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On Human Capital and Agrarisation in Poland

Abstract: At the beginning we delimited agricultural areas. Then we compared the picture obtained with the spatial diversity of human capital. The analysis of human capital was based on three groups of measures. They are related to investments on human capital, its resources and effectiveness of its application, successively. The results show that agricultural areas are rather those one with the lowest level of human capital index.

The core-periphery scheme reveals. Evidently developed core-periphery scheme has serious consequences. On one hand establishment of megalopolises rich in human capital should enable them successful competition at international stage. On the other hand establishment of strong centres at the costs of peripheral – agricultural areas is a serious problem. Great differences that appear between large towns and the rest of the country may get deeper as long as there are no development impulses from the centre to peripheries.

Key words: Human capital, agrarisation index, core-periphery, Poland

Introduction

The observed increase of importance of qualitative development factors, both on the national and local scales, results in a need of including them in the analysis of all aspects of human economic and social activity.

Human capital is widely considered as the most important development factor. Departure from mass-production, increase of importance of the advanced technology activities, establishment of a net-economy and social modernization determine areas with high quality of human capital. These regions can achieve success in the modern world. This also concerns areas with agricultural activity.

The concept of human capital was at first equated mainly with the benefits from such investments in people as: education, trainings, health service, vitamin consumption and gathering of information about economic system (Becker 1962). These investments should bring benefit in the form of higher incomes. During last years, this term has been extended to such elements as: motivation, moral

values and interpersonal attitudes and abilities (Cote 2001). The income aspect has been also broadened to encompass a wider concept of prosperity i.e. social freedoms, right to extend one's knowledge, and noticeable well-being. Presently, human capital is the most often defined through knowledge, skills, competence and other attributes embodied in a human being that enable establishment of personal, social and economical prosperity (OECD 2001).

Agriculture in post-socialist countries is, in great measure, associated with unqualified labour, old ways of management and low competition. Hence, agricultural areas often are associated with low living standards, lack of development perspectives and low enterprise of inhabitants. Considering the need of structural and functional changes in the agriculture of post-socialist countries that are linked with adjustment to the market economy, human capital turns out to be important because of two reasons. First – the introduction of new and efficient ways of management is not possible without knowledge and skills of rural people. Second – because of the surplus of people working in and living off agriculture, there is a need of multifunctional development of areas that have been agricultural so far as well as of finding new sources of people's support. However, this is possible only in the areas with high quality of human capital.

Considering aforementioned remarks, we aim to answer the following questions: whether the quality of human capital observed in agricultural areas in Poland is lower than in other parts of the country and whether (and to what extent) the level of agrarisation may explain the level of human capital. Additionally, we attempted to determine if the same relations occur between individual components of human capital and agrarisation. Determination of relations between these features as well as their spatial analysis were essential issues that we considered.

At the beginning we delimited agricultural areas. Then we compared the picture obtained with the spatial diversity of human capital. The analysis of human capital was based on three groups of measures. They are related to investments on human capital, its resources and effectiveness of its application, successively.

Data and method

Data comes from the Regional and Local Database of the Main Statistical Office (www.stat.gov.pl). Delimitation of agricultural areas was based on the following features: (1) share of arable land in total area, (2) share of agricultural workers in total number of employed, and (3) share of households relying on agricultural incomes. Because of high correlation between features (2) and (3), only (1) and (3) characteristics were considered in further calculation – as they turned to be related the least.

Human capital was determined on the basis of the following features (S – stimulant, D – distimulant) and are classified in following groups:

A. Investments in human capital

1. level of readership – number of books borrowed from libraries per capita (2002–2004 mean) – S

2. self-government expenditure for education per pupil in PLN (2002–2004 mean) – S

3. inner and outer migration balance per 1000 inhabitants (2002–2004 mean) – S

B. Human capital resources

1. share of people with university education (2002) – S

2. share of councillors with university education (2002) – S

3. demographical load- number of people at pre- and post- economically productive age per person at economically productive age (2002) – D

C. Effectiveness of human capital applications

1. enterprise- number of private enterprises registered in REGON system per 1000 inhabitants (2002–2004 mean) – S

2. communal budget revenue per capita in PLN (2002–2003 mean) – S

3. excess mortality of men at the age of 35-60 (2002–2003 mean) – D

All indices in this paper were calculated on the basis of the following formulas (Parysek, Wojtasiewicz 1979):

$$W_S = \frac{1}{n}\sum_{j=1}^{n} y_{ij}$$

where: W_s – synthetic index, y_{ij} – standardised value of feature j in unit i, n – number of analysed features.

Standardised value of feature j in unit i was determined as follows:

$$y_{ij} = \frac{x_{ij} - x_{j\,min}}{S(x)} \quad S$$

$$y_{ij} = \frac{-(x_{ij} - x_{j\,min})}{S(x)} \quad D$$

where: x_{ij} – value of feature j in unit i, $x_{j\,min}$ – minimum value of feature j, $S(x)$ – standard deviation.

Classification of all features and indices was carried out on the basis of arithmetic mean and standard deviation. Following five classes were distinguished (Table 1).

Thanks to the procedure described above, three middle intervals in each classification have the range equal to $^2/_3$ of standard deviation, and units with average values of the analysed characteristics occur in the middle class.

Table 1. The manner of determining classes

Class	Value of index W	Feature value
I	$<x + S(x); + \infty)$	Very high
II	$<x + \frac{1}{3}S(x); x + S(x))$	High
III	$<x - \frac{1}{3}S(x); x + \frac{1}{3}S(x))$	Average
IV	$<x - S(x); x - \frac{1}{3}S(x))$	Low
V	$(-\infty; x - S(x))$	Very low
	where: W – value of described feature, x – arithmetic mean, S(x) – standard deviation	

Delimitation of agricultural areas

In 2003 arable land accounted for more than 58% of total area of Poland. Share of arable land in particular regions varies a lot and is the result of many factors
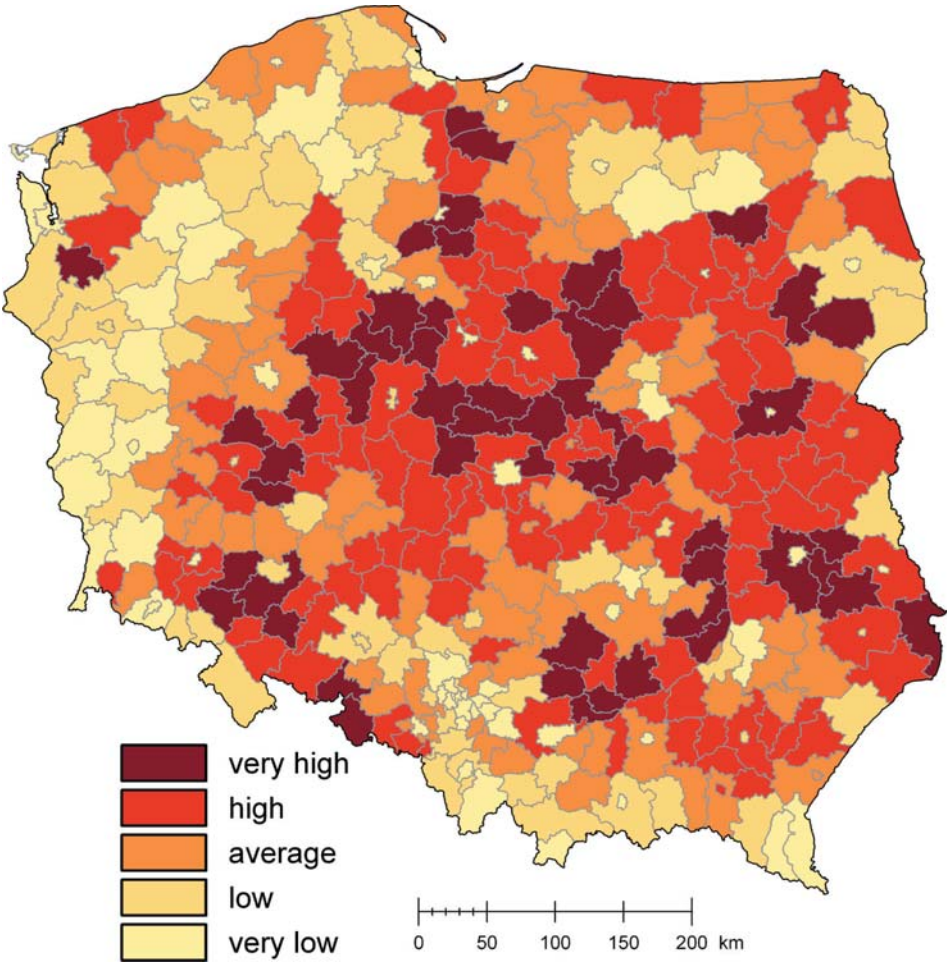

Figure 1. Share of agricultural land in total area by counties, 2003

(Fig. 1). It depends mainly on former socio-economical development in various historical periods in different parts of the country as well as on the rate of usefulness of environmental conditions for the needs of agriculture (Bański 1998). These factors, in particular, caused that Żuławy region, Małopolska and Lubelska Uplands as well as Śląsk Lowland are the areas with the highest share of arable land in Poland.

In some areas of the country, agricultural activity constitutes the main source of income for many families (Fig. 2). Such a situation occurs mainly in the eastern part of Poland as well as in the regions of Kujawy and Wielkopolska. In the former case it is related to the lack of clear alternative for agricultural production. Economic potential of the region is too low to generate non-agricultural jobs. In turn, the latter situation concerns highly specialised production that brings significant benefits to the owners. Over 85% of families that depend on incomes from agriculture gain their income from work in their own farm.
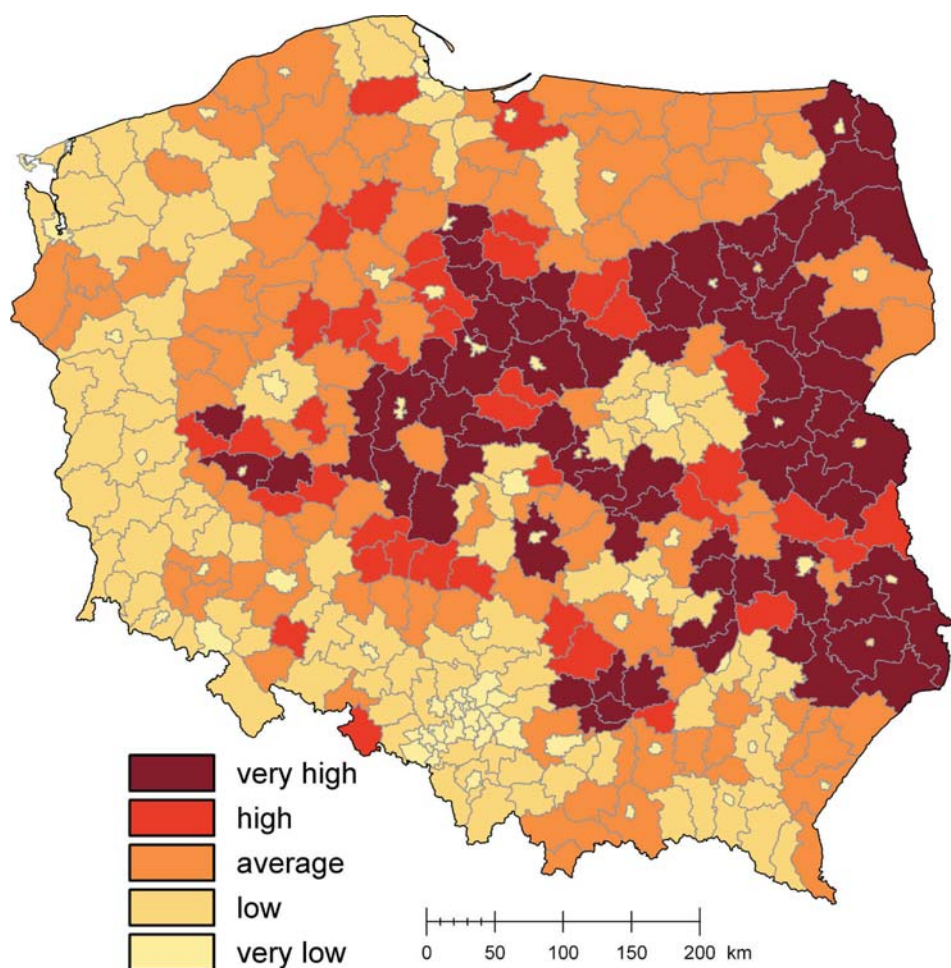

Figure 2. Households depending upon income from agriculture, 2003

On the basis of two aforementioned features and the method described at the beginning, the so-called agrarisation index was worked out. It indicates regions, where agriculture plays an important role because of space management as well as employment and inhabitant incomes. The highest values of the index (class I and II) are characteristic for eastern and central Poland – especially peripheral areas of Mazowieckie, Łódzkie, Lubelskie, Kujawsko-Pomorskie and Wielko-polskie voivodships (Fig. 3). Counties classified in these two classes are later referred to as the agricultural areas. The lowest values, in turn, are typical for separated urban counties, the region of Górny Śląsk, mountain areas and densely forested parts of Pomorskie and Lubuskie voivodships.

It is necessary to stress that the described index does not include qualitative features of agriculture such as its extensiveness or productivity, size of the households, commodity or use structure as it was not the aim of this measure.
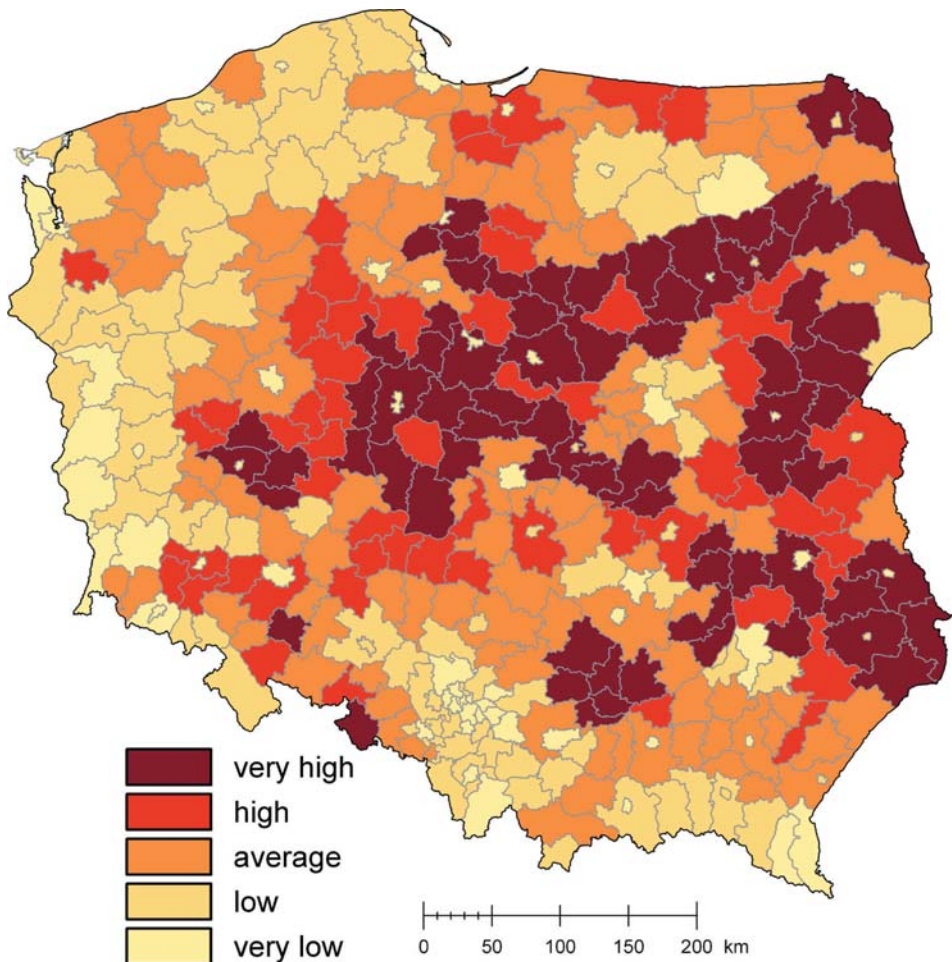

Figure 3. Counties by the values of the agrarisation index, 2003

Human capital

Analysis of human capital carried out in division into three categories enables to present this phenomenon in a comprehensive manner.

Indices (A1, A2, A3) used to establish the level of investment into human capital enable to describe some important aspects related to the increase in knowledge and skills in a given community. The level of readership determines engagement in rising the level of informal knowledge (gained apart from the education system). Local authorities' expenses on education should provide potentially better conditions for knowledge acquisition. Migration balance affects the decrease or increase in human capital resources as people who migrate are the most often young, well-educated, venturesome and eager to change. The human capital resources were described with two features that are connected to the level of education (B1, B2). The level of education of the population shows the formal knowledge resources and is a basic feature that serves to describe human capital. Education of the councillors is also important. As they decide about the way of development and animation of economic life, they are this social layer that should have proper competence. Demographical load (B3) informs about the balance between people in the economically productive age and those supported by them, which enables illustration of human capital in quantitative way. Features concerning economic (C1, C2) and health (C3) aspects were included in terms of effectiveness of human capital application. The enterprise as a feature describing people's ability to take up challenges and activity is an enormously important component of socio-economic life. Communal incomes reflect both success in the activity of inhabitants and efficiency of local governments. Excess mortality of men is one of the most essential features related to health conditions and pro-health attitudes of the society that, in great measure, are the consequence of the level of formal knowledge. One should remember that groups of features distinguished in this way are related to each other not only in a simple cause-and-effect manner: investments-resources-effects, but also there are other relations: e.g. effects-investments.

In the group of "investment into human capital" (Fig. 4) there is no evident regionalization, while urban areas stand out positively. This has a couple of reasons. Towns, because of the there offered chances for better-paid and more prestigious work and because of the better access to social infrastructure, are attractive destinations for migration. Expenses for education are in towns significantly higher, too. Low investments occur in Opolskie region, where this is mainly caused by the outflow of people to the neighbouring agglomerations and abroad. In a part of the region of Pomorze, as well as in central and eastern Poland low investments are connected with the specificity of these areas. These are mainly rural areas with great emigration and poor access to social infrastructure, which results in the low level of readership.

When analysing spatial diversity of human capital resources one should pay attention to the dominant role of large towns (Fig. 5). These are the places where
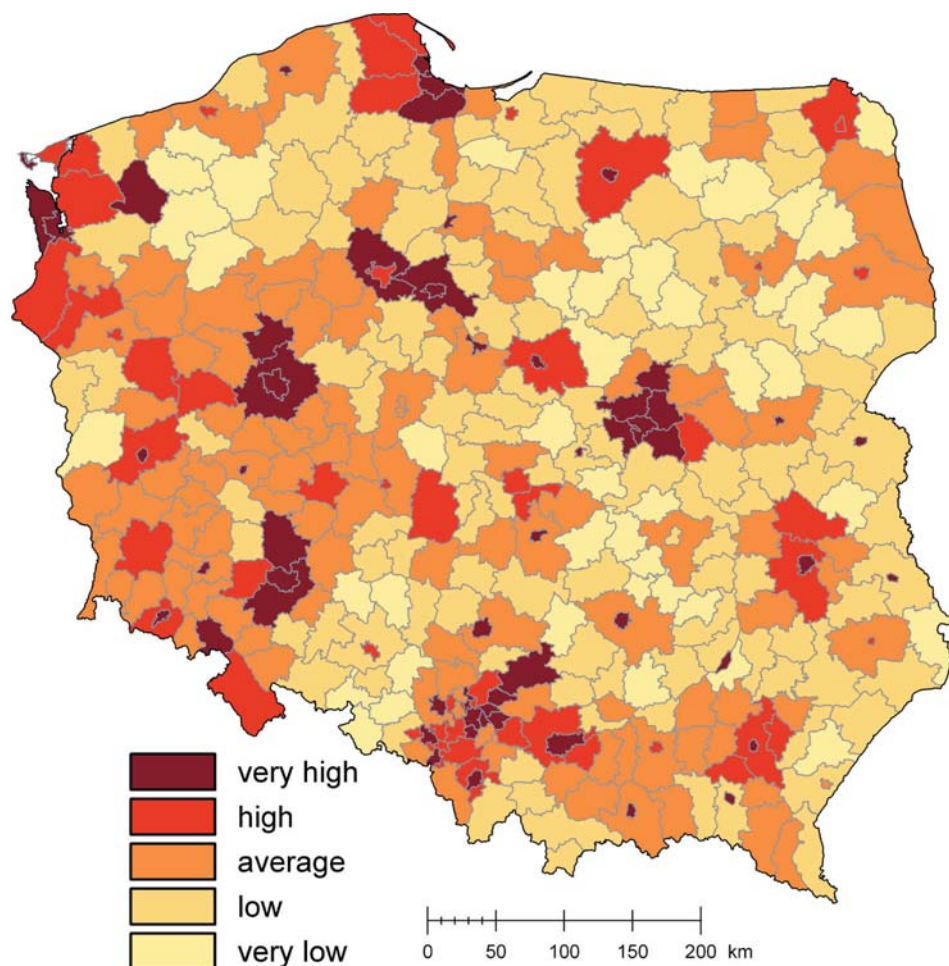
Figure 4. Investments into human capital (composite index) in counties

people with higher education levels concentrate mainly because of better access to universities, lower costs of studying for the local people and immigration of the well-educated ones to work. Local authorities in towns distinguish also themselves as having a higher level of education. Immigration of young people and lower birth rates result in smaller demographical load, as well. This phenomenon is perfectly evident in case of Warsaw, Kraków and towns of the region of Górny Śląsk. A belt from Małopolska to Dolny Śląsk, western Poland and seaside region also emerges clearly. These are areas where human capital resources are higher than in the rest of the country. Areas located away from large towns (mainly rural ones) are characterised by relatively small resources of human capital.

The highest effectiveness of human capital occurs in towns, in the western part of Poland, Pomorze region and in the majority of southern Poland (Fig 6). The split into the west and the east is evident. But unlike in the case of human capital
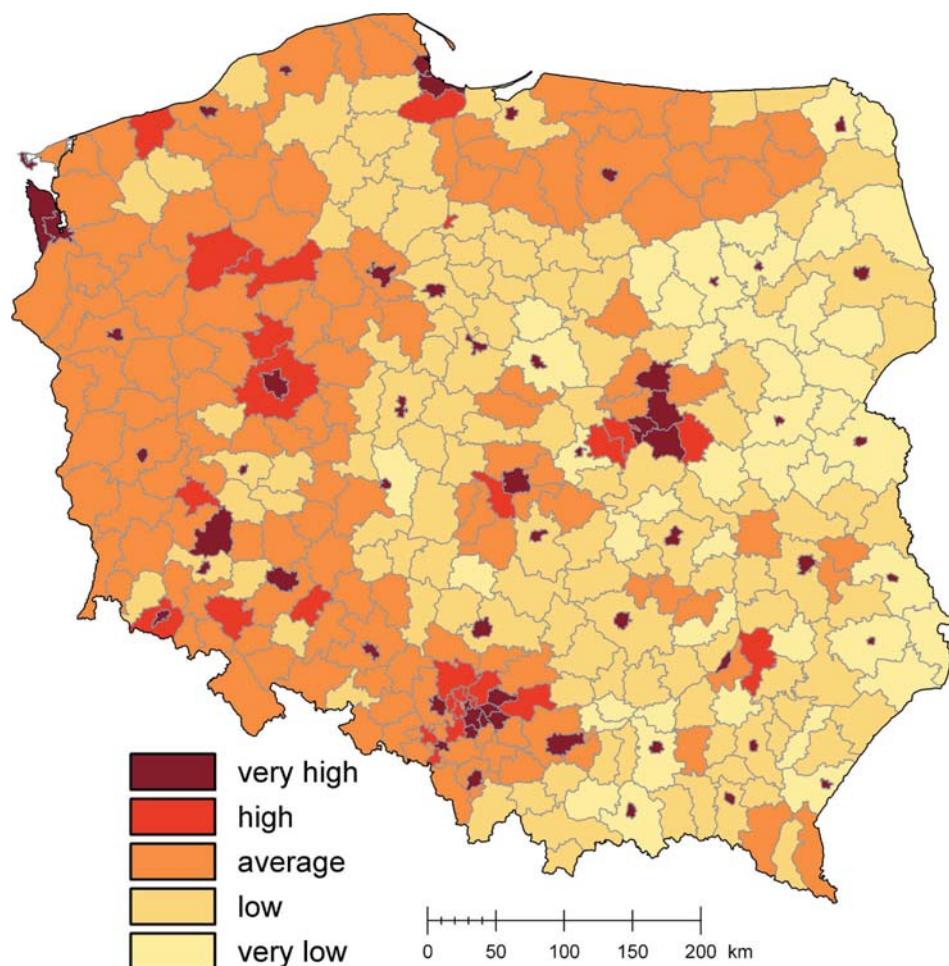
Figure 5. Human capital resources in counties (composite index)

resources, in the west the difference between large towns and areas located away from them is not so great (e.g. Wielkopolska, Zachodniopomorskie). In the east, similarly to case of human capital resources, the town-countryside division is sharp. It is mainly a result of greater enterprise of people from the west and greater effectiveness of local authorities. One should remember that such situation is strongly affected by better conditions for economical activity- proximity of western border (investments, diffusion of values and attitudes), better infrastructure, lower share of people that have been living only on agriculture until recently.

Spatial diversity of the synthetic indices of investments, human capital resources and effectiveness presented in Figure 7 displays the above described regularities. It is important that the town-countryside division is more evident when all features related to human capital are included in one synthetic index than in the case of partial indices. One may state that in town there is an accumulation of
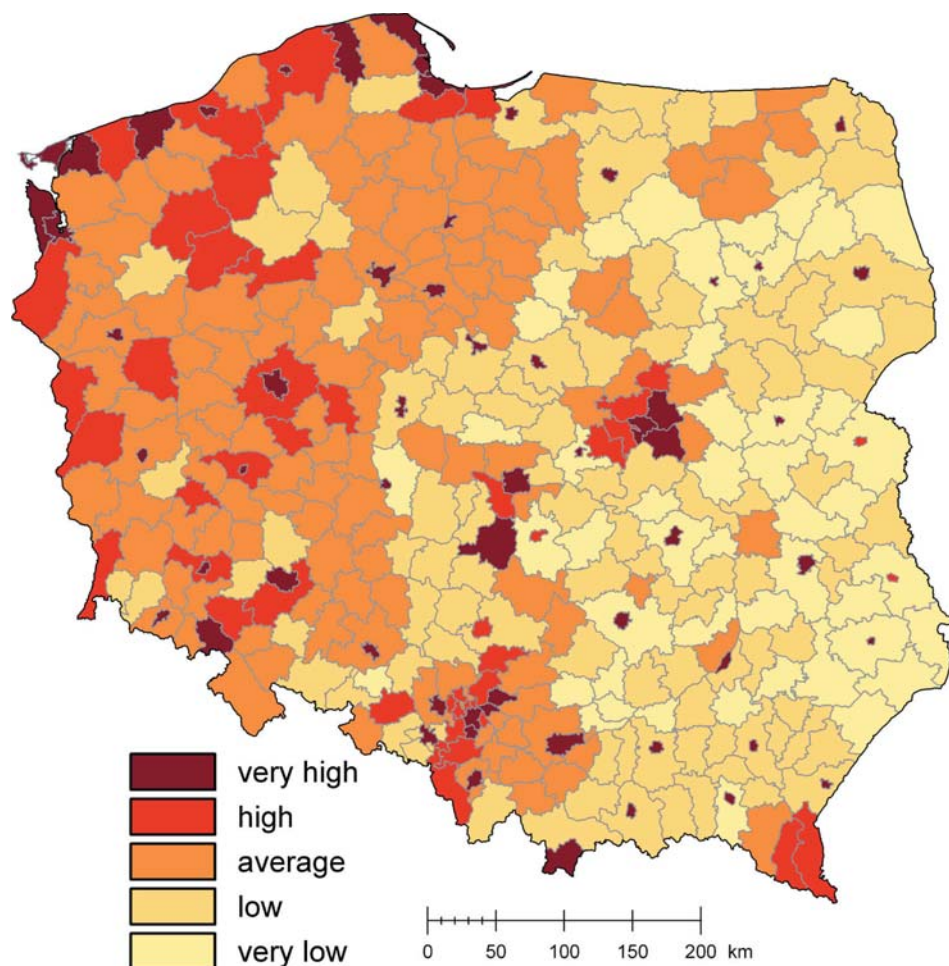
Figure 6. Effectiveness of human capital in counties (composite index)

investments, human capital resources and effectiveness, and that their correlation is strengthened. The core (high value of the index) and the peripheries (low value) arise obviously. It is evident that the larger the town, the greater the area of higher or medium human capital. This is most obvious in the case of Warsaw. Similar situation occurs around the conurbation of Górny Śląsk, in the vicinities of Kraków and Poznań. This is caused also by the generally better level of socio-economical development, as the majority of these towns are located in regions recognised as well-developed for ages.

The east-west dimension of the diversity obtained is also very evident. This is the result of the aforementioned causes. However, once all three components are included, the diversity is less sharp.

High level of human capital in the largest towns results from a specific environment supporting its establishment. It is worth noticing that in a town, as in the
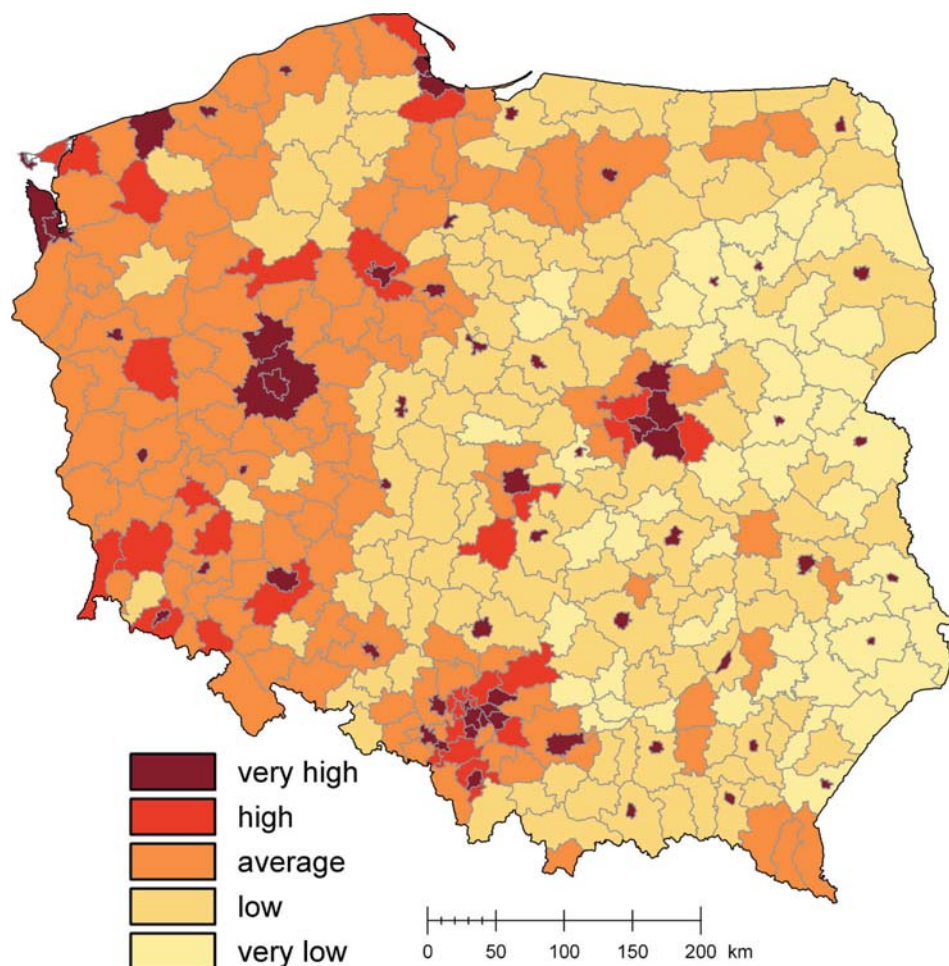
Figure 7. Human capital – one composite index in counties

place inhabited by a great number of people, face-to-face contacts are very usual, which to a great extent affects the extension of human capital. This is connected with the fact that these contacts help in successful communication, are useful in problem-solving and enable socialisation, education and increase in shared values and attitudes (e.g. Bathel et al. 2004, Storper and Venables 2004). Universities and high schools play an important role, as they are not only responsible for the level of education, but also for the establishment of enterprise basis. Population in towns and in the neighbouring areas has the easiest access to higher education, not only due to the lack of the distance barriers, but also to better economic situation of urban population. Rural youth constitute a small proportion of students, which is mainly connected to the cost of studying (economic barrier).

Relations

Spatial diversity of all three components of human capital is strongly correlated to the index of agrarisation. Mean values of the partial indices of expenses, resources and effectiveness of human capital in classes of the index of agrarisation are shown in Figure 8. In all three cases a significant relationship can be seen: the values of components of human capital increase in line with passing from classes with important role of agriculture in land use, income and employment (classes I and II) to classes where the agriculture is not so important (classes IV and V).

The distance in effectiveness and human capital resources is especially clear between areas with low and high values of agrarisation index. It is strictly connected to the fact of concentration of educated and venturesome people in urban centres. Strong correlation between human capital and urbanisation index ($r = +0,82$) confirms this observation (Figure 9.).

Strong correlation appears also in the juxtaposition of the complex index of human capital and the agrarisation index. Pearson correlation rate equals $-0,72$, which means that as much as 52% of determination coefficient of human capital can be explained by diversity of agrarisation index (Figure 10).

To a high extent, areas with high agrarisation are the opposite of the areas with high human capital. Figure 11 presents the spatial co-existence of areas with high level of agrarisation and human capital. Small participation of such areas confirms negative correlation between these features.
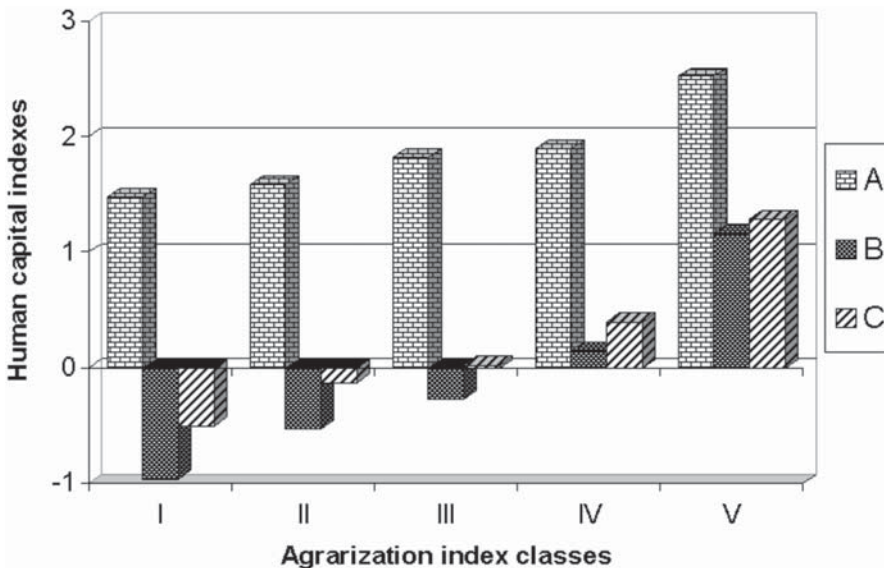

Fig. 8. Pattern of correlation between agrarisation index and partial indices of human capital. A – investments into human capital, B – human capital resources, C – effectiveness of human capital. Agrarization index classes: I – very high, II – high, III – average, IV – low, V – very low.
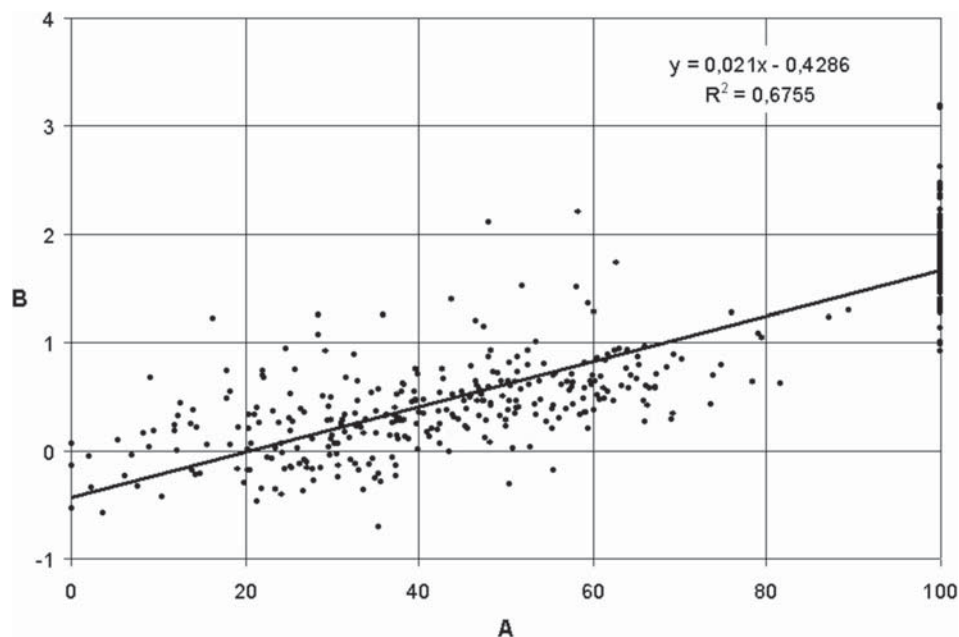
Fig. 9. Correlation between urbanisation index (A) and human capital rate (B) in counties (r = +0,82)
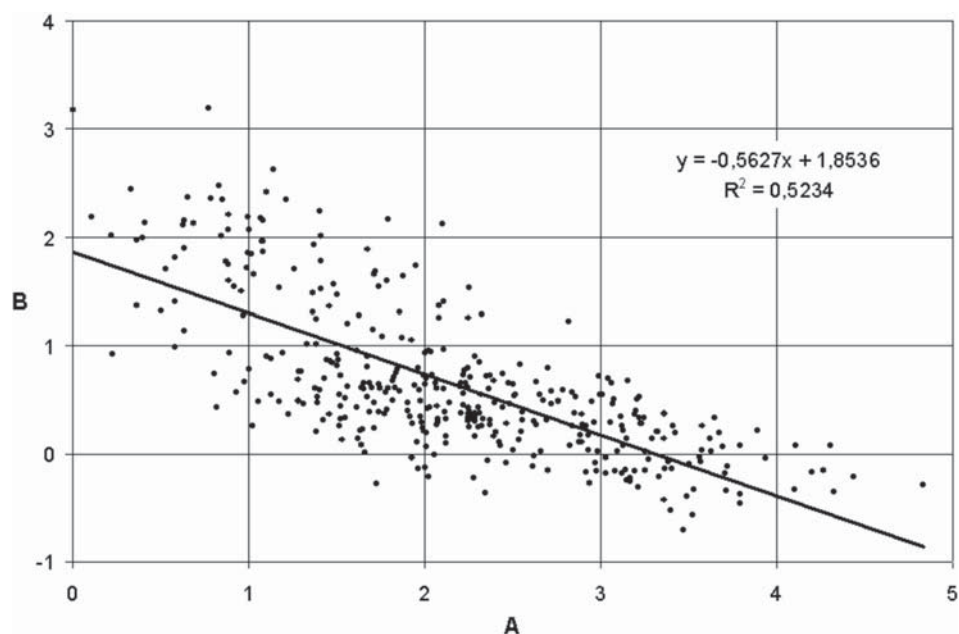

Fig. 10. Correlation between agrarisation index rate (A) and human capital rate (B) in counties (r = –0,72)

Existence of agricultural areas with high level of human capital is determined by two main factors. The distance from the big towns is the first one, while the other is history of some rural areas. Higher level of human capital in rural areas
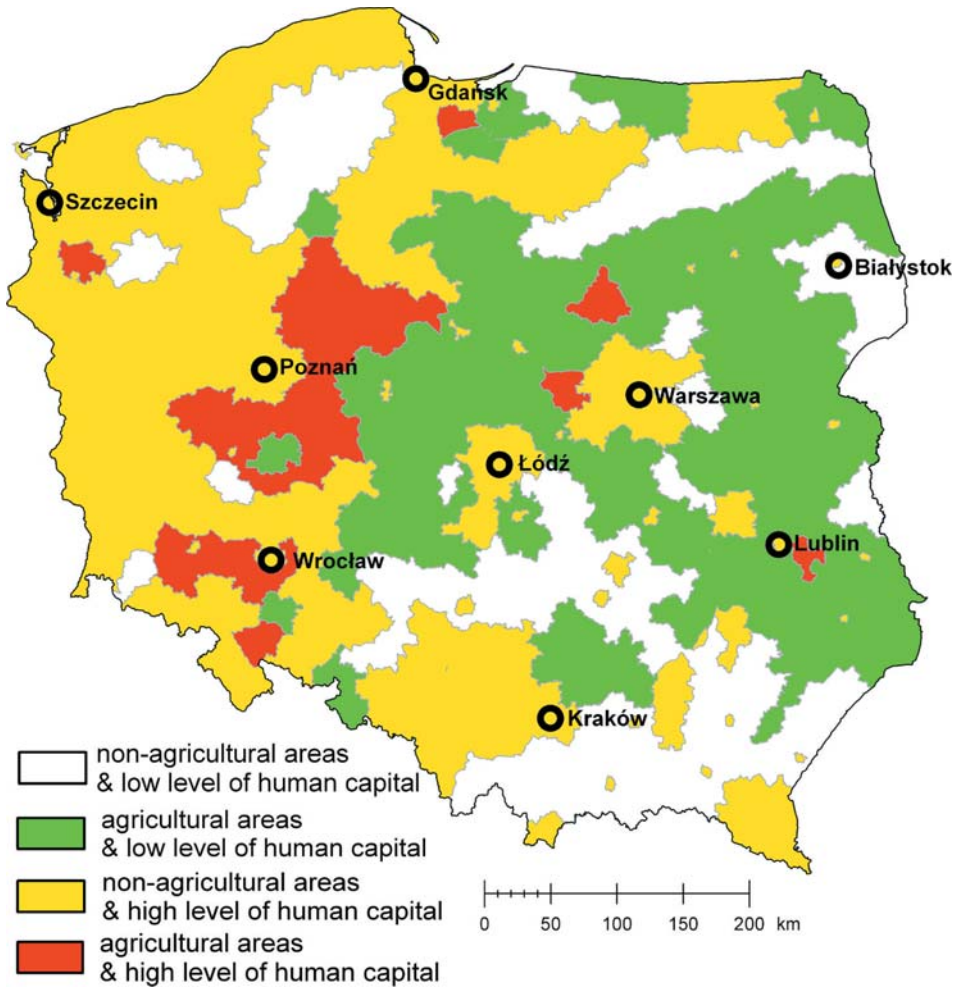
Fig. 11. Comparison of spatial distribution of agricultural areas with human capital rate

of the regions of Wielkopolska and Dolny Śląsk is connected with the character of agriculture. It is better organised and more modern than in the eastern part of Poland. Greater possibility of finding an alternative source of income, resulting from better conditions of economic activity in the western part of the country (better developed services) is important too. It is worth to point out that other very important factors are structure and condition of agriculture in specific regions.

Conclusions

The answer to the questions asked at the beginning is obvious. Agricultural areas have lower level of human capital than non-agricultural ones. Mean value of human capital index calculated in this paper equals 0,14 for agricultural areas, while 0,90 for other ones. Phenomenon of low level of human capital in agricul-

tural areas is adverse, especially when to consider necessary structural and qualitative changes in these areas. Agricultural areas with high level of human capital are not numerous. Their presence is connected to the heritage of Polish space that has its roots in the period of Partitions of Poland among Russia, Prussia and Austria in the 19th century. At the same time it was found out that the fact of having non-agricultural functions does not automatically cause higher level of human capital. Thus, 68 counties (18% of all such units) were found that even though not having agricultural functions, are characterised by low values of human capital. Historical conditions as well as functional structure play an important role. However, the phenomenon of rural-urban division becomes more crucial and, as a result, two completely different societies can be distinguished.

The obviously appearing core-periphery scheme carries serious implications. On the one hand the growth of metropolises that concentrate well-educated and venturesome people should enable some Polish areas to compete at the international level. Great urban centres may be a motive force for the growth of the entire country. However, on the other hand, the process of increase in intra-regional differentiation is evident.

Its further progress may result in establishment of an 'enclave of poverty' in agricultural areas. Hence, the future of these areas, both in the economic and social dimension, to a great extent will depend on the possibility of preventing the process of increase of differences between big towns and agricultural areas. Otherwise, the majority of agricultural areas will soon become the synonym of social exclusion areas with all consequences of this fact. i.e. poverty, lack of jobs, and the developed syndrome of helplessness against challenges created by economic reality.

Acknowledgement

References

Bański J., 1998, *Gospodarka ziemią w Polsce w okresie restrukturyzacji* (Land management in Poland in the period of transformation), IGiPZ PAN, Warszawa.

Bathelt H., Malmberg A., Maskell P., 2004, *Clusters and Knowledge: Local Buzz, Global Pipelines and the Process of Knowledge Creation*, Progress in Human Geography, 28, 1, 31–56.

Becker G.S., 1962, *Investment in Human Capital: A Theoretical Analysis*, The Journal of Political Economy, LXX, 5, Supplement, 9–49.

Cote S., 2001, *The Contribution of Human and Social Capital*, Canadian Journal of Policy Research, 2, 1, 29–36.

OECD, 2001b, *The Well-being of Nations. The Role of Human and Social Capital.*, OECD, Paris, 118.

Parysek, J. J., Wojtasiewicz L., 1979, *Metody analizy regionalnej i metody planowania regionalnego* (Methods of regional analysis and methods of regional planning), Studia KPZK PAN, 69.

Storper M., Venables A.J., 2004, *Buzz: Face-To-Face Contact and the Urban Economy*, Journal of Economic Geography, 4, 4, 351–370.