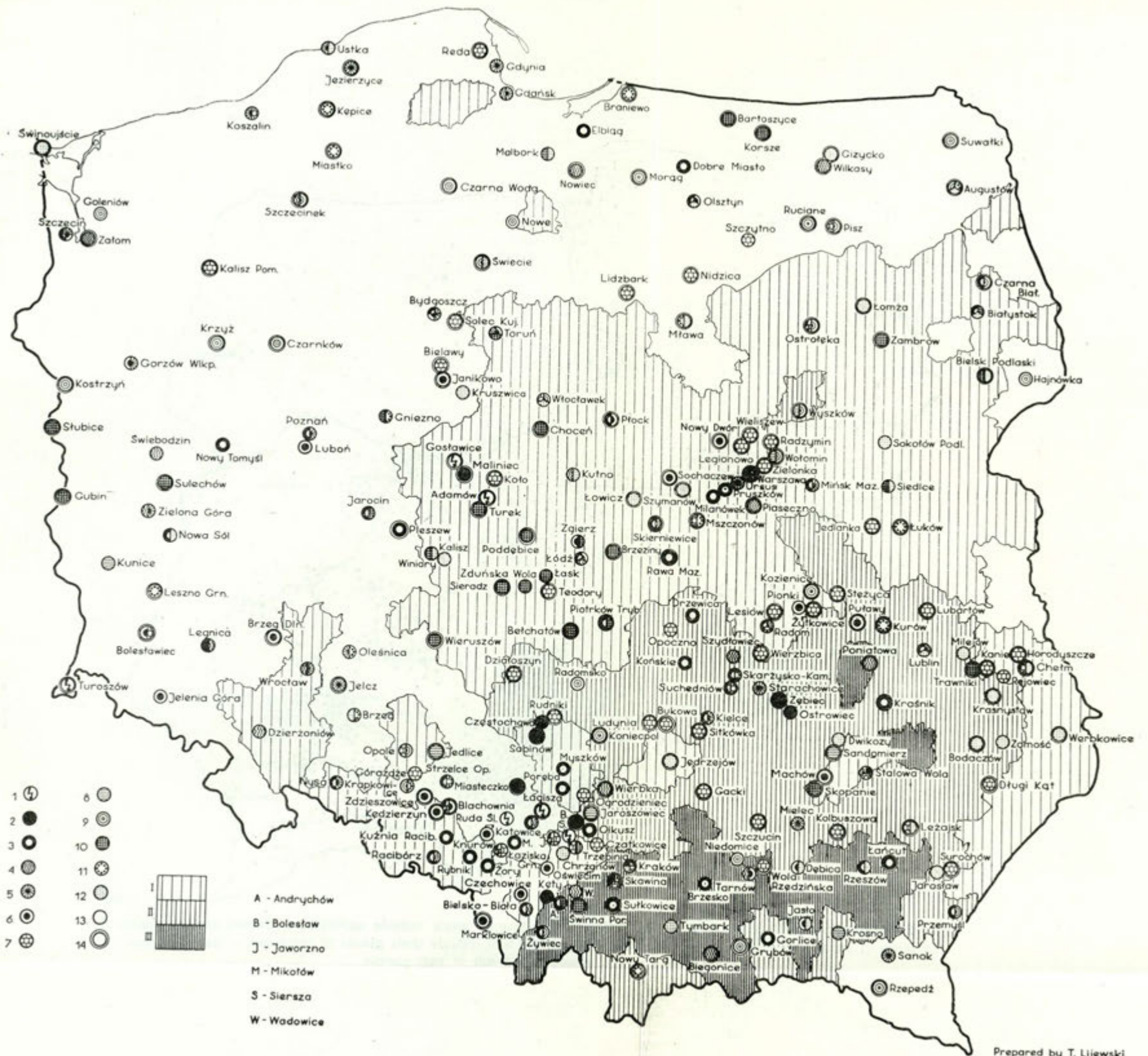


Fig. 1. The distribution of new industrial centres in relation to overpopulation in agriculture (newly elaborated and highly developed centres have been taken into consideration) with the exception of extractive industry; areas with a density of agricultural population in relation to the area of agricultural land in excess of the average are shaded

1 — power industry, 2 — metallurgy, 3 — engineering and metal works industry, 4 — electric industry, 5 — vehicle and transport industry, 6 — chemical industry, 7 — building materials industry, 8 — glass-ware industry, 9 — timber and paper industry, 10 — textile and clothing industry, 11 — leather industry, 12 — food industry, 13 — old highly developed centres, 14 — newly created or reconstructed centres, I-III — density of agricultural population per 100 ha of agricultural land 55-82 people (I), 83-110 people (II), above 110 people (III)

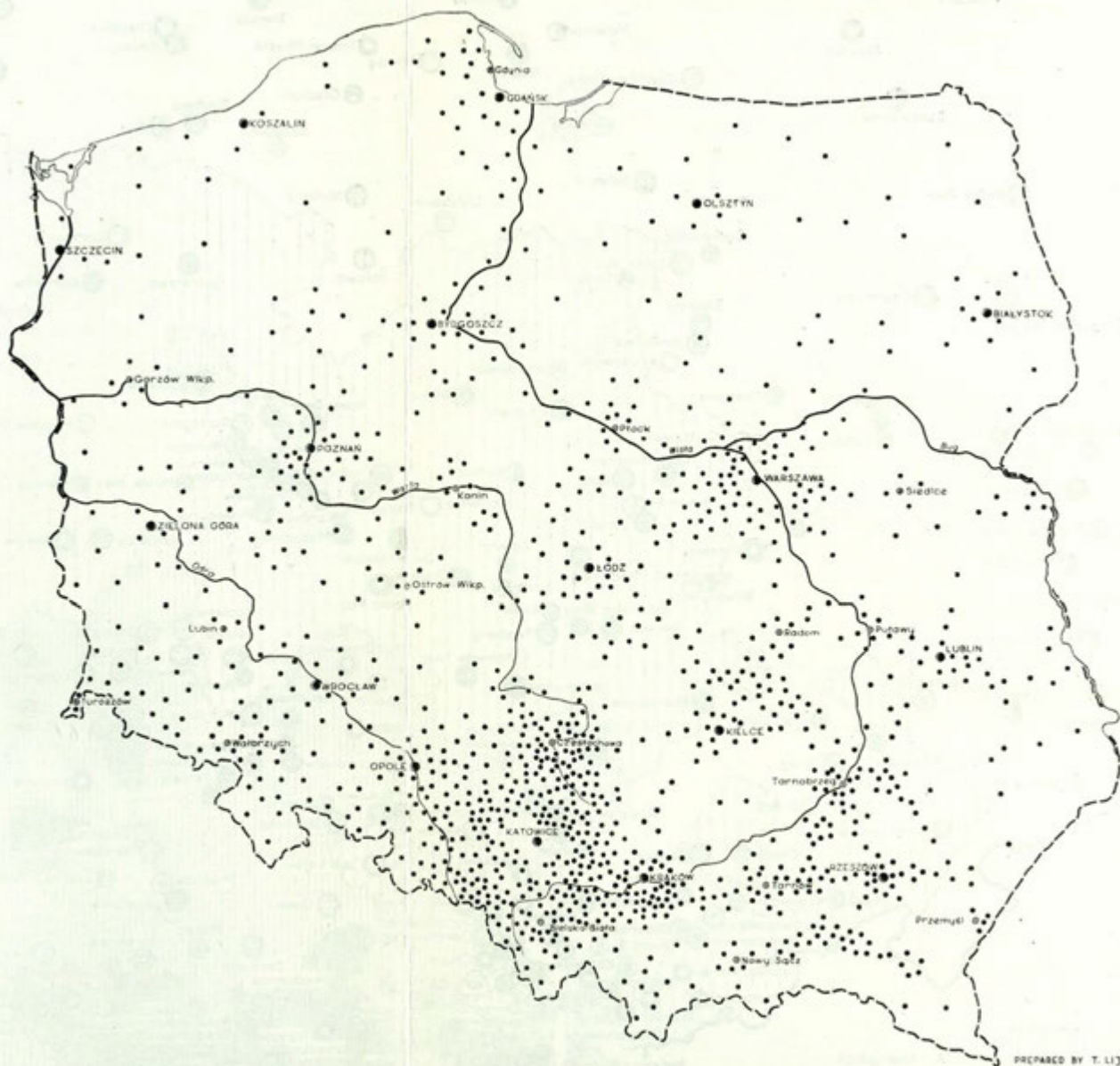


Fig. 2. Estimated distribution of rural population commuting to work outside agriculture (Shown are the places of residence of rural population employed outside agriculture and outside their places of residence — based on test researches). 1 dot = 1000 people

for only 7% of the commuters. These voivodships are inhabited by 14.5% of rural population of Poland in an area of 25% of the total of the country.

The highest absolute density of non-agricultural rural population, and of commuters occurs on the territory of the voivodship of Katowice — north and south of the Upper-Silesian Industrial District. Compared with the south-east of Poland this is in most cases an entirely non-agricultural population, and has often been employed during several generations in mining or in industry. The only difference between them and the workers from the central part of Upper Silesia is that the commuters live outside the towns. This also relates to the western part of the voivodship of Cracow and the eastern part of the voivodship of Opole. Commuting is also common and long established in other old industrial regions such as: the Sudety where big villages are inhabited by a large number of non-agricultural workers and often have local industry, and the region of Łódź where settlements of industrial workers have grown up in the vicinity of the town.

Commuting to Warsaw is of a different type. It does not involve the permanent agricultural population as much as those people who have settled there during the inter-war and post-war period. They have settled in bigger satellite localities along the railways which ensure easy communication with Warsaw. Most of these localities have been granted municipal rights. The rural population accounts for only 36% of commuters to Warsaw. They travel chiefly to the suburban industrial centres of the Warsaw region. It appears from the author's research that in Poland the average distance between the place of employment and of residence of extra urban population is 15 km. In majority of cases the distance travelled do not exceeds 40 km, for only 5% of commuters have to cover a longer distance. Commuting distances are shorter in voivodships with a larger overpopulation in agriculture, because, a smaller hinterland is needed to cover the demand for labour of the industrial centre. Therefore, while in Poland 88% of extra-urban workers commute from a distance up to 30 km, this rises to 92% in the voivodship of Cracow, 94% in the voivodship of Rzeszów and nearly 99% in the voivodship of Kielce. It may therefore be assumed that an area of a radius of 30 km i.e. 2800 km² is a sufficiently large hinterland to provide the labour supply for a medium sized industrial or non-agricultural centre. This, obviously does not relate to bigger towns and industrial agglomerations which attract tens of thousands of extra-urban workers from a much larger hinterland.

In order to make complete use of the surplus of labour supply among the rural population, industrial centres should be localized at a distance of 50—60 km apart. Other factors, such as housing investment, communication, water supply, and raw material supply would certainly cause some

deviations from the assumed pattern, but nevertheless it could be considered as a theoretical formula to be held as near as possible.

From the first part of the present paper it appears that because of a surplus of labour supply in the south-east voivodships, these are the first to call for industrialization. This is true, but on the other hand it is only a temporary symptom. These voivodships have a smaller increase of population compared with the western and northern voivodships which are mostly inhabited by young people, where the index of natural increase of population is the highest.

In the four south-eastern voivodships children up to 15 years of age amount to 34.9% of the population. In the western and northern voivodships they account to 39.5% (the average in Poland is 35.3%). The young people of the post-war demographic boom are just entering the productive age. The distribution of this youthful part of the population is different from that of the existing surplus in the labour supply which formed the basis of a large part of industrial investment.

It is therefore necessary to consider both the present and the future reserve of labour, especially when placing investment which will be effective only after several years. Geological researches have been of the great assistance in this respect. They have enabled three mining centres to be created in the west of Poland, on very weakly industrialized territories distant from large industrial towns. These are the mining districts of brown coal, salt and iron ore in central Poland (the region of Konin, Turek, Kłodawa and Łęczyca), copper mines north of Legnica (the region of Lubin and Głogów) and the brown coal mines in the south-west corner of Poland (Turoszów). These regions are mainly based on the rural labour supply but they do not suffer greatly from agricultural overpopulation. Only the central region of Poland has a larger density of agricultural population, but this does not reach the level of that in the voivodships of Cracow or Rzeszów. Therefore there is also a fear that the development of these regions may cause a fall in the intensity of agriculture in the neighbouring regions.

As for the newly developed industrial centres in the south-east of Poland such fears are without foundation. The existing overpopulation in agriculture will ensure a sufficient supply of labour not only for the present plants but also for many more in the future, with the restriction, that their distribution will be proportionate to use properly the existing labour potential.

SOCIO-ECONOMIC STRUCTURE AND DYNAMICS OF THE SUBURBAN ZONE

MARIA DOBROWOLSKA, JAN RAJMAN

The suburban zone, the borderland between countryside and town, — a changing feature, dynamic, abounding in transient forms and inner contrasts due to its spontaneous development and its double functions, presents a micro-region of research problematics of particular complexity.

This is linked not only with the diversity of a definition of the term suburban zone, and of criteria for its delimitation but also, predominantly, with the number and variety of interrelated problems, yet little recognized so far. First place takes here the need of investigating the basic functions of a suburban zone as the source of food and of man-power supply, as well as of some dwelling opportunities. Nor can be left out of consideration the part played by the suburban zone as the area intended for planned location of industry and transportation facilities (railway, bus service and waterways), as well as for other services, for recreation and communal amenities.

The object of the present paper is the study of the intrinsic processes of urbanization as occur due to urban-market labour demand, resulting in an inflow of population and on transformation of the socio-professional structure of suburban villages in consequence of their inhabitants commuting to work.

The bonds of labour shaped between peasant-workers and workers living in the hinterland of towns with the industrial plants employing them as lathe operators, welders, mill workers, fitters, engineers, shop helpers or as salesmen, health workers or civil servants respectively, constitutes a factor expanding the urban boundaries, formally defined by legal status. Wide suburban areas are absorbed by the influence of cities and towns. Such ties with the industrial and service centres are evolving not only by the steadily growing number of commuters travelling by railway, bus, plant-owned motorbus service, motorbikes, bicycles or on foot, but — above all — by a multitude of concepts, values and needs which in rapid succession alter the pattern of formerly rural areas.

There are no changes yet in the urban boundaries. Even so, along the periphery of the town a new dynamic feature evolves, a suburban zone which potentially becomes part of the town not merely by decrees and planned investment outlay, but rather by changes in its inner character and its demographical, social and economic structure and by evolution of its settlement pattern. Here the protracted contact with the town, strengthening social and cultural bonds between the peasant-worker and his place of work, the town, with its cultural and technical achievements, rapidly obliterates former concepts of values. Modern progress and its varieties of topics penetrate the suburban villages, sustained by the spell of television, printed word and radio. And thus man, history's driving force, advancing in knowledge and experience rejects many elements now becoming obsolete. Increasingly appreciating the value of the new means of production and new technical methods, he usefully contributes to the process of urbanization and to the expansion of the urban boundaries far into the suburban areas.

Analysing these processes with various suburban zones of Southern Poland as example, we tend to recognise their variety and typical aspects in reference to urbanization tendencies.

I. CHANGES IN SUBURBAN ZONE DUE TO INDUSTRIAL INVESTMENTS AND POPULATION INFLUX

Urban expansion following the Second World War and changes in the structure of suburban zones were brought about by heavy industrial investments and by the man-power demand of the towns. The establishment of industrial plants in urban peripheral regions, introduction of communal improvements and organization of transport systems and power transmission networks there set in a vigorous influx of labour. In the beginning, this labour was unskilled or little versed in construction and transportation, later more qualified, and settled near their plants. All these processes we have studied analytically in different industrial centres and larger plants as to their influence upon their respective hinterland. The large metallurgical complex of the Lenin Plant in Cracow's eastern periphery, the Aluminium Works and the big Power Station at Skawina, the Chemical Works at Oświęcim, the Nitrogen Plant at Kędzierzyn, the expansion of the Nitrogen Works at Tarnów-Świerczków (formerly Mościce), the enlarged Bierut Steel Mill close to Częstochowa, the new big Shoe Works near Nowy Targ, the Sulphur Mines and Processing Plants next to Tarnobrzeg — all these represent part of industrial investments that initiated processes of changes in suburban zones.

In their first phase, investments connected with the Lenin Metallur-

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