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## The demographic changes in Poland in the core - periphery layout during the period of the systemic transformation

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**THE DEMOGRAPHIC CHANGES IN POLAND IN THE CORE  
– PERIPHERY LAYOUT DURING THE PERIOD  
OF THE SYSTEMIC TRANSFORMATION**

**ABSTRACT.** The systemic transformation has contributed to far-reaching changes in processes shaping the demographic situation of the Polish society. These changes had their clear spatial dimensions. In the years 1994–2003 an increase in population figures of centres and a decrease in the population size of peripheral areas were observed. Although average changes were not big, counteracting tendencies in the two mentioned types of areas prove that there is ongoing polarization of places where the population tends to concentrate. Migrations of population stimulated the process of polarization. According to the analysis migrations shifted inhabitants from peripheral areas to centres. As a result, the concentration of the population in centres understood as daily urban systems rose. It should be made clear that the demographic situation in particular central and peripheral areas was differentiated. The differentiation of centres was connected with their rank in the hierarchy of the settlement system. In general, this regularity resulted in the existence of bigger average absolute increments of population in the centres of high hierarchic status. Consequently, such centres' predomination continued to grow bringing about more advantages of scale and agglomeration.

The analyses carried out in the course of research work showed, in statistical terms, lack of relationships between the demographic situation of centres and peripheral areas that surround them. The advancement of the systemic transformation affected the demographic situation of socio-economic centres. In turn, historical conditions played the decisive role in shaping the demographic situation in peripheral areas. If we assume that falling natural increase and rising positive net migration form in Polish conditions at least an indirect demographic measure of the advancement of the systemic transformation, then it is reasonable to say that the greatest differentiation related to this process took place on the axis centres – peripheral areas.

**KEY WORDS:** demographic changes, systemic transformation, core and periphery, daily urban system, actual increase, natural increase, net migration.

## INTRODUCTION

The transformation of the political system in Poland has led to sweeping socio-economic changes. Their structural, cultural and technological importance was so significant that it has greatly influenced the country's demographic situation.

Processes of transformation have been strongly diversified territorially. That is why their impact on demographic changes varied considerably between different parts of Poland. The paper deals with a spatial analysis of changes in the population figures as well as two factors which shape the changes – the natural increase/decrease and net migration. The spatial analysis of the above mentioned aspects was carried out with respect to the core – periphery areas layout. This relationship between the research elements makes it possible – according to the author – to show the spatial structure and dynamics of the demographic processes as closely to the reality as possible. At the same time the research retains a high level of generalization related to analyses that were carried out and conclusions that were drawn. The analysis covers the decade of 1994–2003. The beginning of the analysed period points out the overcoming the transformational crisis (Kleer, 2003), whereas the end of the period falls on the last year before Poland joined the EU.

The paper attempts to answer five research questions. Firstly, whether the population of the socio-economic development centres in the analysed period tended to decrease or increase. Secondly, the research aimed at finding out whether density of the population in socio-economic development centres increased. Thirdly, it was worth knowing if there was a relationship between the role socio-economic development centres played in the hierarchy of the settlement system and their demographic situation. The fourth question concerned a potential relationship between the demographic situation of particular centres and their peripheral areas. The fifth question referred to the role the natural increase and migration increase played in shaping the population figures. Consequently, the analysis attempted to show whether there was a relationship between the level of these indicators and the position of the analysed areas in the hierarchy of the settlement system. Answers to these questions require a prior explanation why the core – periphery layout was chosen to analyse problems of the systematic transformation and its adaptation to the spatial structure of Poland.

**THE CORE  
– PERIPHERY LAYOUT AS THE SPATIAL MODEL  
OF THE SYSTEMIC TRANSFORMATION IN POLAND**

As it has already been said the course of the systemic transformation was spatially differentiated. The differentiation was caused by different socio – economic conditions of development in particular areas.

These areas which had at their disposal desirable resources conducive to the development of a democratic society and market economy became leaders of reforms and gained the upper hand over other areas of the country whose level of socio – economic development left a lot to be desired. The author of this paper is convinced that the greatest differentiation in the level of development during the systemic transformation in Poland was observed in the core – periphery layout. This thesis was put forward on presumption that transformation processes form a bundle of innovations whose spatial diffusion was directed downwards the hierarchic settlement system. It seems to be reasonable to claim that the systemic transformation in Poland is based on a hierarchic model of the diffusion of innovations. Apparently, these are the biggest cities that inherited from the state and monopolistic model of management the most diversified and relatively modern social and economic structures which were able to more or less easily adjust themselves to sweeping changes of the transformation period. The research carried out by Domański (2001, 2004) into foreign capital invested in the Polish industry directly confirms the above thesis. Indirect proofs come from other research sources concerning streams of foreign trade (Gawlikowska-Hueckel and Umiński, 2000) and the results of changes which affected property ownership in agriculture (Dzun, 2005). Further proofs are provided by analyses of changes in the structure of the economy, level of economic activity and unemployment. Conclusions indicating the increase of differentiation in the level of development of socio-economic centres and peripheral areas are additionally supported by general attempts to describe spatial effects of the systemic transformation (Rykiel, 1998; Czyż, 2001).

According to the mechanism showing how transformation processes influence the demographic situation (Kotowska, 1998) a clear fall in the natural increase of the population was observed in the analysed period. The intensity of migration also fell due to a difficult situation in the labour and housing markets. Data available on the course of development of the discussed phenomena indicate a serious deterioration in the demographic situation of cities in comparison with rural areas. The comparison, however, does not take into account the rapid development of suburban zones of the biggest cities which may distort the true picture of changes happening in the generality of cities. This problem was so-

ived by the use of the layout of basic research units based on the model centres – peripheral areas where the role of centres was played by cities understood not as administrative but functional units.

### ADAPTATION OF THE CORE – PERIPHERY MODEL TO THE SPATIAL STRUCTURE OF POLAND

Numerous publications which use the approach based on the core – periphery model show that it can be applied to various spatial scales. Moreover, the same areas, depending on the scale of observation, may play the role of either a core or periphery area. This paper analyses demographic changes in the scale of subregions (NUTS – 3). Their structure is related to the administrative division of Poland before 1998. The cities which had voivodeship status in the years 1975–1998 are considered to be the centres of subregions. Almost twenty five years of their functioning within the previous administrative division contributed to the establishing of long lasting spatial links around these centres. The creation of the research units forming a centre – periphery system on the level of subregions required certain modifications of the initial assumption. Firstly, Elk, Rybnik and Jastrzębie – Zdrój were regarded as centres. These cities did not have voivodeship functions in the previous administrative division but nowadays they are the biggest centres of the subregions where they are situated. Secondly, out of a group of eleven subregions whose names indicate their bipolar character only six actually turned out to be “double – centred”. It results from the equal role the centres of these subregions play in the settlement system. Four subregions: białostocko-suwalski, krakowsko-tarnowski, rzeszowsko-tarnobrzegi and toruńsko-włocławski were considered to be monocentric. Here the explanation comes from the domination of the centres which at the same time have subregional functions. Suwałki, Tarnów, Tarnobrzeg and Włocławek are of peripheral character when compared with the above mentioned centres. In the case of two other subregions, łódzki and poznański, the domination of regional centres, respectively over Sieradz and Leszno (former voivodeship cities) is so strong that it is impossible to regard them as bicentric. After modifying the initial assumptions concerning centres in the subregional scale there were forty five centres altogether. (1)

As it was previously pointed out functional borders of the cities in the analysed period considerably went beyond their administrative borders which was due to the intense development of suburban zones.

That explains why cities alone are no longer considered to be socio-economic development centres. Instead, daily urban systems have taken over the functions of such centres. These systems are understood as areas in which round the clock local inhabitants' activities are enclosed (Alonso, 1971 (2) quoted by Rykiel, 2002).

Lack of data concerning present shuttle migrations between subregional centres required the use of a certain delimitation. Six indicators were chosen to indirectly measure the over and above average intensity of migrations: population intensity in 2002 (persons per square km); average net migration for the years 1998–2002 (per 1,000 inhabitants); average inflow of inhabitants from cities in the years 1998–2002 (per 1,000 inhabitants); the change in the number of flats in the years 1998–2002 (%); the number of firms run by individual persons in 2002 (per 1,000 inhabitants) and the share of the population in households in total with users of private farms in relation to the population number (grand total) in 2002 (%).

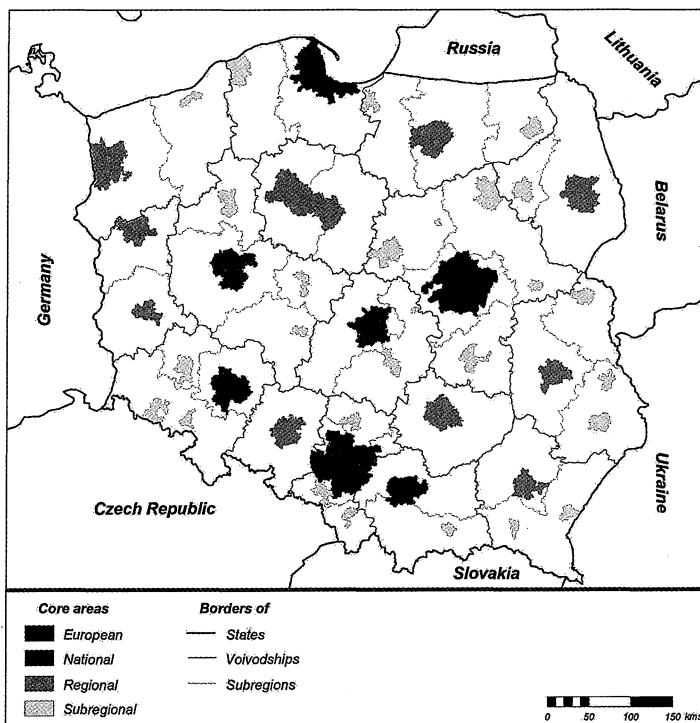


Fig. 1. The core and periphery areas of the socio-economic development in Poland  
*Source:* author's own elaboration

The area of a gmina served as the basic unit of the delimitation (Tarkowski, 2005). The delimitation resulted in setting out daily urban systems of forty five subregional centres (S) which incorporated approximately 15% of all Polish gminas (Fig. 1).

Some of the above mentioned centres function at a higher level in the hierarchy of the settlement system. One of them – Warsaw – carries out functions of European significance (E). Six other centres have the status of national range

(N) and eleven of them constitutes regional centres (R). The remaining peripheral areas of each of the subregions were assigned – on the principle of dichotomy – to the indicated centres. This way of delimitation was used to adapt the general model “centres – peripheral areas” to the spatial structure of Poland. The obtained layout of basic research units is analysed in the further parts of this paper (Fig. 1).

## CHANGES IN THE POPULATION FIGURES

The population size of daily urban systems (DUS) in the analysed centres rose by 39 thousand in the years 1994–2003. It was a tendency contradictory to that observed in the cities within their administrative borders. In the cities the population figures fell by approximately 125 thousand. It explains why official statistics seemingly show a fall in the level of urbanization (Korcelli, 2004) without taking into account a dynamic development of suburban areas of the analysed centres. The share of DUSs in the total population number in Poland rose from 44.5% in 1994 to 44.7% in 2003. It can be said that a slight increase in concentration of the population is observed in the described areas. The real increase of the population of DUSs was different in particular centres.

A certain relationship can be observed between the scale of changes in population figures and the position of a centre in the settlement system. This relationship is not of a functional nature as in some cases clear deviations from it were noticed (Fig. 2). The highest absolute increase in population figures was observed in the area of the DUS of Warsaw (EU – European rank; increasing population), which is the centre of the highest status in the hierarchy of the settlement system in Poland. In the analysed decade the number of the inhabitants of this area rose by over forty thousand. Further differentiation, high in average terms, concerns the absolute increase in the population size of four out of six DUSs of national rank (NI – national rank, increasing population). The increase amounted to 14 thousand persons. The DUS of Tricity was in the best situation as its population rose by approximately 25 thousand. The lowest increase of two thousand persons was observed in DUS of Wrocław.

The DUS of the conurbation of Katowice and the DUS of Łódź were exceptions among centres of national rank. They saw the biggest decline in population figures among all analysed areas of this kind. In the years 1994–2003 the population of the DUS of the conurbation of Katowice fell by over 101 thousand inhabitants. Similarly the DUS of Łódź lost almost 53 thousand inhabitants. Such a sharp fall resulted from restructuring decadent and obsolete industrial branches which used to play a great role in the economy of these areas.

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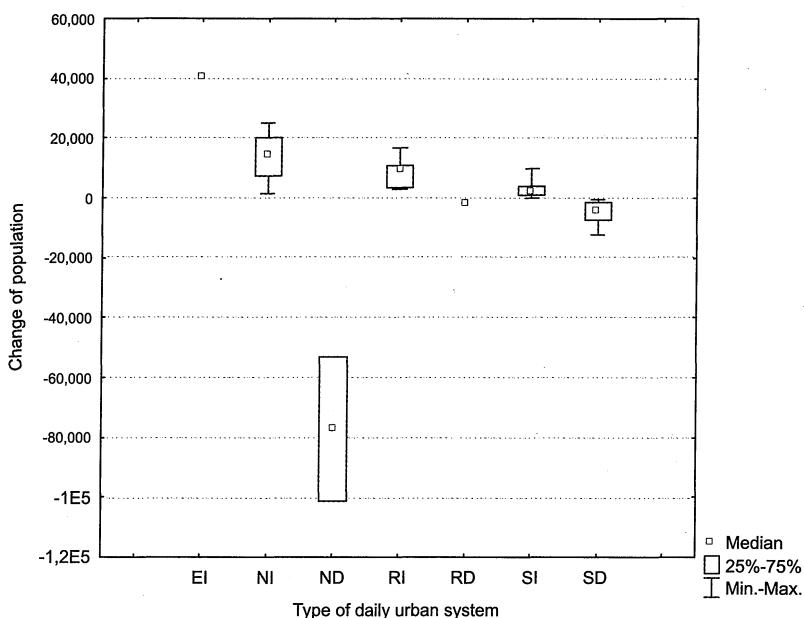


Fig. 2. The changes in the population figures of the daily urban systems of the subregional nodes in Poland in the years 1994–2003

Source: Author's own elaboration based on data of Central Statistical Office

Ten out of eleven centres of regional rank (RI – regional rank, increasing population) also saw an increase in their population size. The increase was approximately 9 thousand inhabitants on average. In this group of centres DUSs in the east of Poland were characterized by a high increase. The biggest increase was observed in the DUS of Białystok where the number of inhabitants rose by almost 17 thousand. The DUS of Kielce saw the lowest increase of about 3 thousand inhabitants. In one centre of regional rank (RD – regional rank, decreasing population) the number of inhabitants fell by over two thousand. It was the DUS of Opole.

Changes in the population figures in DUSs of subregional rank (S) confirm the existence of the relationship between the rank of a centre in the hierarchy of the settlement system and the value of the absolute increase in the population of this centre. 16 out of 21 centres saw an increase in population (SI – subregional rank, increasing population). On average, this increase was lower in comparison with groups of centres belonging to a higher rank and amounted to two thousand inhabitants. The highest rise in population was observed in the DUSs of Ostrołęka and Siedlce. It reached almost 10 thousand persons. The lowest increase was only 10 persons and was observed in the DUS of Legnica. In the remaining five DUSs of subregional rank a decrease in population was registered in the analysed



period (SD – subregional rank, decreasing population). The DUSs of Jelenia Góra and Wałbrzych saw the steepest decline reaching 12 thousand persons (Fig. 3).

On the one hand data referring to the absolute increase of the population of daily urban systems confirm the relationship between their rank in the hierarchy of the settlement system and the value of the rise in population. On the other hand there is no such relationship in the case of relative data concerning the average rate of dynamics of changes in the population numbers. (3) The analysis of the dynamics allows to draw only very general conclusions. Although there was a big absolute increase in the population of daily urban systems around city centres of national and European ranks, the average rate of the dynamics of the changes in the population figures was lower than that of the centres of regional and subregional levels.

In DUSs of NI type the population number in the years 1994–2003 rose year by year by 0.18% on average, whereas in DUSs of RI type – by 0.24% and in DUSs of SI type – by 0.22%. In turn, the fall in population numbers in DUSs of ND type was -0.47%, whereas in DUSs of RD type the decrease was -0.13% and in DUSs of SD type -0.14%.

Most of the daily urban systems with high population dynamics was situated in the north and east of Poland. The DUS of Olsztyn was characterized by the highest dynamics. The negative dynamics concerned, first of all, daily urban systems of city centres lying in the middle and south – west parts of Poland. The biggest loss of inhabitants compared with the total population number was registered in the DUS of Łódź where the average negative value in the analysed period was -0.54 proc. (Fig. 3).

As it was already mentioned the population number of the analysed daily urban systems rose by 39 thousand in the years 1994–2003. The reverse process was observed in peripheral areas (i.e. in the remaining areas of particular subregions). In the same period the number of inhabitants in peripheral areas dropped by 49 thousand. The situation of particular peripheral areas was differentiated. In 19 cases the analysis indicated an increase in population figures. It referred mainly to those subregions whose daily urban systems were classified as the ones of national rank (excepting the subregion of Łódź) and also others – lying in the south – east, north and west of Poland (Fig. 3). The biggest absolute increase among peripheral areas was observed in the subregion of Nowy Sącz. In the analysed period the number of its inhabitants rose by approximately 44 thousand. The greatest loss of inhabitants of about 30 thousand was seen in the peripheral part of świętokrzyski subregion.

The layout of the average dynamics of changes in the population numbers of peripheral areas was not very different from the spatial structure of the absolute increase (Fig. 3). Five subregions enjoyed the best situation: bielsko-podlaski, gdański, nowosądecki, poznański and śląski. A bad situation was seen in the south-west, middle and west of Poland. The above presented analysis clear-

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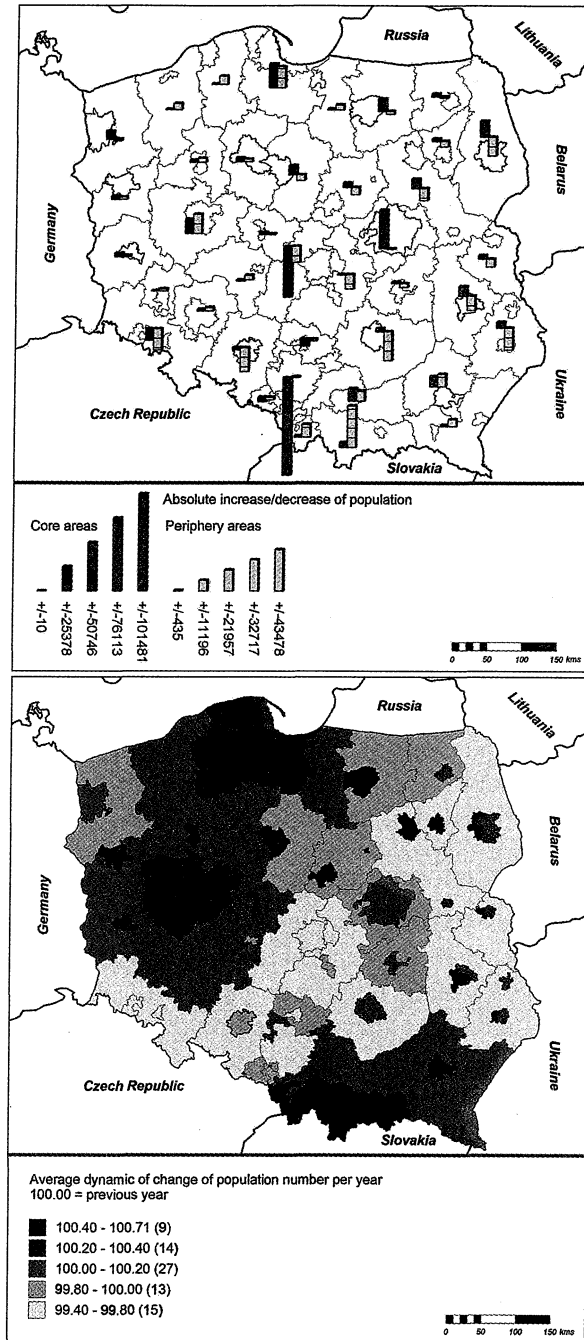


Fig. 3. The changes in the population figures of the core and periphery areas in Poland in the years 1994-2003

Source: Author's own elaboration based on data of Central Statistical Office

ly shows that there is no significant relationship between changes in the population of central areas and surrounding peripheral areas. On the one hand changes in the population of socio-economic development centres depended to a large extent on positive or negative results of the systemic transformation. On the other hand, peripheral areas were much more sensitive to historical conditions (Gorzelać, 2004). Varied circumstances and a mixture of chance events and coincidences led to changes in the relationship between the population figures of centres, that is daily urban systems, and population figures of peripheral areas understood as the remaining areas of particular subregions. Taking into account the layout of research units being considered in this paper we can distinguish eight subregions (class A and B) where the majority of population lives in daily urban systems and 31 subregions where the majority of inhabitants lives in peripheral areas (class C and D).

Two out of eight subregions with the majority of population living in centres (class A) saw further concentration of population in the years 1994–2003. In other six subregions there was a decline in concentration (Fig. 4). In some cases the decline was caused by higher average dynamics of the increase in the population figures in peripheral areas than in central ones (e.g. gdański subregion). In other cases the fall was caused by negative dynamics of the population living just in centres (e.g. łódzki subregion, central śląski subregion).

Out of 31 subregions with the majority of the population living in their peripheral areas as many as 22 subregions (class C) saw an increase in the concentration of the population in their centres. In the case of the subregions of eastern and central Poland it was the result of high positive dynamics of the changes in the population figures in socio-economic development centres and negative dynamics observed in their peripheral areas. In the case of western Poland the increase in the concentration resulted from the higher positive dynamics observed in the centres compared with the corresponding peripheral areas. Nine subregions characterized by the majority of the population living in peripheral areas saw a decline in the concentration of the inhabitants of the socio-economic development centres (class D). Jeleniogórsko-wałbrzyski and bielsko-bialski subregions found themselves in a particularly bad situation because both central and peripheral areas suffered from negative dynamics (Fig. 4).

## CHANGES IN THE BALANCE OF NATURAL INCREASE AND MIGRATION

The changes in the population figures described above directly resulted from changes in the natural increase of the population and migration. The fall in the natural increase, as observed in Poland in the period of the systemic transfor-

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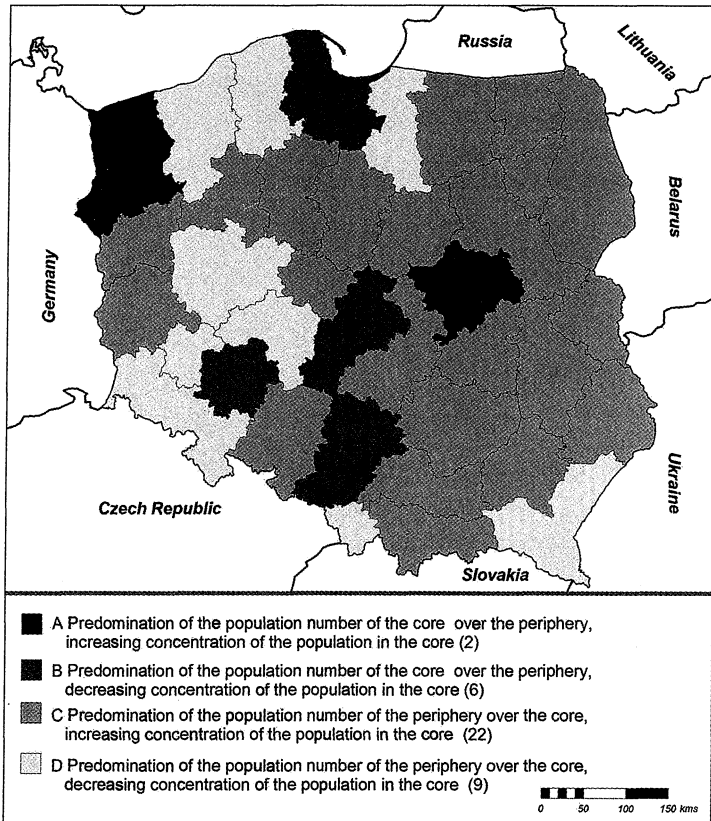


Fig. 4. The changes in the relationship between the population figures of the core and periphery areas in Poland in the years 1994–2003

Source: Author's own elaboration based on data of Central Statistical Office

mation, was particularly evident in socio-economic development centres. The average value (median) of the natural increase rate calculated for the analysed centres reached 3.1 per mille in 1997. In 2003 it dropped to merely 0.3 per mille. It should be noted that despite a sharp fall the value of the natural increase calculated for centres, i.e. daily urban systems, exceeded the value of the indicator for cities (-0.7 per mille in 2003). The fall in the natural increase rate was differentiated and showed inverse proportion to the position of a given centre in the hierarchy of the settlement system (Fig. 5). The sharpest fall was observed in the daily urban systems of the subregional rank (SI). A tangible fall was also observed in the centres of the regional rank (RI). The daily urban systems of the national rank saw a slight decrease in the level of the analysed indicator. In the centre of the European rank (EI – Warsaw) the natural increase rate achieved stability.

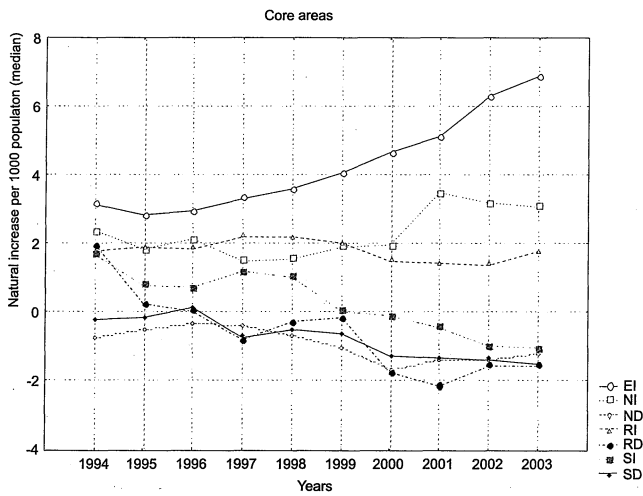
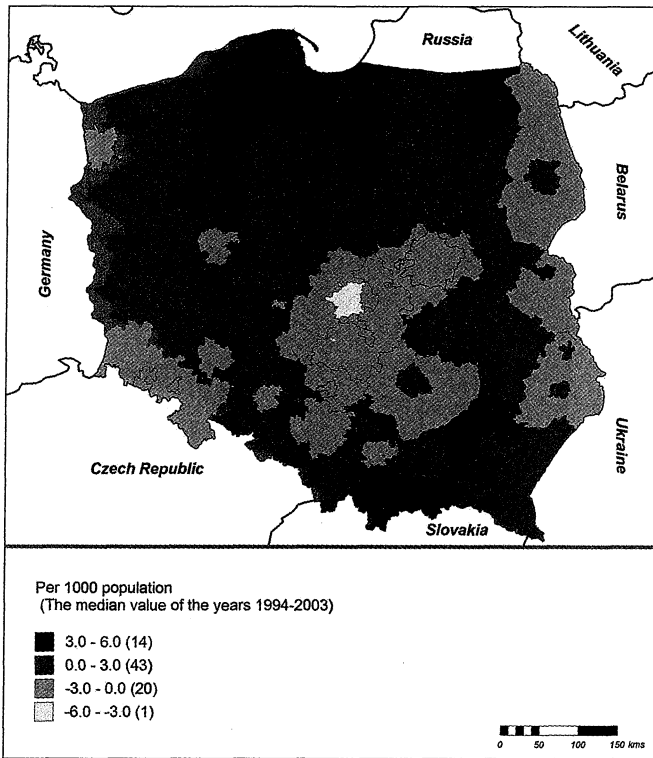


Fig. 5. The average natural increase in Poland in the years 1994-2003  
Source: Author's own elaboration based on data of Central Statistical Office

Despite a big decrease, the centres of subregional importance (SI) still enjoyed the highest rate of natural increase. When compared with the data of 1994 their predominance over the centres of a higher status in the hierarchy of the settlement system was not as significant as at the end of the analysed period. Differences between the analysed groups of centres (EI, NI, RI, SI) measured with the use of the above mentioned indicator were getting smaller and smaller during the whole decade (Fig. 5). In the group of the centres which suffered from depopulation (ND, RD, SD) the research did not reveal any relationships between the natural increase rate and position in the hierarchy of the settlement system. It may result from a small number of the centres belonging to this group as well as characteristics of particular areas – e.g. a very low natural increase rate in the DUS of the conurbation of Katowice and the DUS of Łódź stems from a sweeping restructuring of the local industry which was previously intensely industrialised for a few decades.

The value of the natural increase rate in peripheral areas did not show connections with the demographic situation of centres. Low rates of the increase were typical of the subregions characterized by an unfavourable age structure and outflow of inhabitants. These subregions were situated mainly in the areas in the middle and eastern parts of Poland. The average value (median) of net migration in the centres, similarly to the natural increase rate, dropped in the period of transformation from 1.64 per mille in 1994 to -0.1 per mille in 2003. However, in the final year it was higher than in cities in total (-1.3). It does not mean that the situation worsened in all daily urban systems.

As far as net migration is concerned, a relationship between its level and the rank of a centre in the settlement system is noticeable. This relationship became clearly seen only after 1999 (Fig. 6). The net migration in the DUS of Warsaw (EI) rose twofold. The increase of the analysed indicator referred also to centres of the national rank (NI). It was observed in 2001. Centres of the regional rank (RI) were characterized by a stable net migration. The decrease was recorded for centres of the subregional rank (SI). The net migration in these centres turned to negative values in 2000. The above noted changes led to a substantial increase in the differentiation of the value of net migration among analysed groups of centres (EI, NI, RI, SI). The gap widened from the level of approximately 1.5 per mille to 8 per mille (Fig. 6).

The fall in the number of inhabitants registered for centres of type (ND, RD, SD) was caused not only by a bad situation in the natural increase but also by a negative net migration which was observed during almost the whole analysed period and referred to all three kinds of centres. The negative net migration in 2003 was lower than in 1994 and its values varied from -1.0 to -1.5 per mille. The differences among particular three types of centres were insignificant (Fig.6). Following the case of the natural increase, the values of net migration in peri-

peripheral areas showed no relationship with the level of the indicator for centres. The average net migration (median) was observed in 35 out of 39 peripheral areas. It was particularly low in northern and eastern areas of Poland (Fig.6). Positive average net migration was seen only in four subregions: bielsko-bialski, częstochowski, poznański and warszawski.

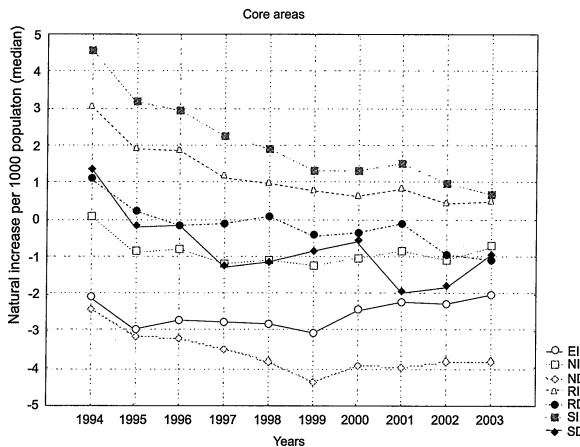
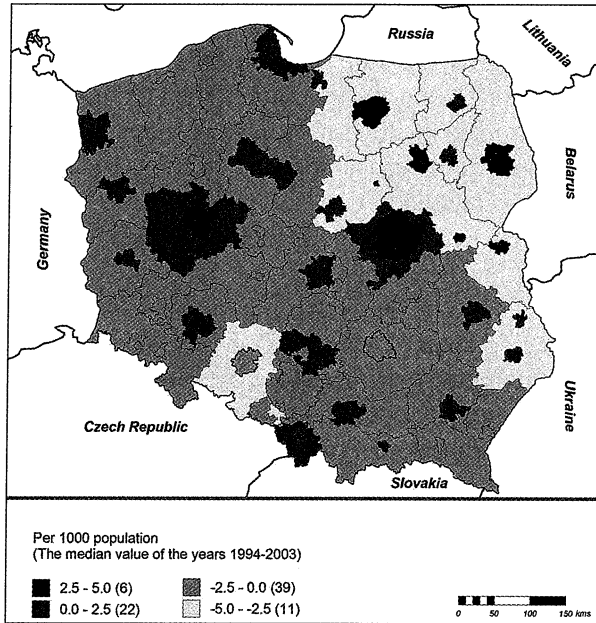


Fig. 6. The average net migration in Poland in the years 1994-2003  
Source: Author's own elaboration based on data of Central Statistical Office

## FINAL REMARKS

The systemic transformation contributed to far-reaching changes in the processes shaping the demographic situation in Poland. These changes had their clear spatial consequences. The years 1994–2003 brought about an increase in population of centres and a decrease in peripheral areas. Although average changes were not significant, counteracting tendencies observed in the two types of areas prove that there is ongoing polarization of places where the population tends to concentrate. This process was stimulated by migrations of the population which, as the analysis showed, took the direction from peripheral areas towards centres. As a result, in the analysed period centres saw an increasing concentration of population which indicates the same tendency for daily urban systems.

It is worth noting that the demographic situation both in peripheral areas and centres was greatly differentiated. In the case of centres the differentiation was connected with the rank a given centre held in the hierarchy of the settlement system. In general, this regularity was expressed by greater absolute increments of the population in the centres of a higher hierarchic status. These centres increased their predomination over other centres in terms of advantages of scale and agglomeration. Interestingly, when relative values are considered (in relation to the number of inhabitants), centres of low rank in the hierarchy of the settlement system observed a higher average dynamics of changes in population figures. Despite relatively high dynamics they were not able to make up for the difference in population figures between them and daily urban systems of the biggest Polish cities. There were, however, a few evident exceptions from this base line. Two centres of a high rank – the DUS of the conurbation of Katowice and the DUS of Łódź saw a relatively bad situation. On the one hand, certain problems had continued since the intense and often irrational industrialization. Moreover, they got even worse as a result of restructuring some industries which went under during the systemic transformation. Subregional centres also arise anxiety although a considerable group of them (SI) enjoyed an absolute increase in the population size. The analysed data show a tangible decrease in the value of natural increase and net migration.

It is worth noting that a big fall in the average net migration in this group took place in 1999 which may be interpreted as a consequence of so called new territorial division and lowering the rank of these centres from voivodeship to powiat level.

The analyses made in the course of research work showed lack of relations in statistical terms between the demographic situation of centres and their surrounding peripheral areas. Correlations were checked only for static indicators while dynamic ones need further research. The demographic situation of cen-



tres was influenced by the advancement of the systemic transformation. In the case of peripheral areas historical conditions prevailed. If we assume that falling natural increase and rising positive net migration is in Polish conditions serve as at least an indirect demographic measure of the advancement of the systemic transformation, then it is reasonable to say that the greatest differentiation related to this process took place just on the axis centres – peripheral areas.

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**NOTES**

- (1) DUSs of the bicentric subregions in this paper are analysed in their total values. This allows to create the layout of reference which consists of 39 central areas and 39 corresponding peripheral areas.
- (2) Alonso W., 1971, The economics of urban size, Regional Sciences Association, Papers, No 26, pp. 67–84.
- (3) The average rate of dynamics of changes in the population numbers is a geometric mean based on the product of chain indexes of variable bases calculated for the population numbers in the years 1994–2003.

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