

***“Demographic Characters and their Impacts in a Hungarian Region”***

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**Abstract:** The major issues of Hungarian demography are the decreasing population and the increasing average age. The number and proportion of (potentially) active employees have been continuously decreasing. The number of school and higher education attendees is decreasing, while the number of retired people is increasing. Thus the education system, the retirement- fund system, as well as the elderly health care system needs to be reformed.

## INTRODUCTION

The major issues of Hungarian demography are the decreasing population and the increasing average age. The number and proportion of (potentially) active employees have been continuously decreasing. The number of school and higher education attendees is decreasing, while the number of retired people is increasing. Thus the education system, the retirement- fund system, as well as the elderly health care system needs to be reformed.

Consequently, the entire socio-economic structure of Hungary needs to be re-organized.

We analyzed the population change of Hungary in this study by analyzing the impact of temporal population fluctuation on the education system. By itself, thorough understanding of such trends and impacts is fundamental as future employees are educated in elementary schools, high schools, colleges, universities and other educational institutions of today, and the present level of education obviously affects the socio-economic standards of the future. However, education and the subsequent employment mutually interact with each other; while at the same time spatial differences can be further exacerbated. To detect spatial differences of this type we selected a study area that appropriately represents the entire nation, namely the Southern Great Hungarian Plain Region (Dél-Alföld Region, SGHP Region hereafter).

## MATERIALS AND METHODS

Two segments of the entire population were analyzed in our studies: primarily we focused on the population <18 years old, secondary we studied the age-class between 18 and 35 years old. From the viewpoint of this study and the entire education system the number of educated person has a principle importance. It is also essential to know the number of potential students of the future. Changes of the population over the past 20 to 30 years need to be studied and closely analyzed to draw appropriate conclusions.

The <18 years old group of individuals was further subdivided into three classes: (a) 0 to 5 years old age-class; (b) 6 to 14 years old age-class and (c) 15 to 18 years old age-class. By using the selected age-classes, children attending to various educational institutions (kindergarten, elementary school and high school) can be studied. The data was analyzed based on the 2001 demographic data, as this is the last comprehensive dataset of this type. Data was obtained from the URL of the National Statistical Agency. The original dataset was modified according to our statistical need and was organized accordingly with the spreadsheet manager of the OpenOffice 2.0 software. GIS analysis of the dataset was processed with Grass 6.0 spatial analyst software.

First, we analyzed the total population of the individual settlements, and its changes between 1970 and 2001. We also considered the population of the individual age-groups; however this latter segment was only studied on the basis of microregions. The population under the age of 18 was divided into three subclasses:

- (a) under age of 6: this age-group has not yet been exposed to school level educational processes

(b) age 6 to 11, i.e. grade 1 to 5 pupils

(c) age 12 to 17, grade 6 to 8 in elementary school and high school students

## RESULTS

The number of 6 to 18 years old individuals has dramatically decreased lately, and any change in this tendency is unexpected in the near future. When we plan nationwide and comprehensive educational processes, we need to pay attention to the decreasing population of youngsters. However this decrease is uneven both temporally and spatially in Hungary and is usually differentiated according to the size of the settlement.

According to the data of the National Statistical agency, 283,526 <18 years old residents inhabited the SGHP Region. This accounts for about one fifth, precisely 20.5% of the total population (1,377,652) of the region.

The number of residents in the age-group of 6 to 18 years is 204,830, i.e. 14.9% of the entire population of the region. The most numerous age-class within this group are the 15 year old residents, they number 18,758 individuals, while the least numerous age-class was the 6 years old residents, they only numbered 15,115 individuals, i.e. 80% of the age-class of 15 year old residents (Figure 1.)

94,153 residents of the age-group of 18 years old individuals lived in rural areas; this number counts for 33.2% of the entire population of the region. This number was almost identical with the proportion of the rural population within the entire population of the region (34%) in 2001.

The temporal changes of the ratio of the <18 year old population in the SGHP Region is somewhat similar to the national tendency; the decrease is continuous, but uneven. According to the 2001 demographic data indicates that the younger the age-group is, the smaller its proportion among the age-group <18 year old. Figure 1 indicates the predicted data for the year 2006 if this tendency is assumed to continue after 2001. Rate of birth was 16‰ in 1970, while this number decreased to 12‰ by the early 1980s with a further decrease by the 1990s, when birthrate reached only 11‰. The decrease indicated a decreasing temporal change per unit time period. However this dataset has a low reliability as the number of residents in the individual age-classes varied greatly.

The age distribution of the individual age groups in the SGHP Region (similarly to the nationwide distribution) indicate a bimodal curve with two peaks being at the age-groups of 27 to 30 years old and 49 to 55 years old individuals, when data is projected to 2006. For future prediction we only considered the proportion of the women of the age-group of <35 years old. As one of the peaks of the age distribution curve falls into this age-group, a temporal increase in birthrate and proportion of <18 year old inhabitants is expected following the present decreasing tendency.

Table 1 indicates the predicted temporal change of the number of residents in the age-group of <18 years. The number of freshly enrolled students (age-group of 6 years old children) in 2006 counts about 12,000 children and those who are graduating from elementary school (age-class of 14 years old pupils) reaches 17,000 individuals. The

number of people in the age-class of 15 years old pupils counts slightly less than 17,000 individuals; a number is almost identical with those graduating from high school (age-class of 18 year old individuals). The age-classes of 20, 21, and 22 years old count about 18,000 individuals i.e. about 1,000 individuals more people than the younger age-classes.

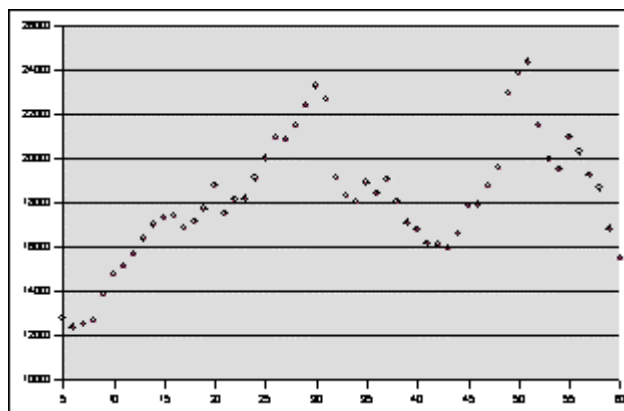
As the age-classes of higher proportion reached their peak reproductive period, the decrease of population ceased, and a slight increase was observed. In 2001, the number of individuals in the <1 year old age-class exceeded the number of 1, 2 and 3 year old children.

What can we expect in three years? Despite the decreasing number of women of highest reproductivity state, the rate of decrease is relatively small, as the majority of women still fall between 30 and 35 years old.

Similarly to the majority of Europe, the average age when women give birth to their first child increases. It is not uncommon, that women over 30 years old give birth to one or two children. Overall, this fact will increase the number of newly born babies, and the number of children freshly enrolling to elementary school (age-class of 6 years old children) will reach 13 to 14 thousand individuals. However, at the same time the number of 14 years old individuals will be slightly over 15,000, just a few hundred individuals less than in the age-class of 15 years old individuals. *Thus the number of schoolchildren enrolling to grades one to three will considerably increase over the next few years, while the number of grade 6 to 8 and high school students will decrease.*

By 2012, the number of children in the age-group of 6 years old children will be higher than formerly, presumably numbering 14,000 children. The number of 14 years old students will reach the historical minimum of the age group, with less than 13,000 individuals. The number of 15 years old individuals will be almost 14,000, while the 15 years old students will number slightly over 15,000. Consequently more students will enroll to elementary schools, and the number of grade 1 to 4 students will increase. This will require a higher number of teachers to teach this age-class, as compared to 2006, the number of individuals this age-class will increase by 16% that equals to 2,000 children. Simultaneously in higher grades a considerable decrease of the student population will be observed, as compared to 2006 the number of student population will fall by 23%, which equals to 4,000 students. In the case of high school students, the number pupils in the age-classes of 15-year-old and 18-year-old will decrease by 17% and 6%, respectively. This equals to 3,000 and 1,000 students, respectively. This population drop will trigger observable, but still manageable changes in the appropriate educational institutions.

**Figure 1. Age distribution of 5 to 60 years old individuals in the studied area.**



The number of 6 years old children will be much higher in 2015 than today, expectedly reaching 16,000 individuals. The number of 14 years old children will range between 12,000 and 13,000, but still exceeding the number in the age-group of 15 years old children. The number of students in the 18 years old age-group will drop by 17% compared to 2006, counting less than 14,000 individuals.

In summary, we can conclude the followings: The overall number of children in the age-group of between 6 and 18 years old will decrease by 2015, compared to their 223,000 population in 2001.

This age-group numbered only 198,000 in 2006, while only 185,000-190,000 individuals is predicted in this age group by 2009, and only 175,000 by 2012. Similar number, i.e. about 175,000 individual is predicted by 2015. The number of elementary school students numbered 150,000 in 2001, while by 2009 only 135,000 children are predicted, and by 2015 only 110,000 to 115,000 individuals is predicted. At the same time, the high school population will decrease from 72,000 to 66,000, and to 63,000 by 2015.

As we have seen on the above mentioned figures, the age-group of the 35 to 40 year old generation, and their children, the 15 to 20 year old generation has a low proportion compared to the overall population. The high proportion of the 20 to 25 years old age-group has a low reproductivity rate, much less than based on the earlier tendency. If earlier tendencies apply, then an increase of birthrate would be expected. In 2005, the 5-year-old age-class should have outnumbered the 6-year-old age-class; the <1 year old children would number twice as much as in reality (!). This phenomenon is partially explained by the higher average age of women giving birth to their first baby. The majority of the <25 year old students are full-time college or university student. While only 32 percent of that generation attended to higher-educational institutions over the 1990s, their proportion reached 45% by 2006, outnumbering the European average of 35%.

As their financial support is limited, their reproductivity rate is low. On the other hand, the economic structure of Hungary has been considerably reorganized. Employment is limited, commuting is more frequent, which counteracts with long-distance relationships.

Professional carrier enjoys priority compared to private life, resulting in postponed and shifted age of giving birth to the first child. It is often observed among individuals graduating from higher educational institutions that their first child is born when parents are over 30 years old. Simultaneously, the average number of children per family is two, dropping from the former average value of four children per family.

However, among the population of low education level, the average age when parents give birth to their first child is lower than in the case of population of more highly educated parents. Similarly, the average number of children per low-education level families is higher than in the case of more highly educated families. However, the proportion of the low-education families compared to the overall population is decreasing, and the number of children per family has been showing a decreasing tendency in the case of this group as well; with a value typically being fewer than four children per family.

## **CONSEQUENCES**

On regional levels, teacher shortage and teacher excess can occur within a decade<sup>2</sup>. However, this phenomenon will enable better teaching efficiency in the case of low-number classes. Demand will exist for better-trained and more qualified employees, as reduced number of employees will be employed, and the sustainability of the national economy will require a higher-value contribution from the employees. To achieve such far-reaching goals a more flexible, broadly qualified population needs to enter to the sphere of active employees.

Conflict will arise in those educational institutions where the number of students determines the amount of financial support and centrally issued subsidy. Infrastructural everyday utility costs will not be lessened in the case of lower number of students, thus specific (per capita) costs will increase. Such changes will financially impact elementary schools first, then, in the second part of the studied period, high schools will also be affected.

### **Settlement-specific impacts**

In the SGHP Region three basic types of settlements can be distinguished:

- rural areas (farms, hamlets, villages)
- urban areas of secondary importance
- urban areas of primary importance

Age distributions considerably differ among the three types of settlements. This difference is caused by the difference in the socio-economic structure among the three settlement types, and especially in the case of rural areas, depends on the distance from the administrative and educational centers. Three cities of primary importance (county seats), 37 cities of secondary importance and 213 villages are located in the studied area.

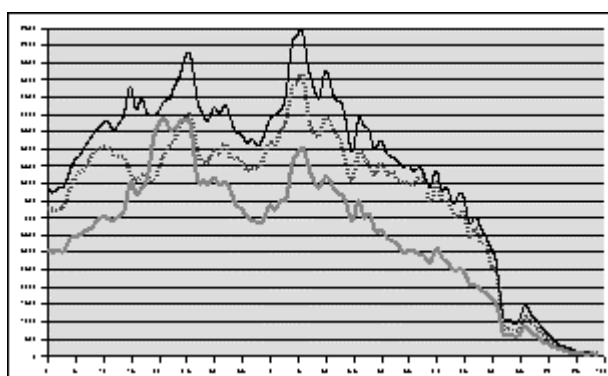
One third of the total population resides in villages and rural areas, 26% in the county seats, while 40% lives in towns. The average number of residents per village is 2,133 individuals, the average number of residents per county seats' is 114,663 and the average

population of the cities of secondary importance is 14,319. The most populated village counts 7,803 individuals, the smallest 131 residents, the most populated town (excluding county seats) has 49,382 inhabitants, and 5,472 people resides in the smallest town. The bimodal age distribution is detectable in all three types of settlements; however difference exists in the height of the individual peaks (Figure 2). The number of individuals in the young age-classes is smaller in the rural areas than in urban areas. The number of young people is significantly less than the number of elderly individuals in the villages, while slightly less in towns and small cities. In the county seats young people considerably outnumber elderly individuals. Consequently, towns and cities represent a significantly different age distribution structure compared to the rural areas. These differences are caused by the differing socio-economic development of the various settlements over the past decades.

Based on the proportion of the age-groups being in their highest reproductivity period, highest birth rates are expected in the county seats. However, as we mentioned above, no “baby boom” has been observed, as the age when women become to age of maternity is shifted towards the late 20s and early 30s. Such phenomena first occurred in the large cities, and have been spreading toward less urbanized areas; consequently its impact was first recognized in the largest cities.

The most mobile generation of the rural population, i.e. age-classes under 30, frequently moves to urban areas for permanent residence. For such reasons, the proportion of the the younger generations decreases in the rural areas and simultaneously increases in the county seats. Changes in lifestyle and everyday habit are also associated with change of permanent residence. As younger generation commutes to the urban centers primarily for educational purposes, they have ample time to get adjusted to the lifestyles of large cities. These lifestyle and attitude changes result in decreasing birthrate and decreasing number of children.

**Figure 2. Population of the SGHP Region according to age-classes.**



Thick gray line: population of county seats, thin black line: population of other cities, dashed gray line: population of villages.

As illustrated on Figure 2, the proportion of the age-group of 10 years old individuals is substantial in the rural areas. This age group comprises of the descendants of the age groups of 30 to 35 and 35 to 40 in 2001 and 2006, respectively. These reproductive age-

classes have not migrated to urban areas, while the 25 to 30 year old rural population has a considerably lower reproductivity rate than in the case of the older age-classes. These latter differences are, again, likely caused by changes in lifestyle. Despite the traditional agricultural lifestyle and the attachment to traditions, changes have been occurring nationwide since the 1990s and have strongly impacted rural lifestyle as well. Such changes include shifted reproductive age span, increasing educational fees and tuition, and the subsequent drop in average number of children per family.

Migration rate from towns is less than migration rate from rural areas toward urban hubs. Thus, the proportion of the age-groups being in active reproductivity state is decreasing compared to the overall population, producing a more non-adequate age distribution. Birth rates have been decreasing in this type of settlements; however, recently, population growth is higher in small cities and towns than in large cities. This phenomenon is likely explained by the lower average age of child-bearing generations. The majority of the population of the SGHP Region in every age-group resides in cities of secondary importance (i.e. excluding county seats).

In summary, we can conclude that the tendency of population decrease is obvious in all the three settlement types; however, regarding the rate and direction of tendencies, considerable differences are detectable among the various types. The proportion of age-groups of 18 to 60 years old individuals and women of highest reproductivity rate are highest in the county seats and lowest in the rural areas. The proportion of the <18 years old age-group is identical in all three types of settlement (22%); however age distribution within this age-group indicates considerable differences. The age-group of 9 to 11 years old individuals has the highest proportion in rural areas, while in urban areas the age-group of 18 years old individuals is the highest, with decreasing proportion toward the younger generations.

## **CONSEQUENCES**

The absolute number of school-attendees will decrease in all three types of settlements in an unsteady way. Elementary schools will experience a significant drop as most children attends to such institutions at his/her place of local residence. This drop may result in 50% drop in the number of school-attendees in larger cities, which presents higher specific per capita costs for the educational institutions. This phenomenon may result in the coalescence of certain schools in order to reduce maintenance costs. However, an increase in the proportion of low grade (grades 1 to 4) is expected from 2012 on, when the generation of 30+ years old women will reach their reproductivity peak, due to shifted average child-bearing age. This fluctuation in children number per academic and fiscal years may further complicate long term planning of school maintenance and finance.

Such problems will be more crucial in settlements of low population where a single school functions as educational institution. In such cases, when local administration is unable to subsidize the increased per capita costs, schools will permanently cease their educational activities. Per capita costs will likely increase as the number of students per academic year will likely drop two – or even threefold, while total maintenance costs (e.g. public utilities) will be constant. To resolve this issue, establishment of regional schools is essential, into

which students can attend from the neighboring settlements. However, such commuting may raise ethical and personal right questions.

This program could only be solved in governmental level. To temporarily maintain schools and other educational institutions at higher per capita cost, the central government needs take over the issue of financial subsidization. In the case of lower number of children, however, the ratio of instructors to children is higher, indicating the possibility of higher-quality education standards.

As high schools are not located in every settlement, such schools will face the problem of fluctuating number of schoolchildren in a different way than elementary schools. Likely, the popularity of various schools will determine the rate of fluctuation in these institutions. Obviously low-popularity and low-reputation schools (such as in textile industry) will considerably suffer from loss of students. Similarly to most higher education institutions, high-popularity renowned high schools are unlikely to be impacted by student loss.

## **EMPLOYMENT**

Recently, industrial segments of low educational requirements have lost popularity among employment seekers. This tendency is in a good correlation with the overall tendency of the EU.

This tendency is primarily affected the textile industry; however most heavy (e.g. metal production) industry and the production of the majority of the mass products have been also affected. This trend, similarly to the majority of developed countries, indicates an increasing demand for qualified and highly-trained employees. This venue has an extreme importance in a country like Hungary where, again similarly to the majority of the EU countries, total population has been decreasing. This decreasing population means lower proportion of the generation of active employment and simultaneously increasing proportion of elderly generations.

The average age of first employment has also shifted toward older ages, as education period of individuals has also expanded. Thus the proportion of the younger generation that is potentially active, but unproductive due to their educational obligations, has also increased. Thus shifting of retirement ages toward older age is insufficient to maintain the present productivity of the Hungarian economy; thus, as a consequence, productivity rate needs to be increased. To achieve higher productivity rates, higher quality of education and training are required. Thus significant investment to educational institutions is unavoidable in the near future. If the average number of schoolchildren and students will decrease, the number of employees employed by educational institutions should not be reduced accordingly, in order to increase the instructor:student ratio and to maintain high-quality education.

## **CONCLUSION**

We studied the short-term effect of population fluctuation on the educational system and employment in the SGHP Region of Hungary.

We concluded that the total population of the studied region slowly, but steadily decreases. The decrease of birth rate is much higher than the decrease of the total population. This discrepancy is caused by the increasing proportion of elderly age-classes. The drop in the number of newly-born babies is caused by the altered lifestyles of the age-classes of high reproductivity rate. The lifestyle change was triggered due to the changes of the socio-economic structure of Hungary over the past decade and half. The average age when mothers give birth to their first baby has been shifted. This phenomenon is likely caused by the longer educational period of the individuals. The average number of children has also decreased, averaging two children per family today. Due to these factors, until 2015, the total number children will steadily decrease. However, meanwhile a delayed increase has begun; i.e. the number of newly-born babies has increased, but at a lower rate than it was expected based on the number of parents being at their active reproductivity years. These fluctuations will create nationwide social and economic tensions in the educational structure. Despite the overall drop of the number of schoolchildren and students, the number of low-grade schoolchildren (age-classes 6 to 10 years old children) will increase, while the proportion of the 14+ years old age-classes will considerably decrease.

As a result, the existence of schools of rural areas is jeopardized, if short-term inadequate financial decisions are made. In larger cities, where more than one schools are operated, coalescence of educational institutions is expected. Such decisions may cause ethical tensions in the society. High schools and secondary schools will be affected diversely by the population fluctuation, depending on their reputation and popularity. Popular and high-reputation grammar schools are unlikely to be short of students and financial subsidies; however the less popular (mainly rural and small town) institutions will face serious financial problems unless adequate governmental subsidence will be available.

Adequate decisions include temporary sustainability and operation of schools despite their increased per capita infrastructural costs. Such decisions would be of nationwide interest as the number of elderly people increase compared to the number of potentially employable, active generation. In such situation, only well-trained and highly-qualified employees could maintain, or perhaps increase the productivity of the national economy. To educate and develop such a social classes, education of higher level is required and unavoidable. To create a nationwide high-performance and vivid educational network system and to adjust to the altered demographic situations an adequate and adjustable maintenance and financial policy need to be adopted and elaborated in Hungary.