

The spatial pattern of educational attainment in Hungary

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Background

The composition of the population by education is related to a number of demographic and health factors as well as other aspects affecting quality of life (Graetz et al. 2018). It has also been proven that education is closely related to the economic development and competitiveness of specific countries and regions, although their cause-and-effect relationship is disputed (Czaller 2016, Krueger–Lindahl 2001); considerable inequality of education moderates economic growth (Castello–Doménech 2022). Based on macro data, it is also known that educational inequalities have decreased globally since the second half of the twentieth century (Morrison–Murtin 2010), but the gap between developed and developing countries has barely changed (Barro–Lee 2013). According to Zhang and his co-authors (2015) the explanation for this lies in the fact that in developing countries, there is still a big difference between rural and urban areas in the extent of education.

Domestic research focusing on inequalities in terms of education has also revealed the fact that the educational level of the population plays a crucial role in regional economic growth in Hungary as well (Nemes Nagy–Németh 2005). However, a high level of human capital in a region is beneficial not only for the territorial unit concerned, but also for the individuals, for example in terms of lifestyle, healthcare and culture (Uzzoli 2017).

In Hungary, the education level of the population increased continuously, even during the period of socialism, and this positive trend continued after the 1990 census (Forray–Kozma 2000). Besides, the proportion of those with less than primary school education decreased amongst those older than the age limit of compulsory education, and the proportion of those in education increased at all levels of education. In addition to Budapest and its surroundings, the biggest winners of the favourable trends after the change of the regime included the Budapest–Szeged axis and the Lake Balaton area (Kiss et al. 2008). Reviewing the individual settlement types, not only did the proportion of people with a higher education level increase in the capital

and suburban settlements around the capital, but an above-average increase was also registered in larger cities, primarily in the vicinity of higher education hubs (Jancsó–Szalkai 2017). Even though education indicators have improved in recent decades, the lower education indicators of areas with unfavourable socio-economic indicators have remained unchanged, and a permanent polarization has evolved between developed and less developed areas of the country (Forray–Híves 2013). While the proportion of graduates increased even in the peripheral regions after the turn of the millennium, the rate of growth was well below the national average (Németh–Dövényi 2018).

With regard to the development of regional inequalities in education, it can be established that the equalization process typical of the period of socialism failed to continue after the change of political regime, and convergence started again only after the turn of the millennium (Kiss et al. 2008, Santa et al. 2015). In terms of most education indicators, a reduction of inequalities can be observed after 2001, except for in terms of those failing to graduate from any classes (Szakálné Kanó et al. 2017). The equalization in the proportion of graduates is significantly modified by its specific territorial pattern, which forms prominent island-like regions (Németh–Dövényi 2018). According to the results of the latest analysis by Péntzes et al. (2018), based on the 2011 census data, the educational indicators of the backward settlements are lagging behind the national average or a permanent gap still exists. However, the trend towards equalization confirmed by other studies can only be observed in terms of occupations requiring lower levels of education which are less valued on the labour market.

The current study shows what education differences can be observed at the regional level in Hungary today by means of a data collection from 2021, and it also examines what education level characterizes each type of settlement.

Data and methods

During the analysis, we relied on the data of a survey based on a personal questionnaire conducted in the autumn of 2021 within the confines of the *HAS Cooperation of Excellence Programme, Mobility Research Centre* project. The data collection was carried out through a nationally representative sample of 5,000 persons aged at least 18, living in Hungary and having Hungarian citizenship. During the selection of the sample, a two-stage, proportionally stratified probability sampling procedure was used. The primary sampling units were the settlements involved, while the final sampling units were the relevant age groups of the population. In the settlements included in the sample, the residential addresses were randomly selected according to the number of cases in the sample frame, and, in addition to the residential address, the address card allocated to the interviewers included the gender and age group of the person visited. The sample reflects the proportions typical of the entire adult population in this area according to gender, age (three age groups), education (four education levels) and settlement type (four settlement levels).

In our study we distinguish four levels of education in our analysis: Early Childhood and Primary Education (ISCED 0–1), Lower Secondary Education (ISCED 2), Upper Secondary and Post-Secondary Non-Tertiary Education (ISCED 3–4), and Tertiary Education (ISCED 5–7). In the analyses we examine the respondents' educational attainment by the territorial differences.

We have created an index with the adaptation of the social stratification index (TRI) of Németh (2008) for the analysis of territorial differences: the respondents Educational-Index (EI). The index expresses in a single value the proportion of groups with different levels of education in a given territorial unit. In this study we use the second and third level of NUTS classification (NUTS 2 and NUTS 3) to divide up the territory of Hungary.

The calculation method of the Educational-Index of the respondents:

$$EI = \left(\frac{e_1}{e_2} + \frac{e_1}{e_3} + \frac{e_1}{e_4} + \frac{e_2}{e_3} + \frac{e_2}{e_4} + \frac{e_3}{e_4} \right)$$

e_1 = ISCED 5–7 (Tertiary Education)

e_2 = ISCED 3–4 (Upper Secondary and Post-Secondary Non-Tertiary Education)

e_3 = ISCED 2 (Lower Secondary Education)

e_4 = ISCED 0–1 (Early Childhood and Primary Education)

or it can be written as a formula in the following form:

$$EI = \sum_{i=1}^{K-1} \sum_{j=i+1}^K \left(\frac{x_i}{x_j} \right)$$

$K=4$ (K : level of education)

With regard to the index we have created, we emphasize that its values cannot be interpreted in themselves. The index is suitable for comparing different areas or populations. Thus, the value of the index cannot characterize the level of educational attainment of a region in itself; it is only suitable for describing the regional differences. Since the index is based on four levels of hierarchical interpretation of educational attainment, a higher index value is obtained if more people have higher education. It follows that the higher proportion of those with higher educational attainment in the region moves the value of the index upwards, while their lower presence or the higher presence of those with lower educational attainment move the value downwards. It is also important to emphasize that the value of the indexes is sensitive to the relative proportions of the groups within each territorial unit. The aim of our analysis is only to provide a snapshot of regional differences in Hungarian educational attainment based on the data of a recent cross-sectional survey.

Results

By regional comparison, the results show that high educational attainment is still highly concentrated in Budapest and Pest county (Table 1). The share of graduates (ISCED 4-5) in the capital is twice as high as in other regions of the country, but it also has the highest proportion of people with high school graduation (ISCED 3-4). The proportion of people with only lower education – Primary Education (ISCED 0-1) and Lower Secondary Education (ISCED 2) – is lowest in Budapest and Pest County. In contrast, the proportion of graduates (ISCED 4-5) is lowest in the North Great Plain and North Hungary and the proportion of those with Primary or Lower Secondary Education (ISCED 0-1 and ISCED 2) is highest.

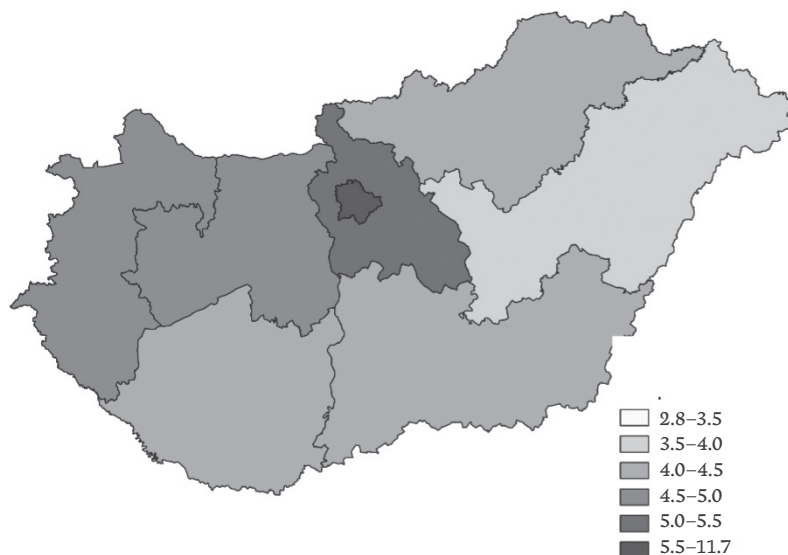
Table 1
Distribution of educational attainment (%) and the values of the Educational-Index by NUTS2 region

	ISCED 0-1	ISCED 2	ISCED 3-4	ISCES 4-5	Educational-Index
Budapest (capital, region)	16.0	12.9	39.2	31.9	11.52
Pest (county, region)	27.0	23.7	31.7	17.6	5.32
Western Transdanubia	28.4	25.6	30.4	15.6	4.84
Central Transdanubia	29.6	24.6	30.8	15.0	4.73
Southern Transdanubia	32.3	25.5	28.0	14.2	4.38
Northern Hungary	34.1	22.8	29.7	13.4	4.28
Southern Great Plain	31.8	24.9	29.3	14.0	4.27
Northern Great Plain	36.8	23.0	27.4	12.7	3.92

Source: KEP3 survey, 2021

This concentration is reflected in the Educational-Index value (Figure 1). The differences between the eastern and western parts of the country are confirmed by the values of the Educational-Index. Figure 1 clearly shows that the EI index value is highest in the capital (11.52), followed by Pest County (5.32), which is only half of the capital's EI index value. Consequently, the capital city has a particularly high population with a high level of education, while Pest County has a high level of education. The regions of Western Transdanubia (EI=4.84) and Central Transdanubia (EI=4.73) have an average level of education. The population has below average and low levels of education in Southern Transdanubia (EI=4.38), Northern Hungary (EI=4.28) and Southern Great Plain (4.27), while the lowest levels are found in Northern Great Plain (EI=3.92). The pattern emerging from the application of EI shows that the regions of Central Hungary and the northern and western parts of Transdanubia are a cluster of regions with high or average educational attainment. Southern Transdanubia and the regions of east Hungary are a cluster with low educational attainment.

Figure 1
The Educational-Index by NUTS2 region



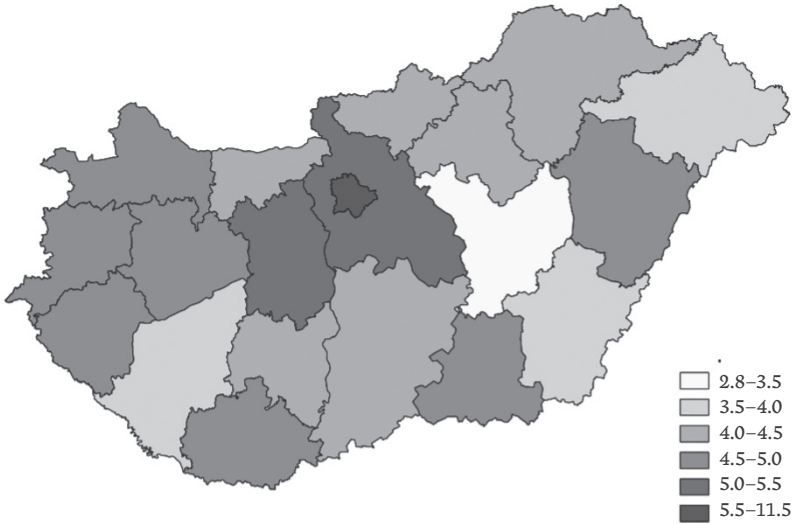
Source: KEP3 survey, 2021

If we look at the Educational-Index by smaller territorial units, it is clear that the educational composition of the population tends to vary within regions (Figure 2). For example, within the Northern Great Plain region, which has the lowest Educational-Index, the value of the index in Hajdú-Bihar county is one and a half times higher than in Jász-Nagykun-Szolnok county. This result confirms that university centres (in this case Debrecen) concentrate populations with higher educational attainment (Sánta et al 2015). The same differentiation is also present in the Southern Transdanubian region and in the Southern Great Plain region, where Baranya and Csongrád-Csanád counties stand out, presumably because Pécs and Szeged are also considered university centres.

Unfortunately, our data do not allow comparisons over time. Taking into account that the educational attainment of a society changes slowly, the analysis requires data series spanning several decades. However, we believe that by disaggregating the sample into birth cohorts, we can still get an indirect picture of how the educational attainment of each region has changed over time. In order to investigate this, we have created three birth cohorts: (1) the first is for 18–35-year-olds (born 1986–2003), (2) the second is for 36–55-year-olds (born 1966–1985), and (3) the third is for 56-year-olds and older (born in 1965 or earlier).

The results show that the oldest generation as a whole had much lower educational attainment, so the educational expansion affected mostly the two younger cohorts (Table 2). Most regions show the Educational-Index values to be twice as high for the

Figure 2
The Educational-Index by NUTS3 region



Source: KEP3 survey, 2021

36-55 cohort than the oldest cohort. There is no significant difference in education between the two younger cohorts in terms of the Educational-Index values.

However, the reduction in spatial inequalities in educational attainment (Sánta et al. 2015, Németh-Dövényi 2018) is confirmed by our data. It can be seen that while the 36-55 age cohort is more disadvantaged in terms of educational attainment in certain regions (Northern and Southern), the youngest cohorts are more equal in rural regions. However, our data do not find a decline in Budapest's knowledge-concentrating power. In all birth cohorts, the capital city stands out significantly.

Table 2
The Educational-Index by birth cohorts and NUTS2 region

	Educational-Index	Born 1986-2003	Born 1966-1985	Born in 1965 or earlier
Budapest (capital, region)	11.52	19.16	19.05	8.31
Pest (county, region)	5.32	7.06	7.90	3.73
Western Transdanubia	4.84	6.99	7.69	3.63
Central Transdanubia	4.73	7.08	6.68	4.33
Southern Transdanubia	4.38	6.29	6.02	2.95
Northern Hungary	4.28	6.20	6.27	3.68
Southern Great Plain	4.27	6.91	5.44	4.10
Northern Great Plain	3.92	6.18	4.07	2.87

Source: KEP3 survey, 2021

If the spatial differences are interpreted by settlement type, a clear settlement gradient in educational attainment is evident (Table 3). While the share of graduates is 9.5 per cent in villages, it is 14.6 per cent in cities, 23.3 per cent in major cities and 31.9 per cent in Budapest. The distribution of the population is reversed for those with only primary education. In Budapest the proportion is 16.0 per cent, while in the villages 39.3 per cent. These differences are also reflected in the EI-index value.

Table 3
Distribution of educational attainment (%) and the values of Educational-Index by settlement type

	ISCED 0–1	ISCED 2	ISCED 3–4	ISCED 4–5	Educational-Index
Budapest (capital)	16.0	12.9	39.2	31.9	11.52
Major city	21.5	18.6	36.6	23.3	7.51
Town	30.2	24.8	30.5	14.6	4.61
Village	39.3	26.7	24.5	9.5	3.19

Source: KEP3 survey, 2021

When the Educational-Index is examined by the type of settlement within regions, there is no spatial equalization (Table 4). People living in villages have significantly lower educational attainment and the value of the Educational-Index for villages in each region is closer to each other than to other types of settlement in the region. Only the villages in the Western and Central Transdanubian regions show a slight increase. The Educational-Index values for cities and major cities reflect the presence of university centres; in regions where the major city is a large university-centre city (e.g., Pécs in Southern Transdanubia), the value of the Educational-Index in the major city is proportionally higher than in other cities.

Table 4
The Educational-Index by settlement type and NUTS2 region

	Educational-Index	Major city	Town	Village
Budapest (capital, region)	11.52	–	–	–
Pest (county, region)	5.32	–	5.95	4.31
Western Transdanubia	4.84	6.94	5.47	3.50
Central Transdanubia	4.73	7.58	4.65	3.73
Southern Transdanubia	4.38	8.38	3.96	2.82
Northern Hungary	4.28	7.96	4.80	2.95
Southern Great Plain	4.27	7.48	4.56	2.82
Northern Great Plain	3.92	7.04	3.45	2.72

Source: KEP3 survey, 2021

As an illustration, we have selected some freely available indicators of quality of life to compare with the index of educational attainment (Table 5). The table shows that regions with lower levels of education also have a lower quality of life. Unemployment is higher, so a higher proportion of the population is at risk of poverty and social exclusion. Poorer living conditions can also lead to poorer health. In these more disadvantaged regions, life expectancy at birth is also lower among both men and women. It is therefore clear, that the three regions with the lowest EI values are also the regions characterized by the worst socio-economic and quality of life situation.

Table 5
The Educational-Index and other indicators of the quality of life

	Educational -Index	Proportion of at risk of poverty or social ex- clusion 2021 (per cent)	Unemploy- ment rate 2021 (per cent)	Average life expectancy at birth for men, 2021	Average life expectancy at birth for women, 2021
Budapest (capital city)	11.52	15.20	2.92	72.84	78.80
Pest (county, region)	5.32	16.60	2.95	71.50	77.94
Western Transdanubia	4.84	15.20	2.23	71.99	78.20
Central Transdanubia	4.73	11.90	2.10	70.42	77.37
Southern Great Plain	4.38	20.30	4.47	70.37	77.24
Northern Hungary	4.28	25.90	6.20	68.34	75.87
Southern Transdanubia	4.27	26.10	4.78	70.19	77.46
Northern Great Plain	3.92	25.40	7.09	69.50	76.92

Source: KEP3 survey, 2021; HCSO Statdat-database

Conclusion

In our analysis we have attempted to examine spatial differences in educational attainment based on recent data. For this purpose, we adapted Zsolt Németh's territorial stratification index, which is able to show spatial differences in education.

Most of our results are in line with previous studies. Although Budapest continues to have a prominent concentration of knowledge, in rural regions there are smaller spatial differences in educational attainment between younger age groups than between older age groups. Previous analyses at the level of municipalities have found that not only regional equalization is observed, but also shifts at the sub-regional level and by settlement type (Sánta et al. 2015). Further investigation of the problem has revealed that this equalization is highly asymmetric. The size of settlements, economic development and proximity to universities have a positive influence on this process. The results clearly show that this levelling off mainly affects the large city agglomerations, which is referred to as "suburbanization of the degree" by the researchers who conducted the study (Németh-Dövényi 2018). As it was not possible to conduct a study at the level of municipalities in our study, we treated the settlement types in aggregate. Our results highlight that the settlement slope is still very strongly present in the distribution of educational attainment. Our results show that the value of the Education-Index for villages in different regions is much closer to each other than to other types of settlements in the region.

Our results also show that the East-West divide in the country remains dominant. While the more developed western regions have a concentration of knowledge, the population of the eastern regions is less educated. Our research also clearly shows that this is where university centres disrupt the pattern. Within regions with a poorer education index, counties with a university centre had significantly higher levels of education.

Finally, it is important to confirm here that education and economic development and quality of life are strongly correlated. Regions with lower levels of education also have worse living conditions. Another line of research is to examine the spatial concentration of schooling and migration together. The study of the relationship between access to education, concentration of knowledge and spatial mobility can make a significant contribution to territorial development projects.

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