

## **Population projections for Hungary and Slovakia at national, regional and local levels**

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## **1. Introduction and brief methodological comments**

Six scenarios of the future national population development have been prepared for both Hungary and Slovakia. The most frequently used three-variant demographical forecast represents the basic output. It has been prepared with using of most commonly applied Cohort-Component method in the deterministic (variant) way. The three major components of the future demographical change are modelled, namely the processes of fertility, mortality and migration. The respective estimated rates of probabilities of these processes are being applied to demographical cohorts. A few alternative methods are used for modelling population development – for instance probabilistic, micro-simulation or accounting methods - yet, the Cohort-Component method appears to be to most acceptable in case of the UN, EUROSTAT and official national forecasts.

Forecasts differ from projection scenarios (simulations) introduced below (Keilman 1990, Smith et al. 2001, Bleha 2006). Unlike projections are population forecasts are unconditional. They represent the forecasters' view on the future most likely population change. Forecasts are unconditional expressing the future „true“ according to their authors, whereas projections put some primary external preconditions thus showing what would happen if some assumptions are given. Sometimes they play the role of so called “warning” scenarios. They were frequently used during the times when Paul Ehrlich published the “Population Bomb” in 1968. At that time, the population explosion was perceived as one of the most probable future scenarios since the running demographic revolution in developed countries made the population increase very strong. Thus, several warning future scenarios were drafted, showing to the public what will happen if the fertility remains at extremely high levels. As the subsequent development shows, the fertility and mortality like “blades of demographical scissors” were re-approaching again, resulting in decelerating rates of population increase.

Since the 1970s population implosion became an actual topic in Europe and other developed countries. Instead of the previously anticipated rapid population increase, de-population and population ageing have taken over the central stage of demography. Following these trends, three alternative population scenarios were prepared in WP 5. All three simulations differ in the migration assumptions, whereas the fertility and mortality assumptions are borrowed from the medium scenario.

Zero-migration scenario shows what will be the population development if no migration gains occur. In other words, it puts the view on demographic future influenced by the fertility and mortality exclusively. The difference between forecasts with incorporated and zero migration projection

actually represents the clear impact of migration on the population change which appears to be positive in case of most European countries.

The “real migration” scenario takes migration not registered in the vital statistics into consideration. Estimation and incorporation of undocumented migration flows are the main objectives of this scenario. Since the official data on migration are very likely underestimated - especially in case of out-migration - there is a great need for such scenarios. The real migration variant was drafted with the medium variant of fertility and mortality.

Finally, the “replacement migration” scenario has been calculated (see UN 2000, Coleman 2003, Lutz and Scherbov 2003 for more information). The results of such a scenario provide answers to the following question: What degree of net migration is needed to avert depopulation? In other words, the simulation demonstrates what level of net migration is inevitable to avoid the natural decrease. It represents “the compensation” level of net-migration. The real-migration variant was drafted with the medium variant of fertility and mortality.

At the sub-national level, a medium (most likely) scenario was used. This scenario was drafted on the NUTS-III, regional level in cooperation with local partners, the cities of Turčianske Teplice and Pécs.

<i>level</i>	<i>scenarios</i>	<i>horizon</i>
National level	Low	2060
	Medium	2060
	High	2060
	Real-migration	2060
	Zero-migration	2060
	Replacement migration	2060
Regional level (NUTS-III)	Medium	2035
Local level (Turčianske Teplice, Pécs)	Medium	2025

*Table 1.* Overview of the forecasting scenarios in the WP5

## **2. Population forecast at national level – basic scenarios**

Population forecast at national level has been calculated for both countries in three basic scenarios – medium, high and low. These three scenarios represent the possible, real development of number and age structure of population as a consequence of possible, real development of fertility, mortality and migration. The medium scenario represents the most likely development from today's perspective. The high scenario presents the less likely but still realistic development in terms of higher fertility and net migration, and lower mortality, as opposed to the low scenario, which presents the less likely but still realistic development in terms of lower fertility and net migration, and higher mortality.

### **2.1 Population forecast of the Slovak Republic at national level**

Population development in Slovakia has changed dramatically since 1989. Substantial changes during the post-communist era have been described and analysed in many studies (Philipov and Dorbritz, 2003, Potančoková et al. 2008, and many others). As most significant were identified shifts in the process of fertility and family behaviour. While the drop in fertility has caused a very strong fertility-dominated ageing, increase of life expectancy has affected the ageing at the top of age pyramid. The affiliated processes such as divorces, marriages and family formations also changed substantially.

#### *Assumptions:*

A detailed cohort and transversal analysis of recent trends in fertility was completed in order to obtain sufficient information and a sufficient base for modelling future assumptions. Three major variants of fertility are introduced below, where the medium scenario represents the most likely future of fertility. The low scenario represents the very low frontier. On the other hand the total fertility rate will not exceed the level that was specified in the high scenario. The increase of the total fertility rates is supposed in all three scenarios (Figure 1). Replacement level of 2 children per woman is too optimistic and unlikely, even if the most optimistic assumptions of high scenario are taken into consideration. The recuperation of postponed births will end in a relatively short time, which is unlikely to take several years at the most. Therefore, potential for a stronger grow is limited.

The timing of fertility changed in the last 20 years and the changes will continue in coming decades. Fertility of older women aged 30 year and over will continue to have a growing tendency, whereas the intensity of fertility of younger women will be going down. The fertility of women aged 35 and over is supposed to increase by more than 50% (Figure 2).

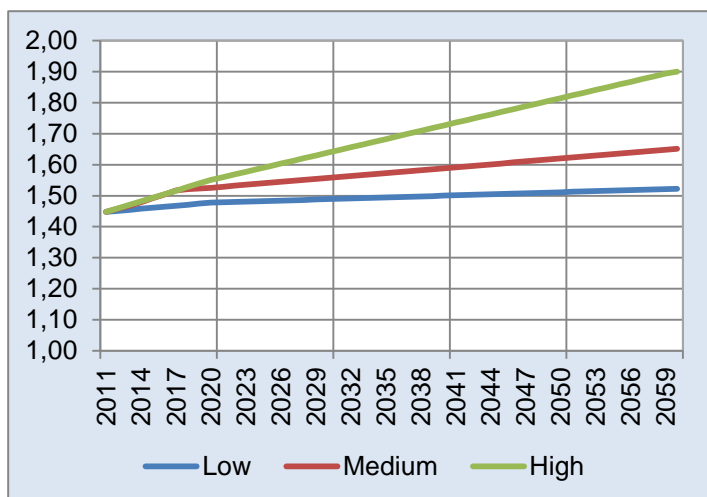


Figure 1. The total fertility rate until 2060 (the Slovak republic)

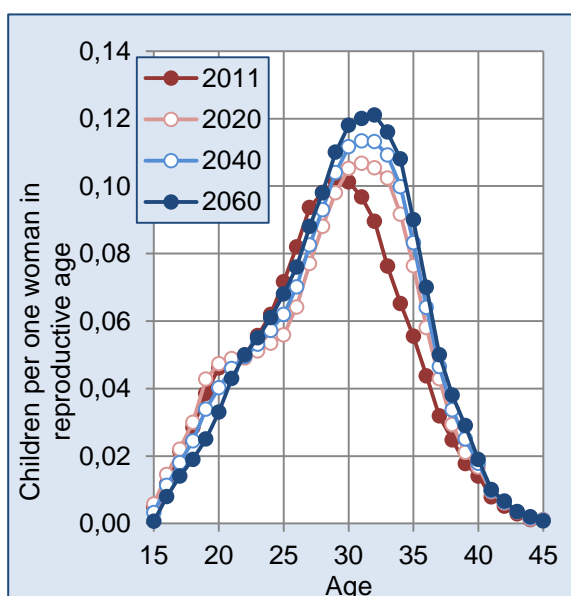


Figure 2. The timing of fertility until 2060 in medium scenario (the Slovak republic)

Trends in male and female mortality of the population have been positive after 1989. The increase of life expectancy is supposed to continue in future in all three scenarios. The most intensive increase will take place in those age groups, in which the difference in comparison to the Western European populations is the most significant. In these age groups, the “potential” for increase is significant, and therefore the rate of contribution to the increase of life expectancy is the highest. The difference between male and female mortality was extremely high during the communist period. This gap has been shrinking in the last two decades. Nevertheless, in spite of a slightly more positive development, male mortality remains relatively high. It is expected that male life expectancy will increase approximately by 14% , and female life expectancy by 9% until 2060 (Figure 3). In spite of this anticipated development, the difference between male and female life expectancy at birth will

be still about 4 years. The most significant contribution to the increase in male life expectancy will take place in the 60 – 75 age category (5 years approximately). This represents about half of the overall increase. With respect to female mortality, in age categories of 60-79 and 80+ is anticipated life expectancy to increase by 3 years (80% of increase will be induced by the oldest population aged 60 years over).

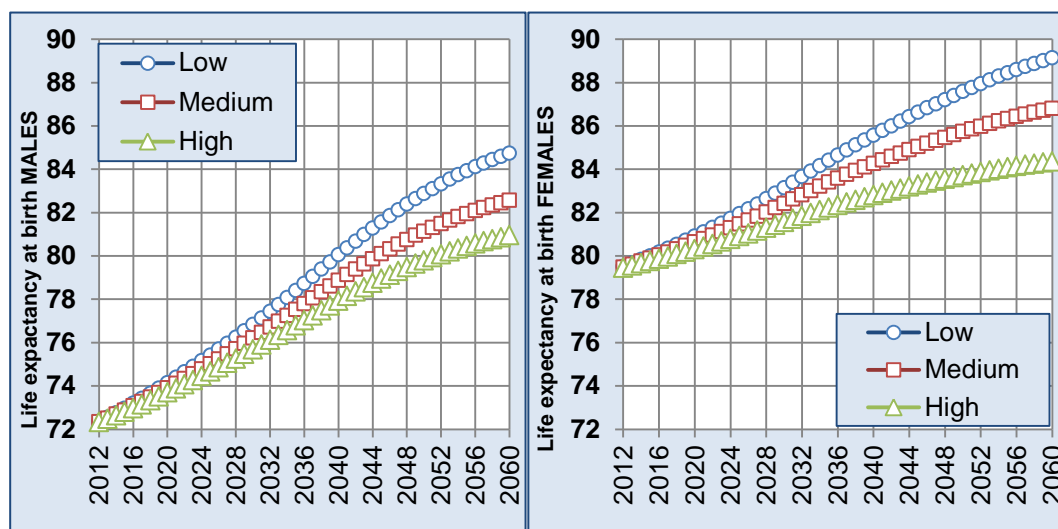


Figure 3. Life expectancy at birth until 2060 (the Slovak republic)

The process of migration is perceived as very volatile in the demographic literature. The uncertainty and inaccuracy of forecasts, especially on local and regional level, is very often caused by inaccurate migratory assumptions. Demographers pay a strong attention to the evaluation of population forecasts (Keyfitz 1981, Keilman a Kučera 1991, Keilman 1997, Bleha 2007). Migration represents a very comprehensive system and the matrix of factors is very complicated. In the second half of the 20<sup>th</sup> Century, the fertility had major impact on the inaccuracy of the population forecasts. Its level changed over time, waves caused by post-World War baby booms were later replaced by the Second demographic transition. Moreover, some pro-natal measures influenced fertility trends in several communistic countries. Recently, fertility fluctuates in a very narrow, as well as very low interval. Thus, the relative importance of migration concerning the inaccuracy has been growing.



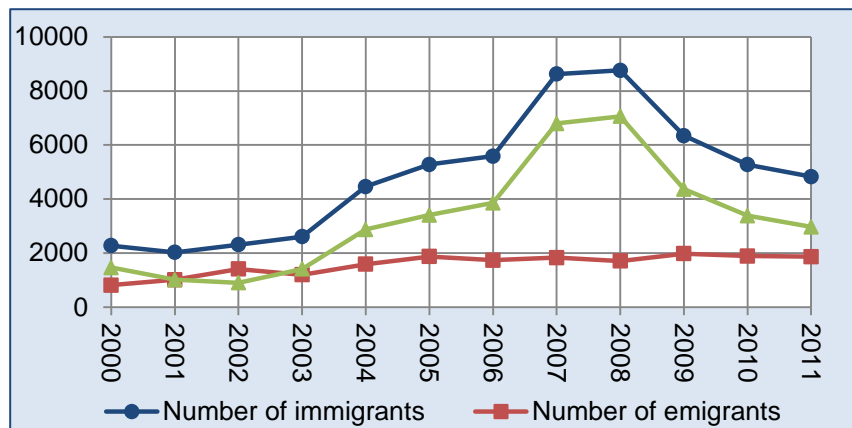


Figure 4. Basic migratory indicators in the Slovak republic, 2000-2011

As Figure 4 shows, the level of migration in the Slovak Republic was affected directly by economic boom and subsequent economic crisis (see more in the WP3 outputs). Talking about sources of uncertainty, the dispute should start with impact of economic crises on migration. The problem is, that economic forecasters cannot come up with relatively accurate economic forecasts, where highs and lows of economic cycles would be highlighted, because this information is crucial for migratory predictions. But, even if economic forecasters could come up with accurate economic predictions, it still would be hard to predict their real impact on migratory behaviour. For instance, will economic down turns intensify migration, or will it keep migration stable? Are migrants now less sensitive to crises that they were 5-6 years ago when the crisis started? Should we expect new behavioural patterns, or “crisis-adjustment” migratory behaviour in the future?

All these questions are hard to answer, but demographers should devote increased attention to the analysis of causal linkages between migration and socio-economic developments. Social scientists who investigated the impact of crisis on international migration brought interesting, yet at the same time diverse results. Martin (2009), for instance, has pointed out that the current crisis differs from all others crises in the past (Oil shock, Asian crisis in 1990s, and others). He argues that the current crisis could be validly presented in a wide variety of graphical shapes. It could be shaped like the V-curve (this represents a quick recuperation), the U-curve (a longer, but still a relatively rapid recuperation), the W-curve (with several transitive periods of decline and growth), or even the L-curve (representing a long-lasting depression). Also, according to Martin, there is no doubt that the current crisis has a more global reach than the crises of the past. Finally, Martin observes that the crisis started in most developed countries, and thus prevented the migrants from having moved into the “boom” countries. This was typical for the crises of the 1970s.

Castles and Vezzoli (2009) in their work try to answer whether the crisis interrupted the migratory trends only temporarily, or it caused and has led to the development of a relatively new structural change. Like some other studies, they are also emphasising tendencies leading to the increase in migrants' vulnerability and growing return migration. They suppose that if migrants have some basic background, linkages, then they try to stay even in worsening situation on labour market. Yet, they dispute function of migrants being like "safety valve" in time of the crisis.

Papademetriou et al. (2010) country studies to show that between 2008 and 2009 migration flows from the new member states to Ireland dropped by 60%. The drop in migration flow to Spain at the same time was more than 65%. Some destination countries became emigration countries basically overnight. The best examples are Ireland and Greece. Finally Kohler et al. (2010) explains differences in reactions of EU and non-EU member state migrants. Return migration from the Great Britain and Ireland is more extensive to the EU countries than to the non-EU countries. They argue that it depends on situation in homelands, namely the opportunities of finding a job there, and the quality of social services.

Besides the impact of economic crises, some other sources of uncertainty have been identified. They are strongly bound to globalisation, geopolitical issues, as well as the position of the macro-regions in the globalised World. The question of migration policies must be tightly under demographers' supervision too. Some useful comments from other SEEMIG partners were received. We tried to include into the future assumptions. The examples are as follows. According to Hungarian colleagues (Dobos Erika) economic crises have an obvious effect on migration. However, one cannot expect that the decline, or the end of the crisis will completely eliminate migration. First, the topic should be treated in accordance with the specifics of each country or region. The migration history, practice and social, historical, cultural factors are not the same in the new member states. Using the results of literature review, expert opinions of SEEMIG partners, the WP3 results and results of foresight exercises, we formulated three scenarios as follows (Figure 5).

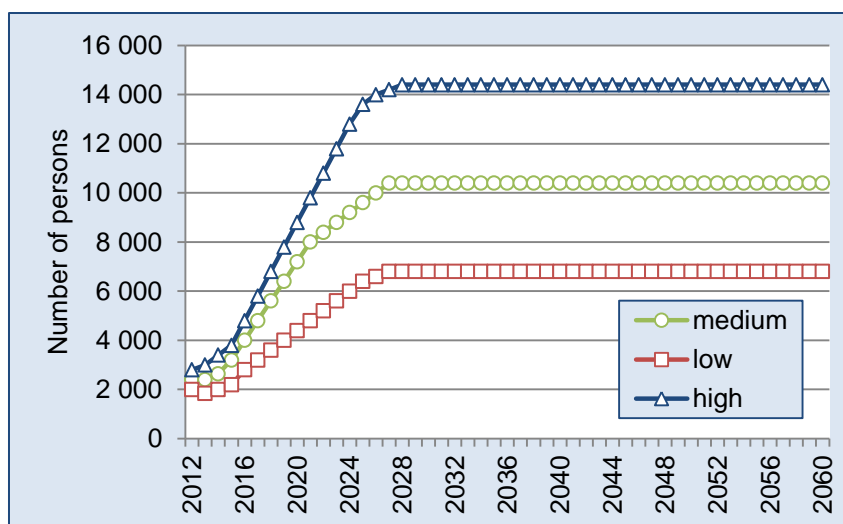


Figure 5. Net migration scenarios for the Slovak republic

All three variants represent growing net migration. Some recuperation of attractiveness is anticipated. In general, the Slovak Republic will be not only a transitive, but also a destination country in the long-run. There is no doubt, that Slovakia will be a destination country in forecasting horizon. The range between the high and low scenario will depend on a set of factors such are migratory measures (asylum policy and openness), end of crisis, or economic development. Consequently, the medium scenario shows a slight increase exceeding the pre-crisis values to approximately 10 000 migrants until 2025. In high scenario, the number could reach 14 000, whereas in the low scenario the net migration should not exceed the surplus of about 6 000 per year. The period after 2030 shows the future in a more or less schematic manner since long-term forecasts are uncertain.

#### *Main results:*

The population size of the Slovak republic is more likely to decrease than grow. As demonstrated in Figure 6, in the medium scenario slight population surplus will be replaced by non-negligible process of de-population. Slovak population size will shrink by 200 thousand inhabitants approximately in the whole forecasting period. The population loss of about 600 thousand inhabitants is expected in the low scenario with more pessimistic assumptions. The population surplus is expected just in case of the high scenario. In such case, the population size should reach roughly 5,7 million.

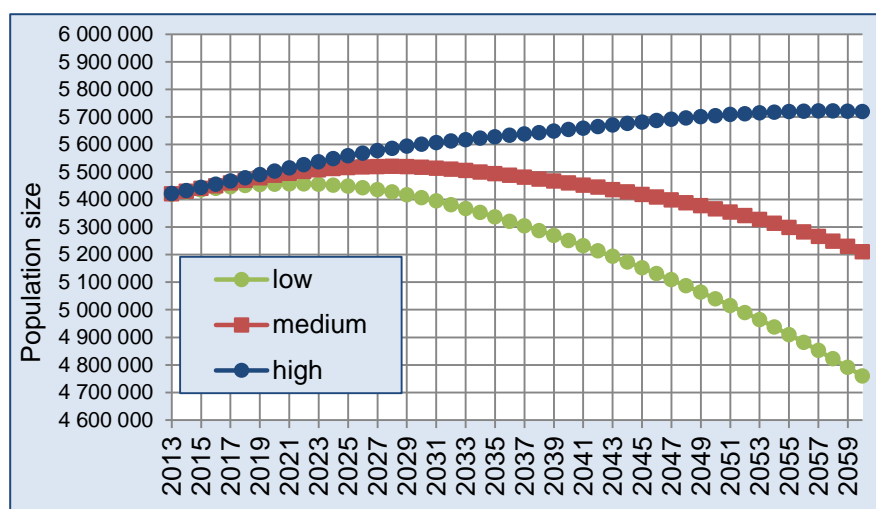


Figure 6. Number of inhabitants in the Slovak republic, 2013-2060

A negative natural increase is sole factor of population losses in the Slovak republic (Figure 7). In all three scenarios after 2020 (in low scenario 2018 already), the annual number of deaths exceeds the number of births. The reason of this is easy to explain. The total fertility rate will be going up, but the number of potential mothers will not. The waves of the very low fertility of recent decades will induce the secondary decrease. Moreover, the deaths will increase as the number of seniors will extend rapidly. This is a direct consequence of “transitive” age pyramid, in which the big “communistic cohorts” are together with younger and less plentiful post-communistic ones.

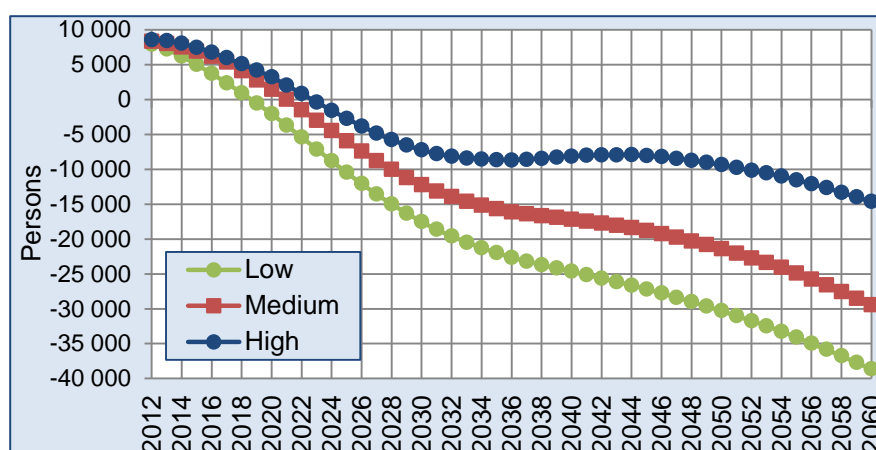


Figure 7. Natural increase in the Slovak republic, 2013-2060

The total annual increase is shaped by the values of both natural increase and net migration. The values of total increase are less pessimistic thanks to the positive net migration being assumed (Figure 8). The difference between curves in Figures 7 and 8 is the clear evidence of migration’s impact on the overall population change.

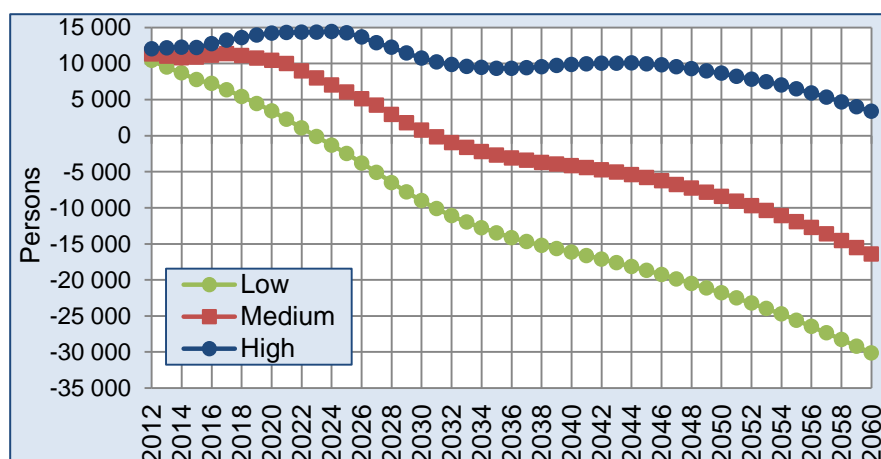


Figure 8. Annual population increase in the Slovak republic, 2013-2060

A very quick population ageing, one of the quickest within Europe, will remain a dominant display of population development in the Slovak Republic (Figure 9). As we depicted above, this is a direct consequence of “transitive” age pyramid, in which the big “communist cohorts” are together with younger and less plentiful post-communist ones. Current value of mean age belongs to the lowest in Europe, whereas the value of 2060 will be at the top of European ranking. The variance of values according to all three scenarios will remain very low for the entire forecasting period. This fact is in a clear contrast with population size development. The age-structural momentum is given, “pre-programmed”, and formed by shifting of generations already born. Thus, the uncertainty in this case is very low. Neither a very optimistic increase of fertility, nor a very high net migration will be sufficient in order to avert population ageing.

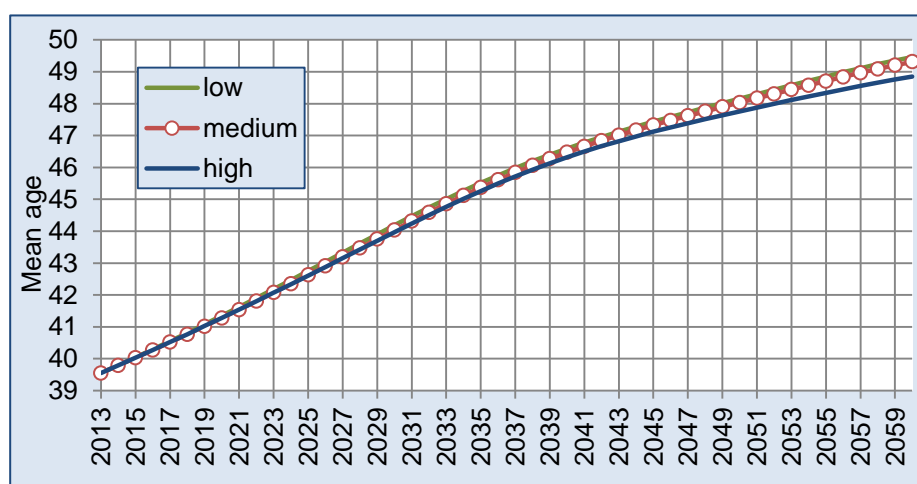


Figure 9. Mean age of population in the Slovak republic, 2013-2060

The impact of the age structural momentum is demonstrated by Figure 10. The only growing category is the category of persons aged over 65. More than million seniors will accrue until 2060 in

population of about 5 million. This number is very fitting with respect to the effort to express the force of population ageing. Shift of big cohorts that had born before 1989 together with an increase of life expectancy is the causal root.

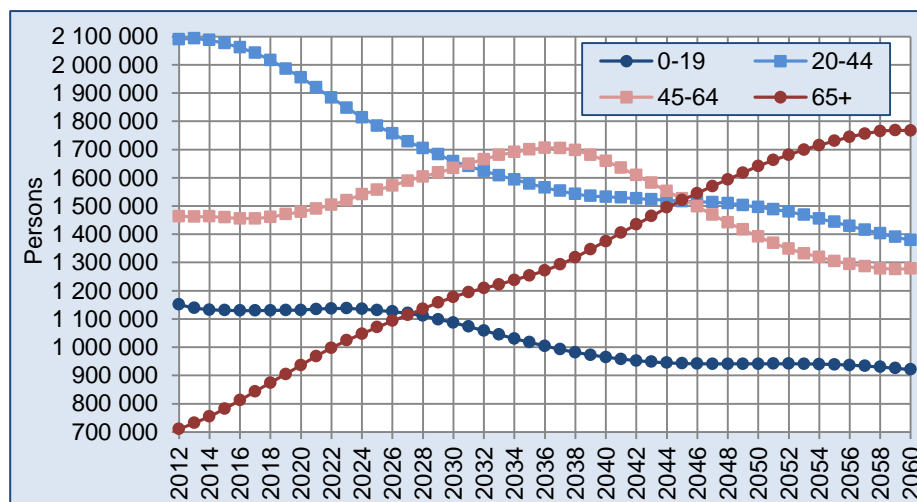


Figure 10. Major age categories in medium scenario, 2013-2060

## 2.2 Population forecast of Hungary at national level

The population of Hungary has been decreasing from the beginning of the 1980s. During the period of democratic transition the initial uncertainties of the transformation, emerging unemployment and rising poverty obviously had negative effect on population development. Fertility decreased, life expectancy became lower, less people got married, more married people got divorced, and the population decrease continued – that is, the signs of demographic crisis became more and more visible.

At the same time, some changes could be noticed in demographic patterns, making Hungarian trends getting closer to the western countries. During the democratic transition migration processes were more vivid, but this fact was to be attributed to the wave of war refugees coming from the countries of South Europe. The next milestone was Hungary joining the European Union in 2004: this time migration became more active again, but mostly immigration to Hungary, not emigration – contrary to the previous expectations. Emigration has intensified after the global economic crisis began in 2008, while immigrants arriving from the neighbouring countries have taken into consideration Hungary as a transit country. In this situation significant positive net migration is less and less likely.

Important changes occurred in marriage and childbearing as well. Childbearing intentions have declined and women's age at the first birth has become higher and higher. This change of fertility pattern was initially hidden by the fall of cross-sectional fertility. Total fertility rate dropped to 1.24

by 2011, reaching the lowest value in the history of the country – however, this rate showed some rise in 2012 again.

The impact of the democratic transition could most clearly be seen in mortality: life expectancy decreased, mortality ratios rose, mostly among middle-aged men. However, life expectancy began to increase slowly but continuously from the beginning of the 2000s, and this trend was not broken even by the effects of the economic crisis.

#### *Assumptions:*

The recent very low fertility in Hungary and the measures worked out to improve this situation are well-known. If these measures are sustained for long period of time consistently, it is almost certain that there will be some rise in fertility as a result. For the medium hypothesis only this effect is taken into account, so calculating with a very small increase, it is supposed that total fertility level reaches level 1.45 in the next decade (Figure 11). In this case fertility level in Hungary will be the same as it is in Austria today.

For high and low fertility assumptions other factors are also involved, not only family policy measures.

If changing trends are due to a change in family formation or childbearing patterns, we can suppose that children who would/should have been born at a younger age of their mothers were eventually not born and therefore they are now 'missing' from the present population. When the change of these patterns will be completed, after the 2020s, these children will probably be born – that is fertility level will gradually be closer and closer to the level experienced earlier, before the changing pattern. This is the high assumption, when the projected total fertility rate is 1.75 in the perspective of the next two decades.

In the light of recent changes in fertility it is likely that the period when women would like to give births to all their intended children will be shorter. At the same time this means that even if births intentions will be higher, the number of births will be lower than in case of high fertility assumptions. The medium fertility hypothesis is level of 1.6 as for total fertility rate. In this case fertility reaches the recent European average but with a delay of one decade.

All three fertility assumptions concern some rise in fertility in the future – but the chance of realisation depends upon the effects of family policy measures and also the permanence of these effects. With cautious optimism we can say that calculable family policy measures and relatively high family allowances might influence fertility level in favourable direction (see the French case, Makay

2009). Considering the fact that young people have relatively high childbearing intentions (about two for a family), it is also promising for the future of fertility (Spéder-Kapitány 2007).

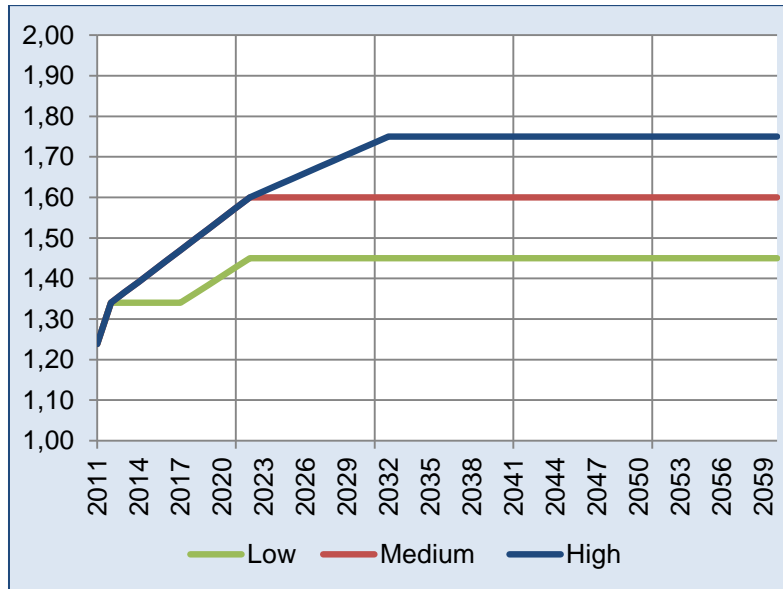


Figure 11. The total fertility rate until 2060, Hungary

The timing of fertility is shown in Figure 12. A distinct shift to the older age-profiles is presupposed in future.

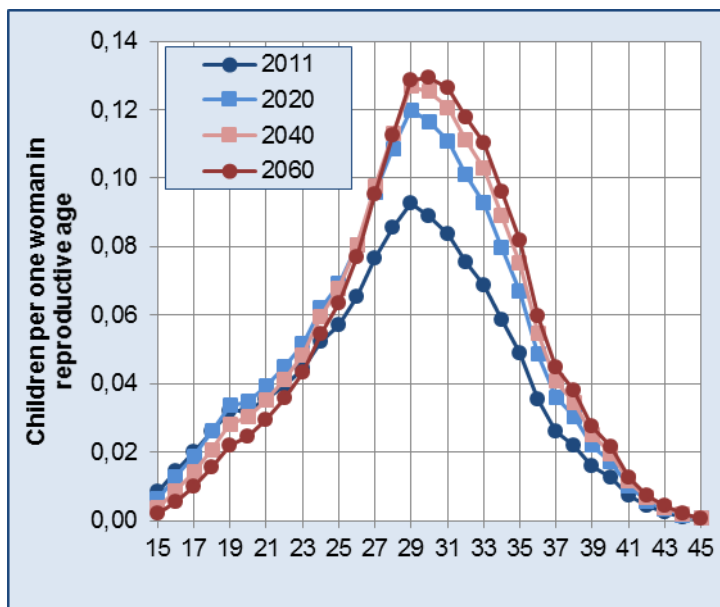


Figure 12. The timing of fertility until 2060 in the medium scenario, Hungary

Concerning mortality, in case of women the high assumption is the continuation of recent trends, the life expectancy of men is getting to closer to women's life expectancy – that is, the recent difference



of eight years will decrease to five years (this is the difference between the life expectancy of the two sexes in Austria now).

The assumptions of the medium variant for both sexes include somewhat lower life expectancy at birth than the high variant, and the difference between men and women decreases to recent European average, that is six years. In the low assumption life expectancy is low, and the approximation of life expectancies of men and women is minimal.

The life expectancy at birth was 70.9 years for men and 78.2 years for women in 2011. According to the hypothesis of the low variant this value will grow up to 72.0 years for men and 79.3 years for women by 2020; these values are 72.6 and 79.8 years in the medium variant; and 73.2 and 80.2 years in the high variant, respectively. As a result of further gradual increase, life expectancy will be about 73.2 years for men and 80.5 years for women by 2030 in the low variant, 74.5 years for men and 81.4 years for women in the medium variant; and, finally, 75.7 years for men and 82.3 years for women in the high variant of population projection. The value of life expectancy will be about 76.8 years for men and 83.8 years for women in the low variant, 80.1 years for men and 86.1 years for women in the medium variant; 83.3 years for men and 88.3 years in the high variant in 2060 (Figure 13).

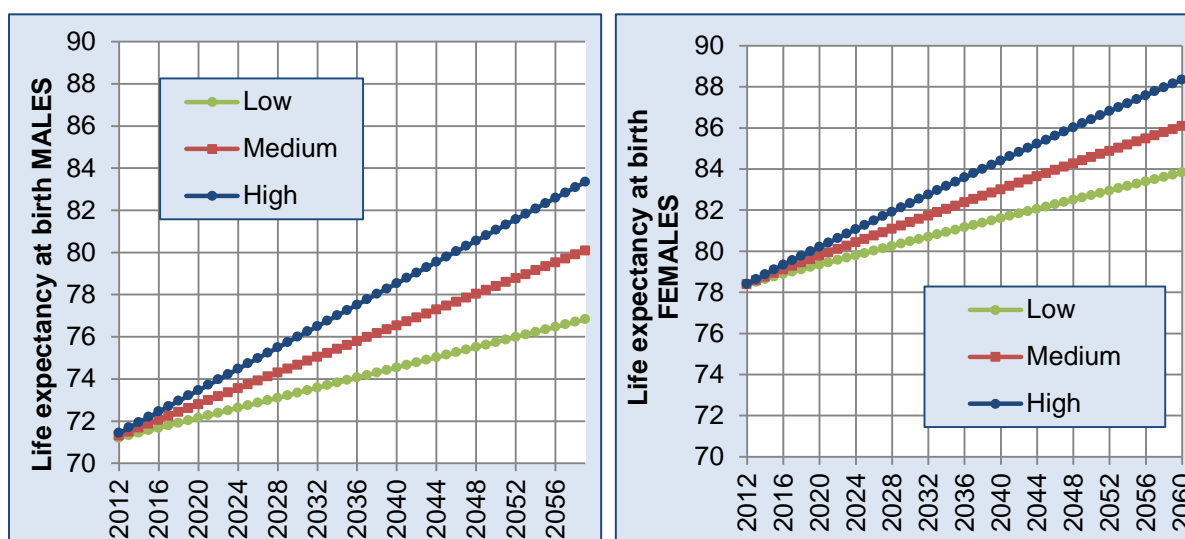


Figure 13. Life expectancy at birth until 2060 (Hungary)

There are many uncertainties and inconsistencies in migration data in latest years – this is why net international migration is equal to zero in migration assumptions for the next decade<sup>1</sup>. After the first decade of the projection period, the migration processes are different in the different scenarios. In

<sup>1</sup> Zero net migration does not mean that there is no migration at all, but it means that the number – and age structure - of immigrants and emigrants are about the same, so there is neither population loss nor population gain coming from migration processes.

the low variant net migration is zero during the whole projection period. Main recent indicators depict Figure 14.

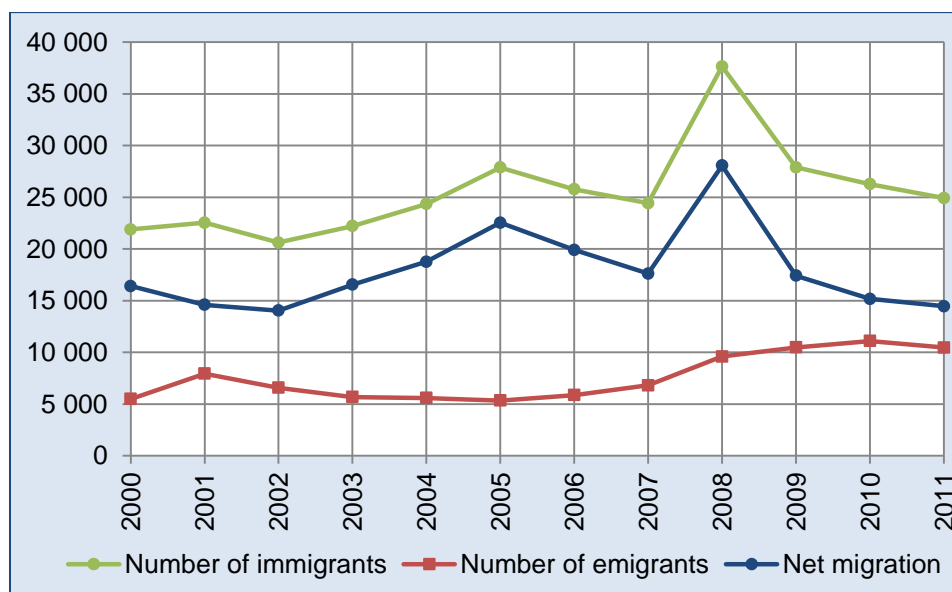


Figure 14. Basic migratory indicators in Hungary, 2000-2011

According to the medium hypothesis, positive net migration occurs in the beginning of the 2020s, then after a slow increase it reaches about 10 thousand persons per year in the beginning of the 2030s, but after that it remains stable. Contrary to the medium variant, in the high variant the increase of positive net migration continues during the next decade while it reaches about 15 thousand persons per year, and then it remains on this level until the end of projected period, 2060.

Migration hypotheses are founded on the assumptions that the directions and tendencies of migration processes will change in the next few decades. For a long time net migration was positive and relatively high, but it will decrease, it can even become negative for some periods, but taking all migration processes into account, the result of these processes will be about zero for a while.

Behind this assumption lies the fact that the source of immigration to Hungary will be narrower – immigrants mostly come from the neighbouring countries, especially from Romania. The other aspect is that immigrants arriving to Hungary do not stay in the country for good, but they go further to the western countries. Moreover, the attractive impact of labour market of European Union countries prevails to a greater extent than earlier as a consequence of economic crisis, so the emigration of Hungarians becomes more intense.

In long term, the outcome of these processes is a lack of labour force in Hungary, which gives good opportunity for immigrants from other countries, including developing countries as well. Thus more

and more immigrants arrive in the country, and net migration will be positive again in a long term perspective (Figure 15).

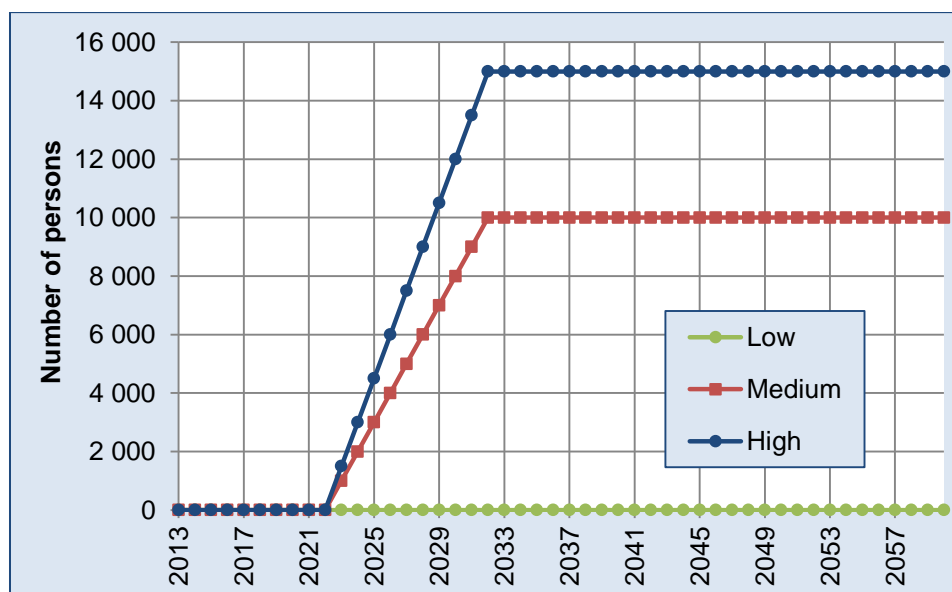


Figure 15. Net migration scenarios for Hungary

#### Main results:

The population projection shows rather wide boundaries for the population number in 2060. The most likely population size is 7.92 million persons according to the medium variant. The highest value of population size is 8.59 million persons in the high variant – the difference between the highest and the lowest population size is about 1.67 million persons (Figure 16).

It means that the decrease of population size is a basic tendency between 2013 and 2060, because even when the most optimist scenario, the high variant – relatively high fertility and intensive immigration - will be realized, the population size is much smaller than 9 million. In order to increase the population size, higher than 1.75 total fertility rate would be necessary – which is the high fertility assumption –, but the chance of realizing higher fertility is very low because of the extremely unfavourable fertility processes which were experienced in past years. The pessimistic variant gives a population size of about 7 million which would mean very serious population loss.

The population loss in Hungary was continuous and approximately steady after the democratic transition: the number of inhabitants dropped by 175 thousand persons between 1990 and 2001 and by 290 thousand persons between 2001 and 2013 – that is, the whole population loss was about 465 thousand persons in this period. According to the population projection, the loss of further 2 million persons could come about during the next half a century, even if fertility and mortality show

moderate improvement. The high scenario of population projection calculates about 1.32 million population loss during the projected period, while the low scenario results in a loss of 3 million.

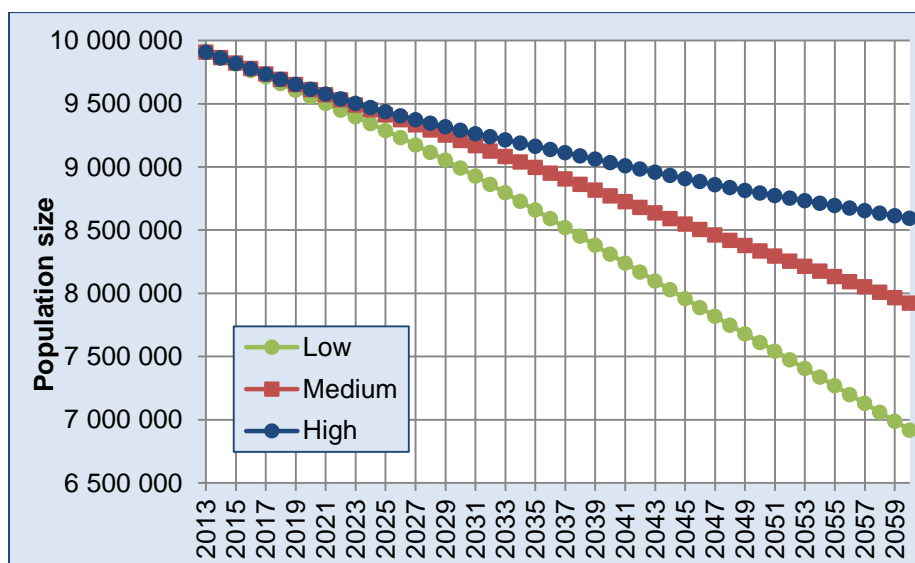


Figure 16. Number of inhabitants in Hungary, 2013-2060

The natural increase remain negative in all scenarios of population projection during the whole projected period, that is the number of deaths exceeds the number of births in each year (Figure 17). In the first decade of the projected period – until 2022 – changes occur according to the assumptions of the projection: natural loss is smaller and smaller while the fertility increases in medium and high variant; the slight increase of fertility in not enough to stop the increase of natural loss in the low variant. The number of population fluctuates in the rest of the projected period and the same is true for natural increase. Natural loss will be higher, except in the high variant of population projection.

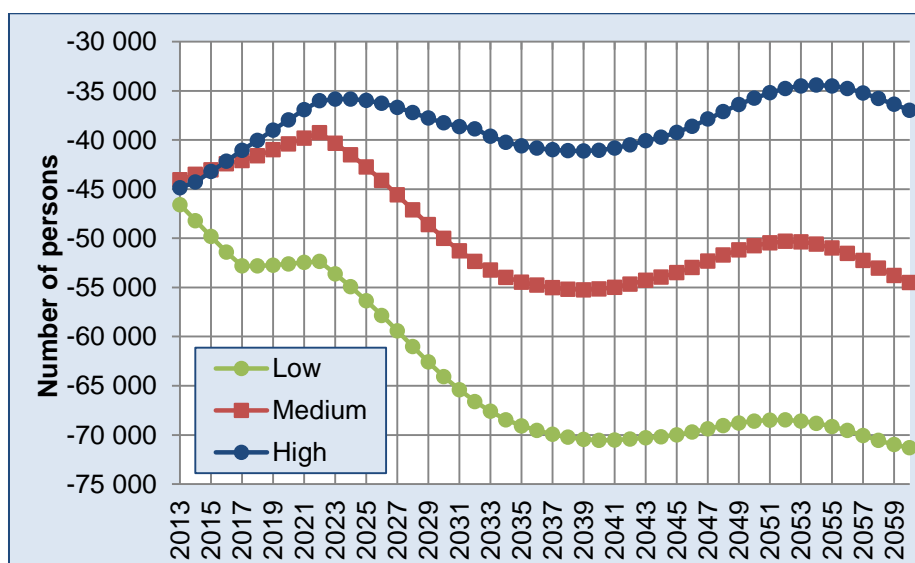


Figure 17. Natural increase in Hungary, 2013-2060

The annual population increase includes natural increase and international migration as well (Figure 18). It can be seen that taking into account migration has an important effect on the change of population size (except in the low variant where migration was not calculated). The population loss decreases or remains stable during the whole projected period according to the medium and high scenarios.

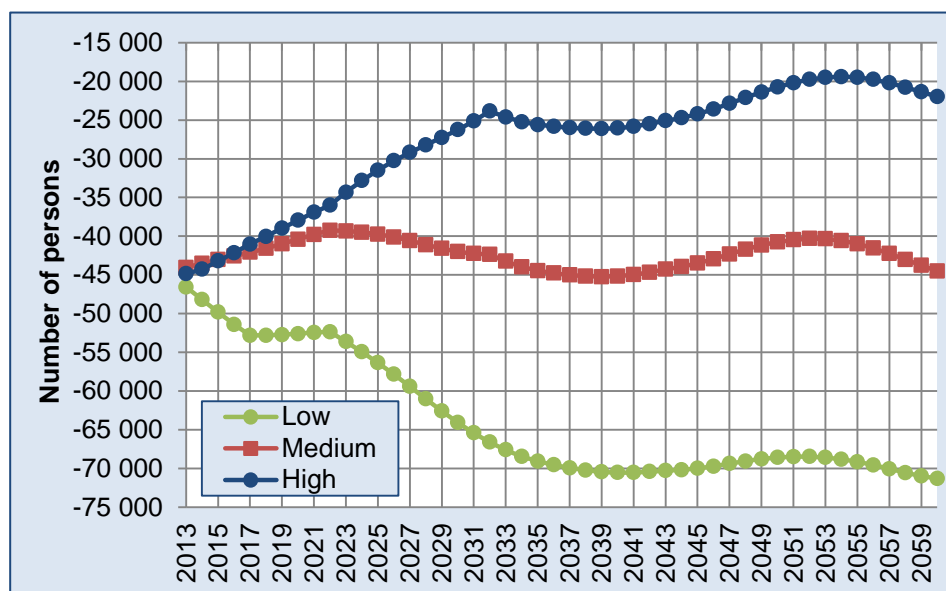


Figure 18. Annual population increase in Hungary, 2013-2060

It seems that population ageing is an irreversible process in the next half a century in Hungary. This process has two important factors: on the one hand, low fertility, on the other hand, increasing life expectancy at birth. The average age of Hungarian population was 41.4 years in 2013, and it will rise in all variants of the population projection. The trends assumed in the medium and the high variant are very similar: two years increase can be seen by 2020, further two years by 2040, and finally, the average age reaches 47 years by 2060. The average age rises more rapidly and reaches higher value in the low variant: it will be 47.7 years in 2060 – the cause of this lower fertility and the lack of younger immigrants (Figure 19).

The age structure of the population shows the clear characteristics of the population ageing. For a long time the size of all age groups decreases, except the 65+ age group, the oldest ones. The number of persons younger than 20 years will drop from 200 thousand persons in 2012 to 140 thousand persons in 2060. Moderate increase can be experienced in the age group of 20-44 years from the mid-2020s – it is a consequence of rising births which occurred earlier and net migration which becomes positive by this time -, but it also begins to decrease continuously from the 2030s. The size of the group of persons aged 45-64 years drops from 3.5 million to below 2 million during

the projection period – this is the largest age group, and the population loss is the largest in this group. Rising and stagnating periods follow each other in the group of the oldest persons, but nearly a loss of 700 thousand persons can be projected on the whole by 2060 (Figure 20).

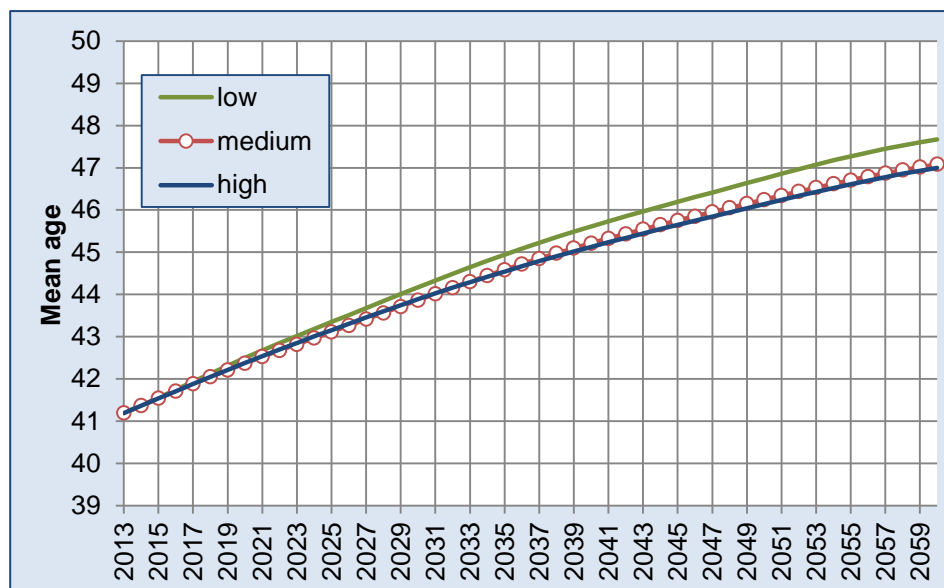


Figure 19. Mean age of population in Hungary, 2013-2060

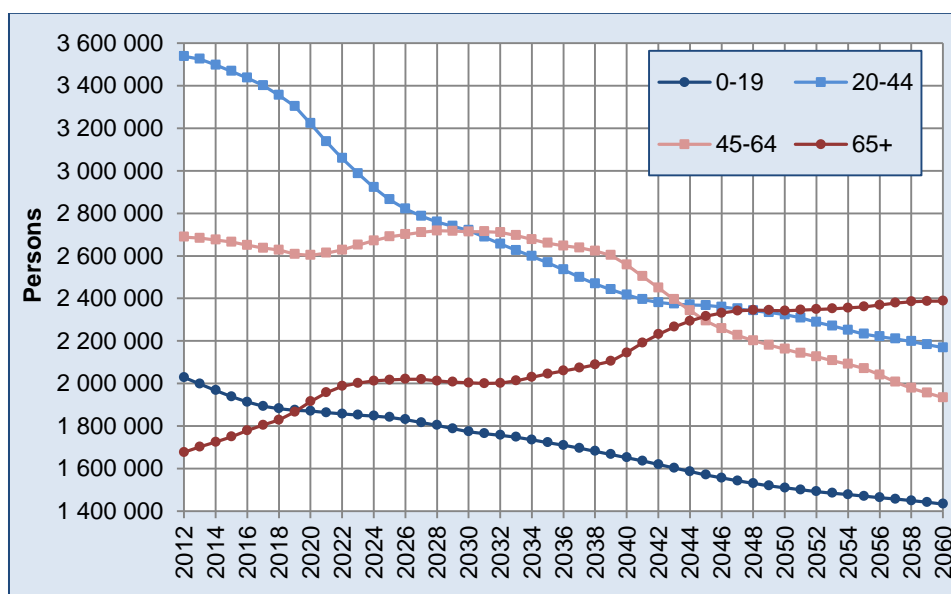


Figure 20. Major age categories in medium scenario, Hungary, 2013-2060

### 3. Zero migration scenario

The Zero-migration scenario shows what will be the population development if no migration gains occur. In other words, it puts the view on demographic future influenced exclusively by fertility and

mortality rates. The difference between forecast with incorporated migration and zero-migration projection actually represents the clear impact of migration on the population change being positive in case of the European countries. This scenario is not “realistic”. It could be true just in case the emigration and immigration are balanced. In any case, the age structure of immigrants and emigrants is likely to differ. Therefore, age structure could change irrespective of changes taking place in the population size.

### 3.1 Zero migration scenario in case the Slovak Republic

We put the zero-migration scenario together with the medium variants of fertility and mortality. In Figure 21 we can see the undistorted impact of migration. If no migration is incorporated into the projection model, the Slovak population will shrink to 4.7 million until 2060. On the other hand the cumulative effect of positive net migration in the most probable medium scenario would prevent the population loss of about half million people. This is a clear evidence that the migration component has a significant impact on the development of the population size. Finally, no significant influence on mean age and other age characteristics of population was observed. The difference between the values of mean age in 2060 is less than half of year (Figure 21).

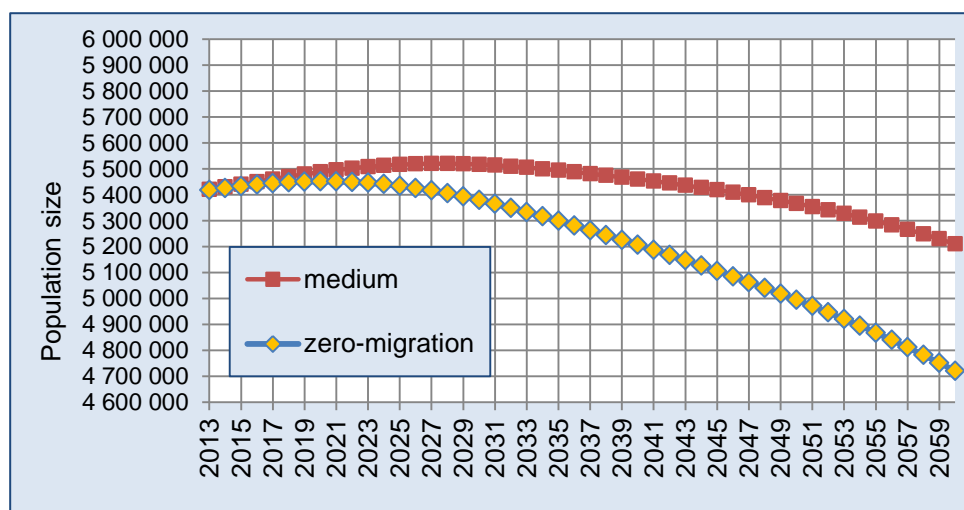


Figure 21. Comparison of population size in two scenarios, the Slovak republic, 2013-2060

The results in the zero migration scenario and other alternative scenarios confirmed that migration affects the population size much more than the age-structure (Figure 22). The difference as for mean age is only about 0,5 year when compared the real migration scenario with the medium one.

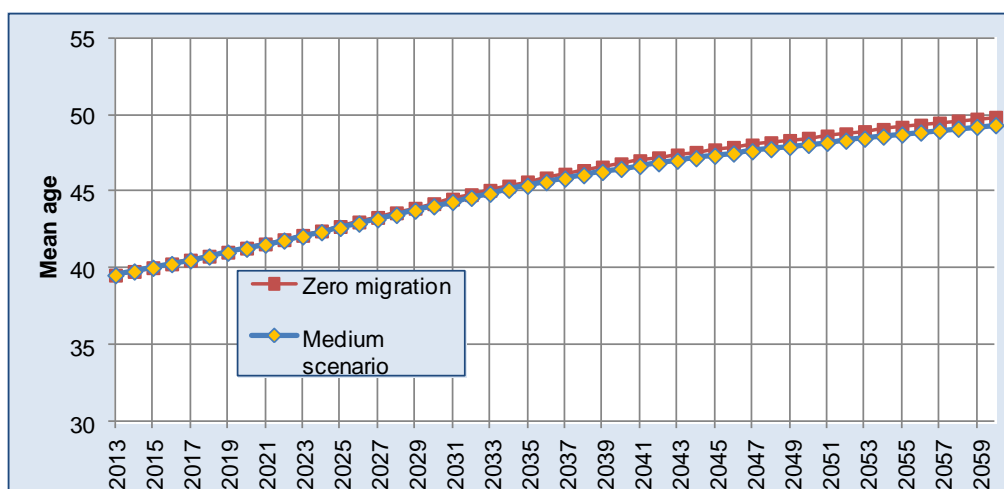


Figure 22. Comparison of mean age of population in two scenarios, the Slovak Republic, 2013-2060

### 3.2 Zero migration scenario in case of Hungary

The zero migration scenario was developed from the medium scenario of the population projection, that is fertility and mortality assumptions are the same for these two scenarios, the only difference lies in migration assumptions. The results of the two scenarios can be seen in Figure 23.

In the medium scenario a small amount of positive net migration was taken into account, this is why zero migration scenario gives more population loss than the medium one. In the medium scenario the population of Hungary will be about 7.9 million in 2060, while in the zero migration scenario the population is about 7.6 million – the difference is about 300 thousand people, which is the cumulative effect of the lack of (positive net) migration. It clearly shows how migration is able to reduce population loss – which is coming mostly from the low fertility –, and the importance of migration especially when the population is decreasing.



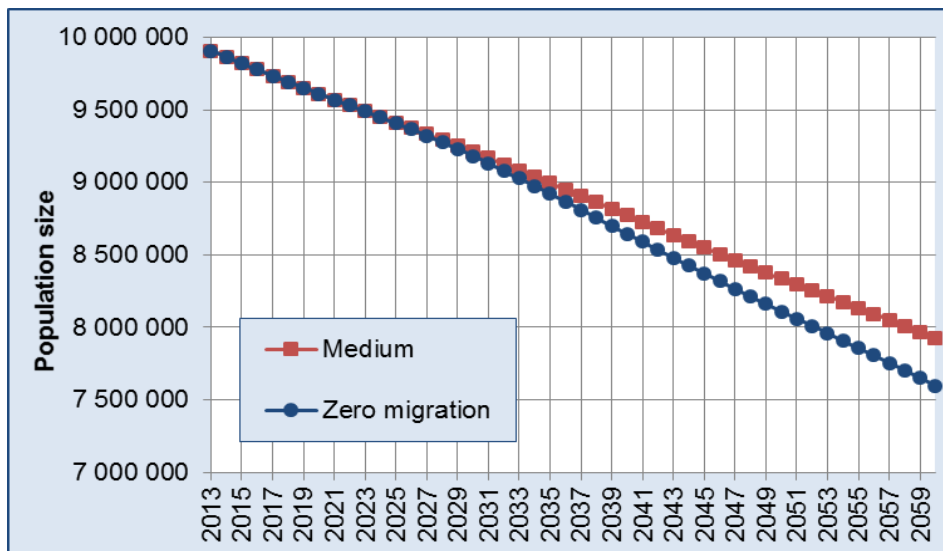


Figure 23. Comparison of population size in two scenarios, Hungary, 2013-2060

In characteristics other than the size of population, there were no significant difference between medium and zero migration scenarios (Figure 24).

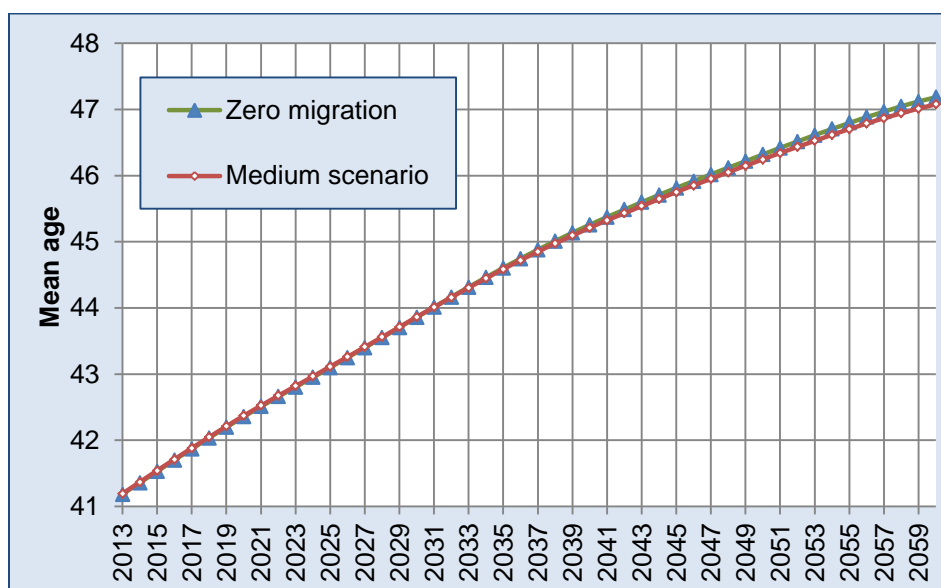


Figure 24. Comparison of mean age of population in two scenarios, Hungary, 2013-2060

#### **4. Real migration scenario**

The estimation and incorporation of the undocumented migration flows are the main objectives of this scenario. Since the official data on migration are very likely under-estimated in case of out-migration especially, there is a strong need for such scenarios.

A similar methodology for estimation of unregistered migration was used in both countries. It is an attempt to estimate the real processes of international migration and to assess its possible development in the future. The „real migration” scenario is a variant of population projection used to estimate the real migration processes by taking into account the assessments concerning the direction and volume distortions of statistical data. This scenario is calculated on the basis of fertility and mortality assumptions of the medium variant of the latest population projection, but applying modified migration assumptions.

The migration assumptions consist of assumptions on net migration volume, sex and age composition of migrants for the duration of the projection period (2012 to 2060). International migration is composed of immigration and emigration of foreign citizens to Slovakia respectively Hungary, and emigration of Slovak respectively Hungarian citizens to abroad and their re-migration to Slovakia respectively Hungary.

The more realistic estimation of migration than in vital statistics is described in detail in case of Hungary (see chapter 5.2)

##### **4.1 Real migration scenario in case of the Slovak Republic**

The real-migration variant was constructed using the medium variant of fertility and mortality. We assume that the relatively wide gap between official and unregistered net migration will diminish in the long-term (Figure 25). We also anticipate that new measures will be applied in migration statistics in coming years. They are likely to improve the accuracy of statistics, thus the gap might be gradually narrowed. Some segments of migration flows are very likely to remain undocumented, but their share will become less significant. Current values of net migration appear to be overestimated. Some authors mention thousands of unregistered emigrants at the time when they are leaving the country. Divinský (2005, 2007) estimated that annual permanent emigration stock could rise to 15-20 thousand people. Perhaps, this value is too pessimistic today, but the slightly negative net migration when we include the out-migrants estimations is very likely to be a valid assumption. In the long-run,

immigration will outweigh emigration even if undocumented migration is incorporated. Both the increase of immigration and decreasing share of undocumented out-migration will facilitate it.

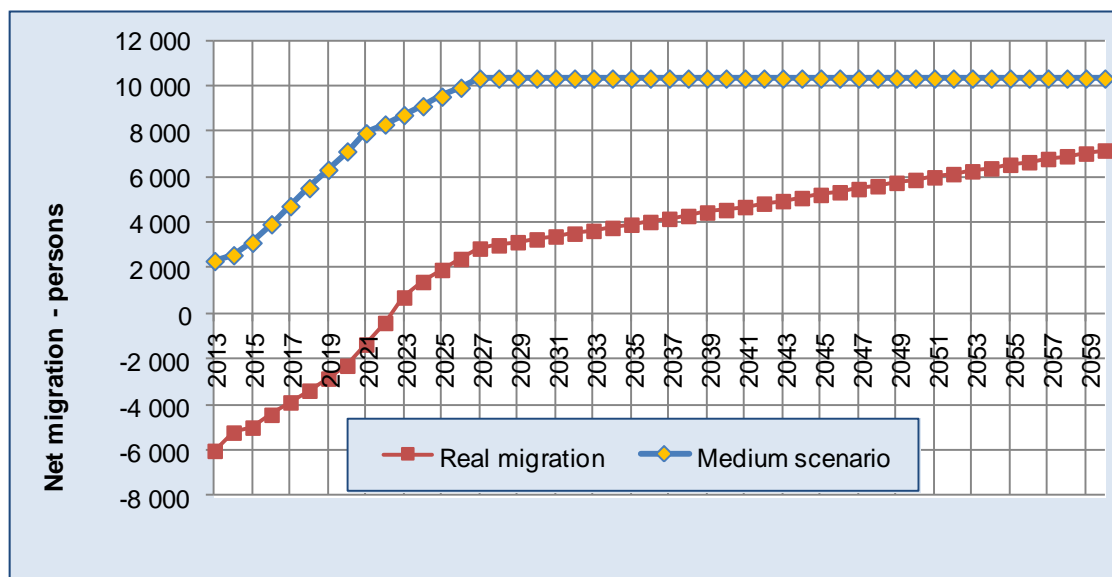


Figure 25. Comparison of net migration in two scenarios, the Slovak Republic, 2013-2060

This scenario confirms again that migration has a strong impact on population size and increase but the impact on the age structure is only slight. The difference in 2060 is growing, being more than 300 thousand persons (Figure 26).

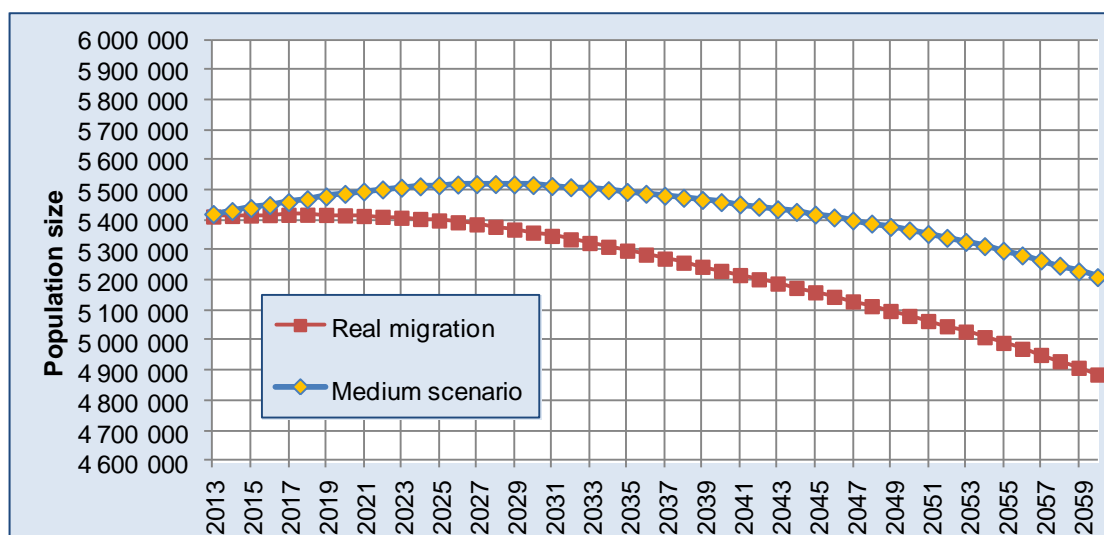


Figure 26. Comparison of population size in two scenarios, the Slovak Republic, 2013-2060

Lower figures representing net migration are resulting in lower values of total annual population increase. In medium scenario the decrease is likely to start in 2029, in real migration would be the

depopulation starting point 10 years sooner. After 2020 the difference will be lowering, the biggest difference is expected in the first years of the forecasting period (Figure 27).

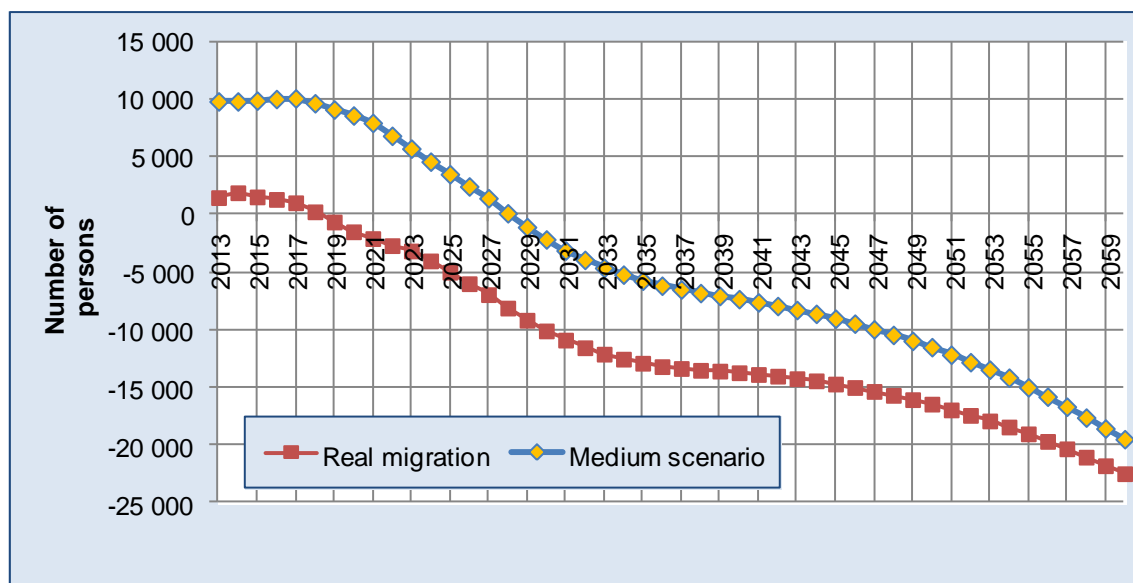


Figure 27. Comparison of annual population increase in two scenarios, the Slovak Republic, 2013-2060

The difference in mean age of population is predicted as very low in future (Figure 28).

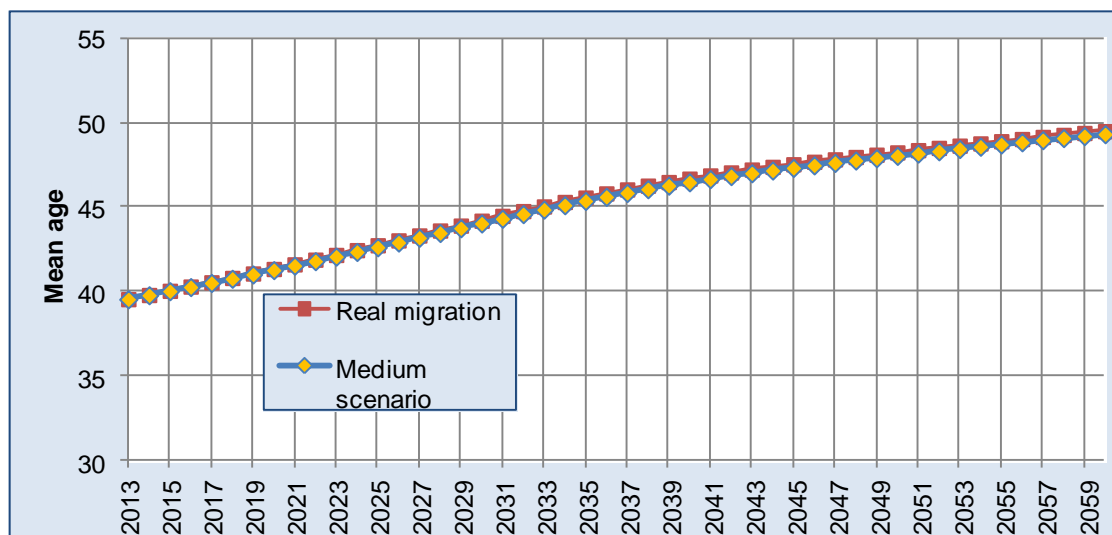


Figure 28. Comparison of mean age in two scenarios, the Slovak republic, 2013-2060

#### 4.2 Real migration scenario in case of Hungary

The HCSO statistics on foreign-citizen immigrants and emigrants show that the average number of immigrants is more than 23 thousand per year, while the average number of emigrants is about 4

thousand per year (Table 2). This means that the population of the country increased by nearly 230 thousand persons during the 2001-2012 period due to the immigration of foreign citizens.

Year	Immigrants	Emigrants	Net migration
2001	20308	1944	18364
2002	17972	2388	15584
2003	19365	2553	16812
2004	22164	3466	18698
2005	25582	3320	22262
2006	23569	3956	19613
2007	22607	4133	18474
2008	35547	4241	31306
2009	25582	5600	19982
2010	23884	6047	17837
2011	22514	2687	19827
2012	20340	9916	10424

*Table 2.* Number of immigrant and emigrant foreign citizens and their net migration, 2001-2012

*Source: Demographic Yearbook 2001-2012*

The net migration of foreign citizens has changed around 15 to 20 thousand in the last more than ten years – between 2001 and 2012 (Figure 29). Its highest value was observed in 2008 when net migration was higher than 31 thousand – but it is not a real growth but the results of an administrative change<sup>2</sup>. During the period started in 2001 net migration reached its smallest value in 2012 when it was less than 10 and a half thousand. Between the two latest censuses the average net migration of foreign citizens was around 20 thousand per year. During the period following the economic crisis net migration has decreased, its average value was about 17 thousand per year between 2009 and 2012.

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<sup>2</sup> The effect of Immigration Act, came into force on 1 July 2007 (The Immigration Act consists of two parts: Act on the Entry and Residence of Persons with the Right of Free Movement and Residence (Act I of 2007) and Act on the Entry and Residence of Third-country Nationals (Act II of 2007). In this case the first part of the Act is relevant.)

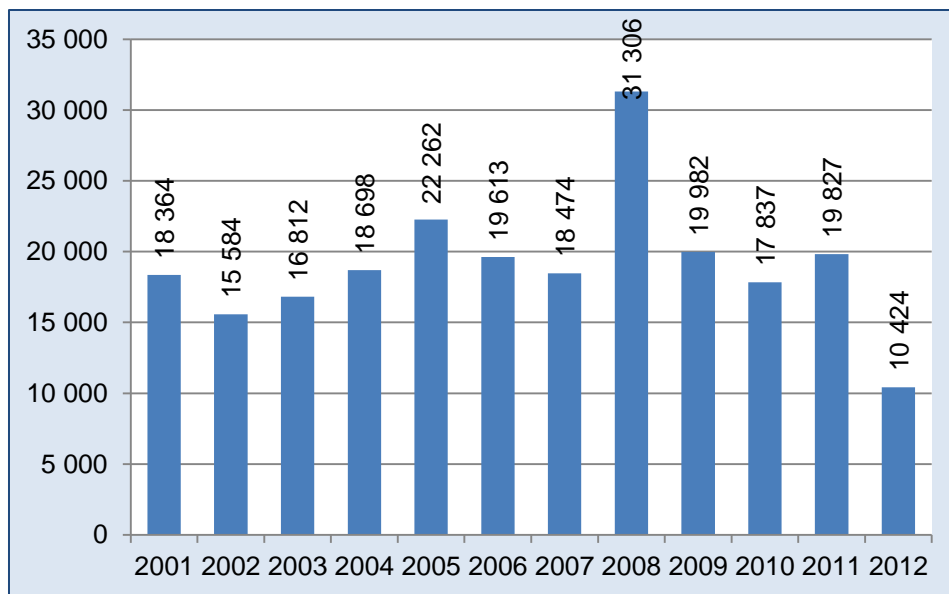


Figure 29. Net migration of foreign citizens in Hungary, 2001-2012

Source: Demographic Yearbook 2001-2012

The data shown here is likely to give a too high value of net migration, because foreign citizens emigrating from Hungary do not register their exit from the country very often. A more precise, closer to the reality picture can be given using the data of censuses.

Foreign citizens	Persons
2001 census	93 241
2011 census	143 310
Difference	50 069
Natural increase 2001-2011	7 637
Net international migration (without nationalization)	42 432
Immigrants, total	259 094
Nationalized persons, total	87 682
Assessment of emigrants (difference between the two latest censuses – registered immigration)	128 980
Real net international migration	130 114
Average net migration of foreign citizens per year	11 829

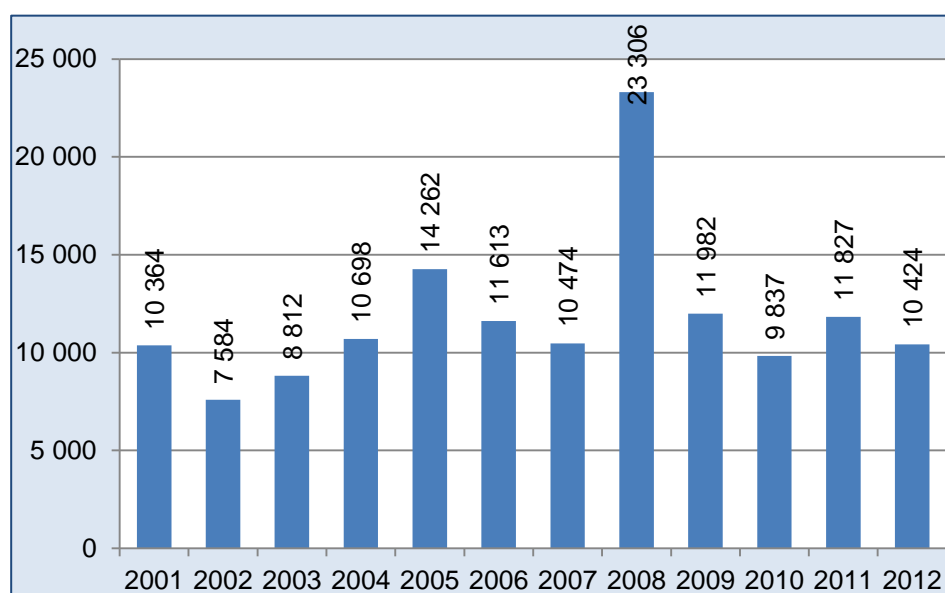
Table 3. The number of foreign citizens living in Hungary: 2001, 2011 censuses

Source: Demographic Yearbook 2001-2012, 2001 Census, 2011 Census

Between the latest two censuses the number of foreign citizens living in Hungary was increased by 50 069 persons. Their natural increase (the balance of births and deaths) was more than 7 600 persons, so net migration was 42 400 persons. However, this number does not contain the number of persons acquiring Hungarian citizenship in the meantime, that is, the number of nationalization.

The net migration of foreign citizens – taking into account the nationalization too – are 130 114 persons, that is the average is near to 12 thousand per year. At the same time it means that 128 980 persons left the country during the period 2001-2012, while 259 094 foreign citizens arrived to Hungary in the same period (Table 3)

The valid net migration of foreign citizens is likely to be closer to average 12 thousand per year than to average 20 thousand per year estimated earlier. Assuming that the vital statistics on migration shows the migration trends well enough, and taking into account smaller amount of net migration - average 8 thousand less per year (Figure 30).



*Figure 30. Net migration of foreign citizens estimated from vital statistics and censuses, 2001-2012*  
*Source: Demographic Yearbook 2001-2012, 2011 Census*

Migration of Hungarian citizens has to be considered too, again emigration and immigration separately.

Emigration can be estimated on the one hand, on the basis of vital statistics of the sending country, and, on the other hand, on the basis of mirror statistics of the destination countries. However, vital statistics on emigration can grasp only a part of the emigration – this fact can be seen from mirror statistics and surveys on migration potential as well.

According to the Hungarian vital statistics on migration, the emigration of Hungarian citizens was fairly low between 2001-2005 and its tendency was slightly increasing (Table 2). Emigration became higher since 2005, the number of emigrants was near to 13 thousand in 2012. The real extent of emigration of Hungarian citizens is probably higher, but data from vital statistics can give a guideline to sketch the tendencies in emigration.

Mirror statistics of immigrant Hungarian citizens of destination countries show much higher numbers, even if considering European countries only. Mirror statistics show a slight decrease between 2001-2003, but about 30 percent rise was experienced in 2004 – the year of EU accession of Hungary – compared to the previous year. After this period a slow increase took place, and then a bit faster growth was experienced from 2010 in the mirror statistics. 2011 was the year when the Austrian and German labour market was opened for Hungary and the new EU member countries – probably its effect can also be seen in data.

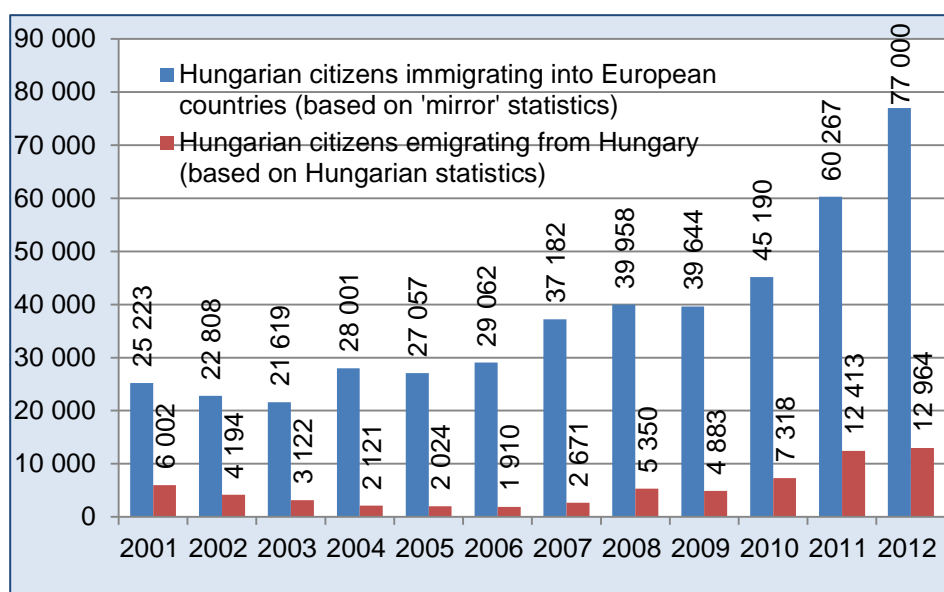


Figure 31. Annual outflows of Hungarian citizens to EEA countries by mirror statistics and Hungarian statistics, 2001-2012

Source: Gödri et al. 2013

However, the two statistics shown here do not take into account return migration, which can be numerous; furthermore, they do not contain data on migration to outside Europe.

There were several ideas to overcome this problem. One of the ideas was to use the OECD statistics which give data on the migration of persons born in Hungary, both on their immigration into OECD countries and emigration from those countries (Table 4). Finally, using these data was rejected because it is supposed that there is a significant part of migration to non-OECD countries.



	Inflow of Hungarian-born persons to OECD countries	Outflow of Hungarian-born persons from OECD countries	Difference between inflow and outflow, OECD countries	Hungarian citizens emigrating from Hungary, Hungarian statistics	Hungarian citizens immigrating to EEA countries according to the mirror statistics
2001	27590	20536	7054	6002	25223
2002	23289	18302	4987	4194	22808
2003	20618	17958	2660	3122	21619
2004	25525	19661	5864	2121	28001
2005	27557	18854	8703	2024	27057
2006	29370	18664	10706	1910	29062
2007	35880	21181	14699	2671	37182
2008	41314	26862	14452	5350	39958
2009	41968	29010	12958	4883	39644
2010	46931	28104	18827	7318	45190
2011	67413	35262	32151	12413	60267

*Table 4.* Inflow and outflow of persons born in Hungary to and from OECD countries and annual outflows of Hungarian citizens<sup>3</sup> to EEA countries by mirror statistics and Hungarian statistics, 2001-2011

*Source: OECD, Gödri et al. 2013*

Another possibility is not to investigate migration flow but migration stock. If these data are known for two different years, the extension of migration during that time can be concluded. This is what we do now.

Considering UN data, the number of Hungarian-born persons living abroad has changed in the following way between 1990 and 2013:

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<sup>3</sup> Both data of Hungarian citizens and of Hungarian-born persons are used in this paper; obviously, these two groups are different. The citizenship raises a new question: there are more and more people born abroad and becoming Hungarian citizens abroad – a new form or channel of migration emerges when they immigrate to Hungary. Their number was 2 thousand persons in 2011, and 9 thousand persons in 2012. At this moment it could not be estimated how this process will be continued. In this paper this form of migration is not studied.

1990	2000	2010	2013
407 611	443 911	491 926	528 184

*Table 5. Hungarian-born persons living abroad, 1990, 2000, 2010, 2013*

*Source: United Nations, Department of Economic and Social Affairs (2013). Trends in International Migrant Stock: Migrants by Destination and Origin (United Nations database, POP/DB/MIG/Stock/Rev.2013).*

To estimate the net migration of Hungarian-born persons in the last decade – that is, from 2000 – the process is the following: for years 2000 and 2010, take the difference between the numbers belonging to the given year, and it shows the change of Hungarian-born persons during that time (48 015 persons). But, the stock for 2000 does not include the deaths occurred in that period; consequently, adding the number of deaths to this difference, the real change will be given. The process is the same for period 2010-2013 too.

To calculate the number of migrants during that period, it is necessary to give estimation for the number of deaths during the period. To achieve this aim we need to know the distribution of Hungarian-born persons living abroad by sex and age. It is not available in this moment, this is why an estimation has to be calculated.

One of the possibilities to do this is to use the sex and age structure of emigrants: the data are known for 2012. This way net migration will be underestimated, because younger population and lower mortality are assumed. It is likely this latter hypothesis is further from the reality than the previous one, because in this case emigrants who left Hungary several years ago are neglected – at least as far as the sex and age composition is concerned.

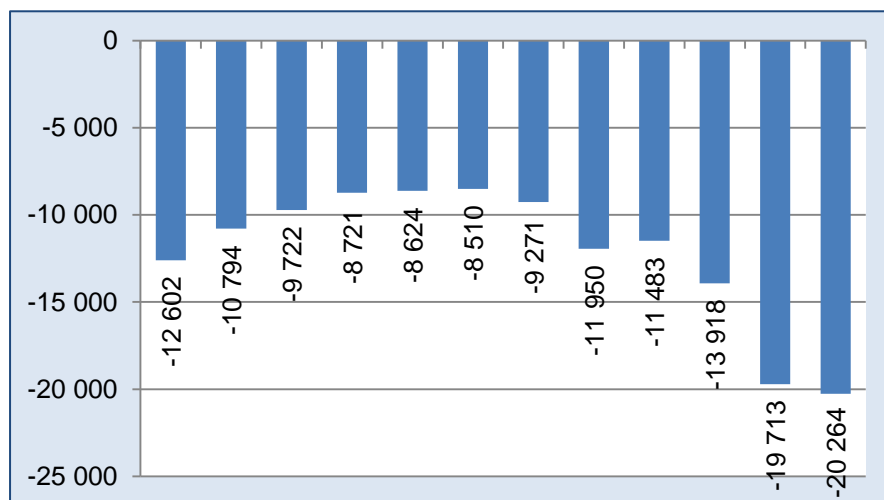
Another opportunity is to assume that sex and age composition of Hungarian-born migrants is the same as it is for Hungarian persons living in Hungary, and using the data of 2001 and 2011 census as starting points. This solution is reasonable because migrant stock contains all the Hungarian-born persons who ever left Hungary (and still alive), that is, their sex and age structure are different from new migrants' sex and age structure to a great extent. This way emigration will be likely to be overestimated, because it is known that emigrants are younger than the whole population generally. This approach is confirmed by some data available from the EU: Table 6 shows that the age structure of Hungarian-born persons is similar to the age structure of the population of Hungary.

	Hungarian citizens in the EU (1998-2013 average)	Hungarian-born people in the EU (1999-2013 average)	The population of Hungary, 2013
Less than 15 years	8%	6%	14%
From 15 to 64 years	88%	69%	68%
65 years or over	4%	24%	17%
Total	100%	100%	100%

*Table 6. Age structure of Hungarian citizens and Hungarian-born persons in the EU and the population of Hungary*

In the latter case, 58 208 deaths occur between 2000 and 2010<sup>4</sup>, while the difference of the two stocks are 48 thousand persons – it means that their summary are 106 thousand persons, an average of 10.6 thousand persons per year.

Between 2010 and 2013 the difference of the two stocks were 36 258 persons and 23 868 deaths occurred in that period. It means that the change is about 60 thousand persons, this is an average of 20 thousand persons per year – which is two times higher than the average in the previous ten years.



*Figure 32. Net migration of Hungarian-born persons between 2001 and 2012 (an estimation on the basis of Hungarian vital statistics and UN stock data)*

*Source: Demographic Yearbook 2001-2012, UN*

The significant growth of net migration of Hungarian-born persons is likely to be in connection with the opening of the Austrian and German labour market in 2011. Generally, Hungarians working in

<sup>4</sup> This calculation of the number of deaths is based on the assumption that Hungarian persons living abroad have the same probabilities of death at every single age than people living in Hungary. This is a „naive” assumption, because there are selection effects on migrants (the healthier people are the higher their chance is to be migrants), and also the living standard of the given country has an effect on mortality.

Austria rather commute, but it can be imagined that several persons considered living in Austria after opening the labour market. The effect of German labour market opening is probably more serious: Germany is one of the most popular destination countries for Hungarian emigrants, and they more likely to settle down there because of the long distance.

The whole net migration – consisting of non-Hungarian citizens and Hungarian-born persons as well – can be calculated from the previous two net migrations (Figure 33).

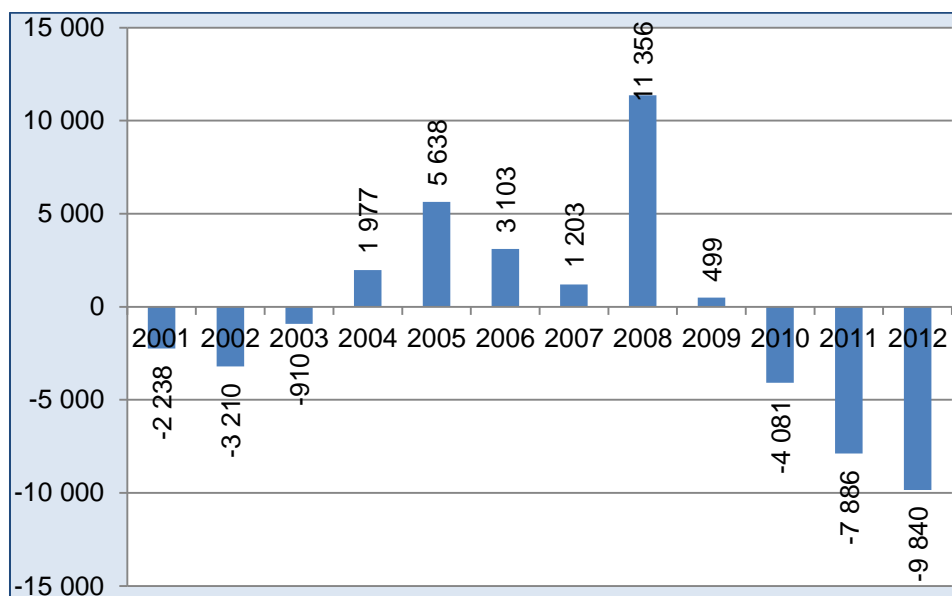


Figure 33. Net migration in Hungary between 2001-2012  
(estimation using vital statistics, censuses and UN migration statistics)

Two questions emerge from previous processes: whether we are near to the real migration processes or not; and, what kinds of future tendencies are expected, on the basis of information summarized here.

#### *Sex and age structure of migrants:*

To produce a population projection using data on migrants, some numeric assumptions have to be formulated concerning not only the number of migrants, but the sex and age structure as well. International experience shows that the proportion of men is higher among migrants, and considering the age structure, most of them are from the 18-40 age group. However, more precise and Hungarian data are needed for population projection.

#### *Sex composition:*

According to HCSO data the rate of men was 53 percent and that of women was 47 percent among Hungarian citizens emigrating from Hungary and immigrating into Hungary in 2012.

Data on immigrating and emigrating foreign citizens for 2009-2012 show that the rate of men is on average 55 percent per year, and the rate of women is on average 45 percent per year.

On the base of these proportions, the sex ratio assumption is 55 percent in favour of men among migrants.

#### *Age composition:*

To determine the age structure of migrants, both foreign citizens immigration to and emigration from Hungary, and Hungarian-born persons emigration from Hungary and re-emigration to the country will be analysed. The starting point are data for 2012 which are available for two sexes and for every single age. Taking into consideration all relevant factors – direction of migration processes, citizenship or birth country of migrants, sex and age composition of migrants – makes the estimation extremely complicated. At the same time, this method does not necessarily mean higher precision in population projection, because when the assumptions concern a smaller part of the whole process or smaller groups are affected by those processes, the assumptions are less accurate. Additionally, the precision of available data is also restricted, that is data used for formalizing assumptions are approximate data. A possible solution is to take into account the sex and age composition of non-Hungarian immigrants in the case of positive net migration, and Hungarian-born emigrants in the case of negative net migration. This is reasonable because migration loss mostly comes from Hungarians emigrating from Hungary, while migration surplus mostly comes from foreign citizens immigrating to Hungary.

#### *Assumption for migration: the „real” migration and changing migration model scenario:*

Assumptions for migration consist of two parts: migration of foreign citizens and Hungarian citizens/Hungarian-born persons, and the net migration is taken into account for both cases (Figure 34).

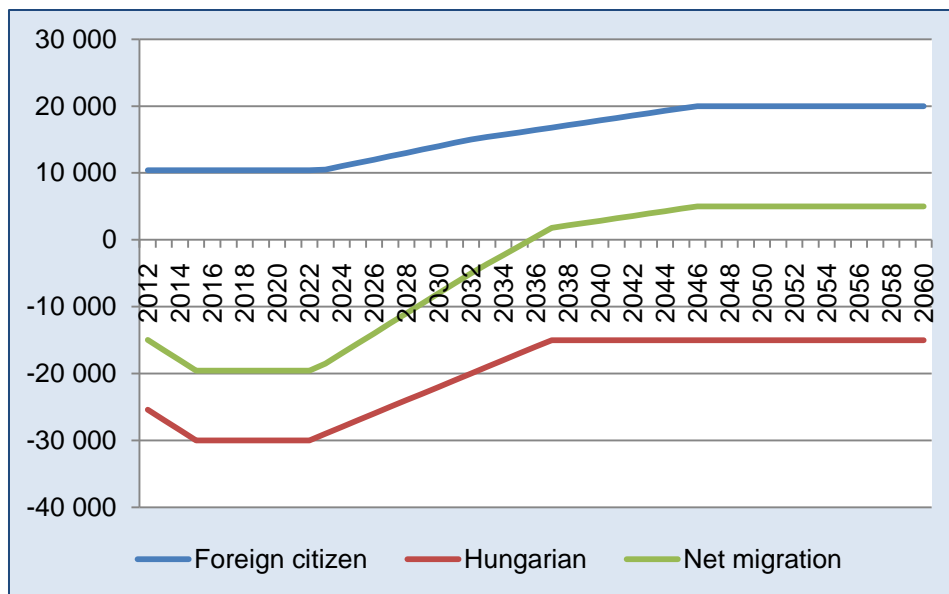


Figure 34. Net migration of foreign citizens and Hungarian-born persons/Hungarian citizens together and separately, „real migration” assumption, 2012-2060

Fertility and mortality assumptions of „real migration” scenario correspond with those of medium variant: the total fertility rate reaches 1.6 in 2060, and parallel with continuous rise in life expectancy at birth, the life expectancy at birth is about 86.1 year for women and 80.1 for men in 2060.

Migration assumptions are the following:

- The 10 thousand net migration of foreign citizens will remain at this level until the next ten years, and then a slow rise will occur and it reaches the average of about 20 thousand persons per year in the middle of the 2040s, and then it remains on this level. The rise in immigration of foreign citizens to Hungary will probably occur because a lack of labour force emerges as a consequence of emigration of Hungarians. It is assumed that the structure of immigrants will be changed: less and less immigrants come from the neighbouring countries or even from Europe, and more and more people come from the countries of the third world.
- Primarily, the labour force demand of Austria and Germany is in the background of current negative net migration of Hungarian citizens – the assumption is that this effect will prevail until a couple of years. But, after this period a very high, an average of 30 thousand persons per year negative net migration is supposed for the next decade – partly as a consequence of the effect of migration networks, partly the high mobility of younger generations, furthermore, as an attractive effect of countries offering more favourable circumstances in the labour market than Hungary. The „migration as a chance” is a real possibility for most of the young people, to go abroad either in order to find a job or to study. After this period it is

a plausible conception that Hungarians emigrated in their young age begin to re-migrate to Hungary in their older ages, subsequently the population loss due to migration will decrease. In the middle of the 2030s the net migration of Hungarian citizens/Hungarian-born persons still show negative net migration, and an average of 5 thousand persons per year negative net migration is supposed until the end of the projected period.

- Considering the net migration of foreign and Hungarian citizens/Hungarian-born persons together a „migration valley” can be detected for a decade. The net migration changes to positive by middle of the 2030s – accordingly to the assumed improving situation -, but its volume is an average of 5 thousand persons per year. This volume is about a half/third of positive net migration observed during 1990-2010.

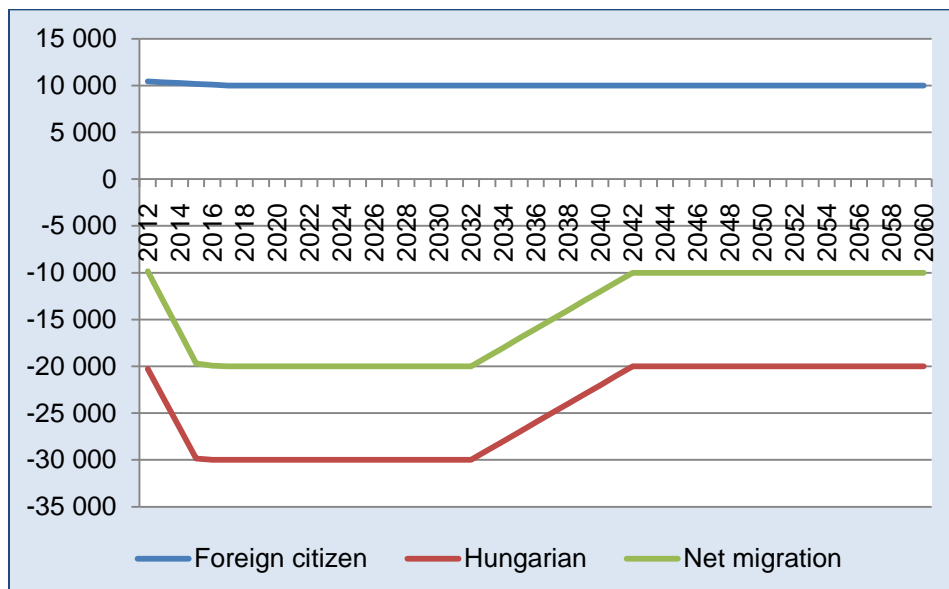


Figure 35. Net migration of foreign citizens and Hungarian-born persons/Hungarian citizens together and separately, „changing migration model” assumption, 2012-2060

The name of the previous migration assumption could be „partially changing migration model”, because net migration is negative in a restricted time period only. In case of the fully changing migration model the assumptions are that the net migration of foreign citizens will not rise, the „migration valley” is more permanent than it was in the previous scenario, and there is some recovery, but it is not enough to make the full net migration positive. This model shows that Hungary definitely becomes a sending country, that is, a full change of migration model will emerge (Figure 35).

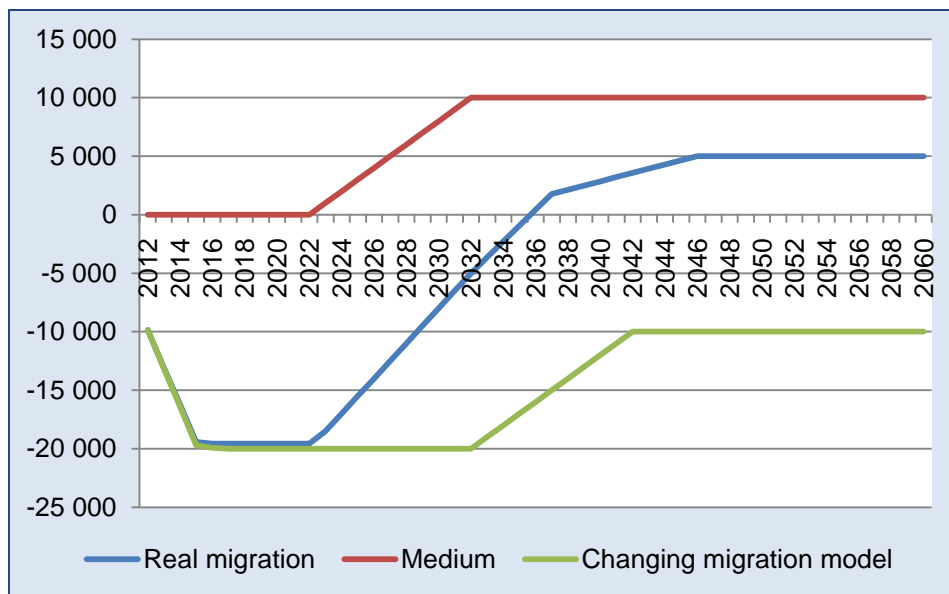


Figure 36. Migration assumptions in medium, „real migration” and changing migration model scenarios of population projection, 2012-2060

These two migration assumptions putting together the fertility and mortality assumptions of the medium scenario of population projection result in two new scenarios: the „real migration” and the changing migration model scenarios (Figure 36).

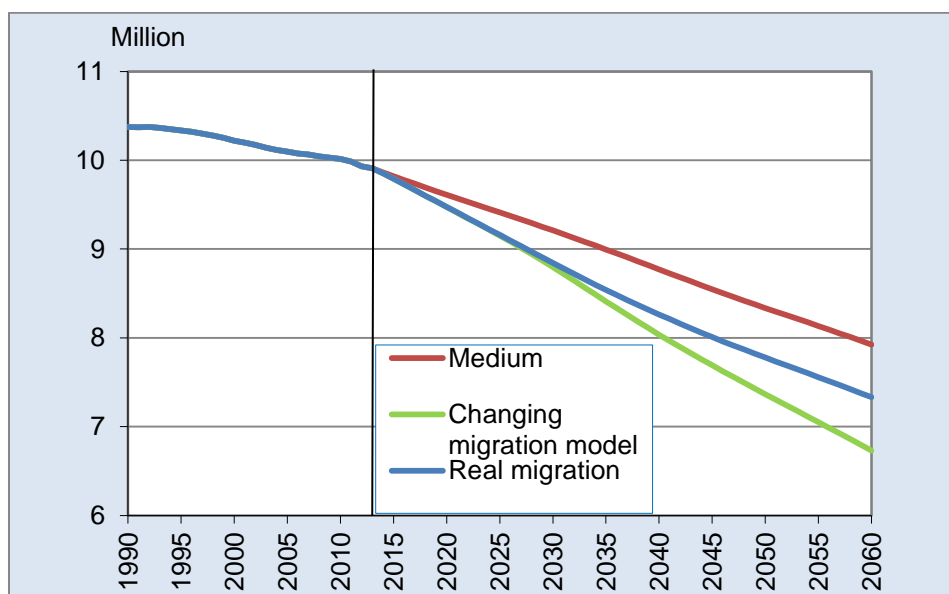


Figure 37. Population size in medium, „real migration” and changing migration model scenarios of population projection, 2012-2060

According to the medium scenario of population projection the population loss is 2 million people during 50 years, but this number is much higher in the new scenarios: further 600 thousand persons in the „real migration” scenario, while further 1.2 million persons in the changing migration model



scenario – in this latter case the population of Hungary would be no more than 7.3 million people in 2060 (Figure 37).

## 5. Replacement migration scenario

The replacement migration scenario shows how many people would be needed to compensate for the population loss emerging from the natural decrease of population. In other words the replacement migration scenario answer the question what net migration is enough in order to avert depopulation.

### 5.1 Replacement migration scenario in case of the Slovak Republic

This projection scenario incorporates replacement-migration into the medium variants of fertility and mortality. As shown in Figure 38, until 2020 the natural increase is predicted. Therefore, no migration is needed to avert de-population. After 2021, a growing net migration is needed in order to fixate the population number at current level.

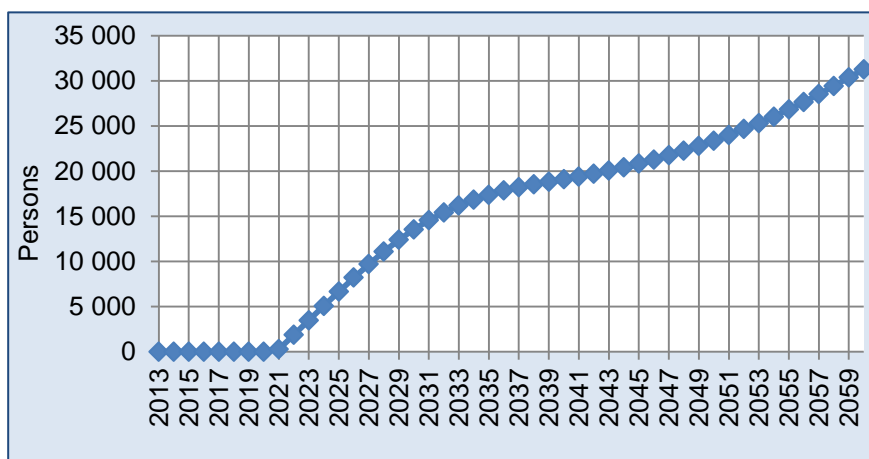


Figure 38. The replacement net migration (stable population), the Slovak Republic, 2013-2060

Neither one of the scenarios is able to compensate for the natural increase of population. The compensating level is much higher than the values in very probable scenarios (medium, real-migration), reaching more than 20 000 in 2045, and more than 30 000 in 2060.

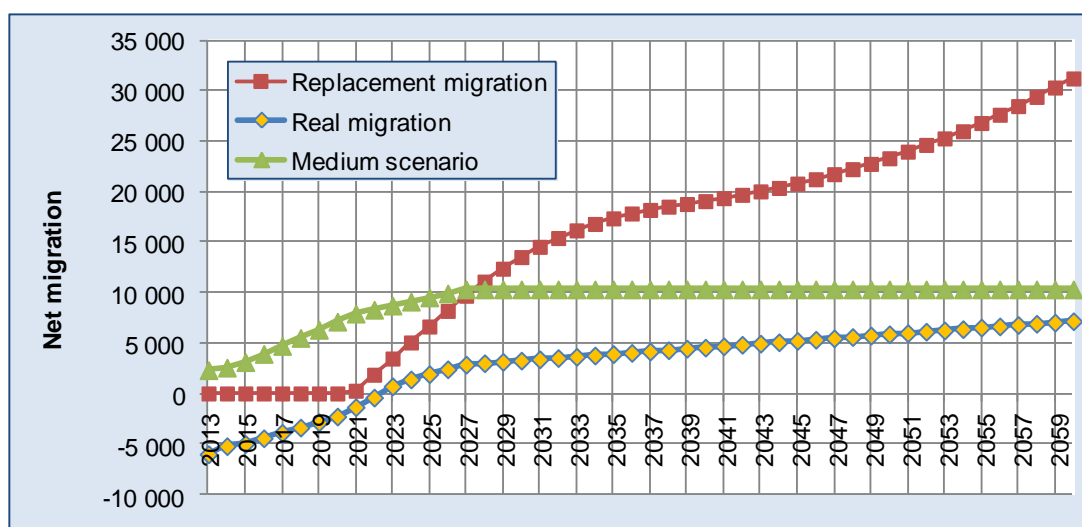


Figure 39. The comparison of several variants of migration, the Slovak Republic, 2013-2060

## 5.2 Replacement migration scenario in case of Hungary

The medium variant of population projection is the starting point for the calculation; fertility and mortality assumptions of the replacement migration variant are the same as they were in medium variant.

The necessary population to compensate for the natural decrease of the population is about 44 thousands in 2013; then decreasing continuously it reaches its lowest point in 2021, about 40 thousands. The cause of this decreasing trend is the fertility assumption concerning this period, which projects increasing total fertility rate. After that period there is no further rise in fertility level, this is why the natural population loss – and, consequently, the replacement migration level – is growing rapidly: its highest value is about 55 thousand persons (Figure 40).

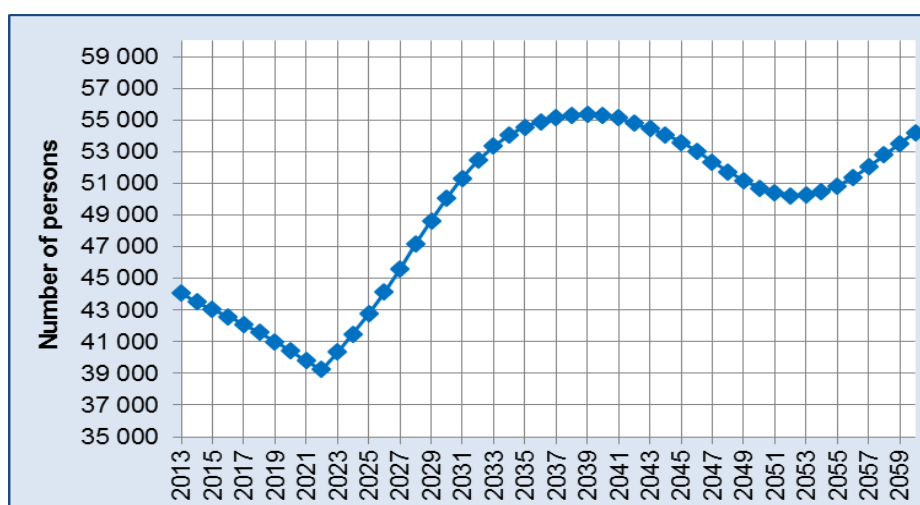


Figure 40. Replacement net migration (stable population), Hungary, 2013-2060

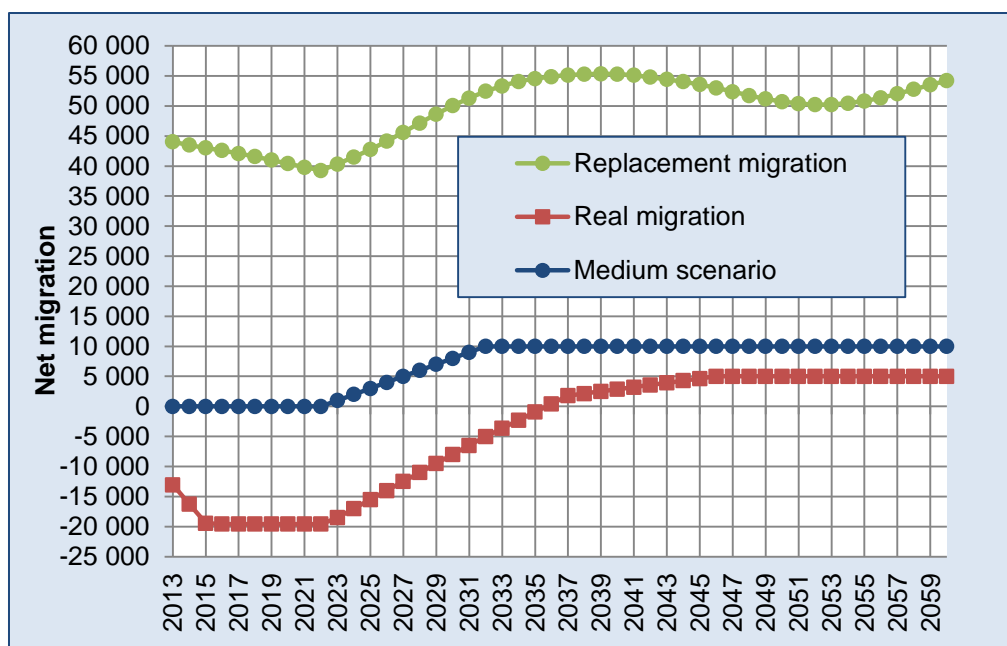


Figure 41. Comparison of several variants of migration, Hungary, 2013-2060

## 6. Sub-national forecast (NUTS-III regions)

### 6. 1 Sub-national forecast of the Slovak republic

The sub-national forecast for both Slovakia and Hungary was completed at the NUTS-III level. There are 8 regions in the Slovak republic. They vary a lot in terms of their population size and area. There are also many differentiating factors in terms of regional and socio-economical development. In general, western and northern regions are more developed whereas the eastern, southern and north-eastern regions are under the average concerning the unemployment rate, GDP and other fundamental indicators. Korec and Ondoš (2006) divide the regions into the three major types, the red ones represent “open” regions, the grey ones the regions of “partial adaptation”, finally the and dark-grey regions are the “laggard” underdeveloped regions (Figure 42). Though the set of regions does not correspond with the administrative units, it provides the sufficient information about regional heterogeneity in the Slovak republic. The southern and eastern regions (except Košice-region) face the biggest problems as for transformation, unemployment, social security etc. The biggest concentration of Roma population can be found there. Thus, we can say about “dividing line” between richer and poorer areas. This fact has to be incorporated into the regional predictions and forecast assumptions precisely.

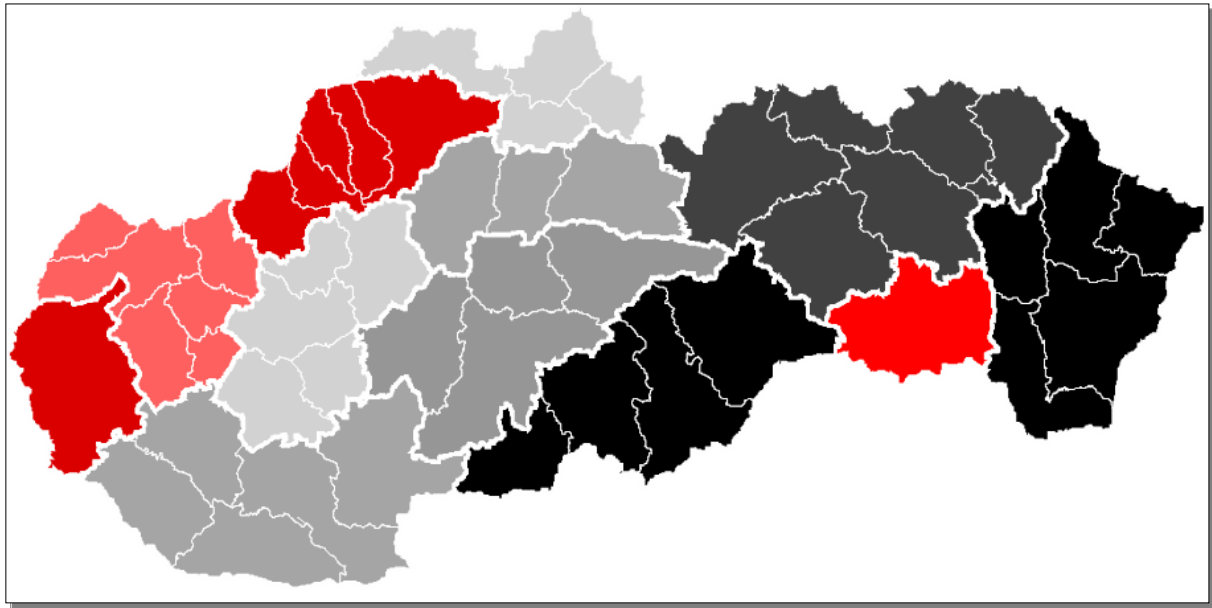


Figure 42. Level of regional development in the Slovak republic (Korec, Ondoš 2006).

Figure 43 depicts the 8 NUTS-III regions including the capitals of them.



Figure 43. The NUTS-III regions in the Slovak republic. Bratislava - BL, Trnava – TA, Trenčín – TC, Nitra – NI, Banská Bystrica – BC, Prešov – PV, Košice – KI, Žilina – ZI (official abbreviations used in the text)

The hybrid model (Willekens 1983) was used in the forecasting process. Its principle lies in combination of bottom-up and top-down approaches. The regional assumptions were initially prepared. Then the calibration with respect to the national assumptions was executed. The national values of parameters and results represented the control benchmark. Since the national population development is more stable and less volatile, this approach is very useful and sufficient. Moreover, some cohort analyses at national level are at disposal, making the analysis more comprehensive.

Likewise in case of the national forecast, the cohort-component method was used in case of regional forecast. The forecasting period is from 2013 to 2035.

Prediction of fertility was based on the detailed time-series analysis oriented at changes in level and timing of fertility, postponement and recuperation of birth. The cohort and transversal analysis were applied in order to obtain the comprehensive view on the process of fertility in regions. In general, some stabilization of the process should come within coming two decades. In case of regional populations, the starting time and intensity of the postponement and subsequent recuperation were taken into the consideration. Some regional specifics were also taking into account. Some alternative indicators such as tempo-adjusted fertility rate serve as useful tool in prediction of the parameters. Ageing of the fertility profiles will be a general characteristic of future fertility developments across the regions. Slight convergence within regions is predicted. The highest fertility is expected in the eastern regions. The fertility is hardly to exceed the level of 1.7, whereas in regions of Bratislava and Nitra will slightly increase up to the level of 1.4. Stabilisation of the process is predicted in all regions (Figure 44).

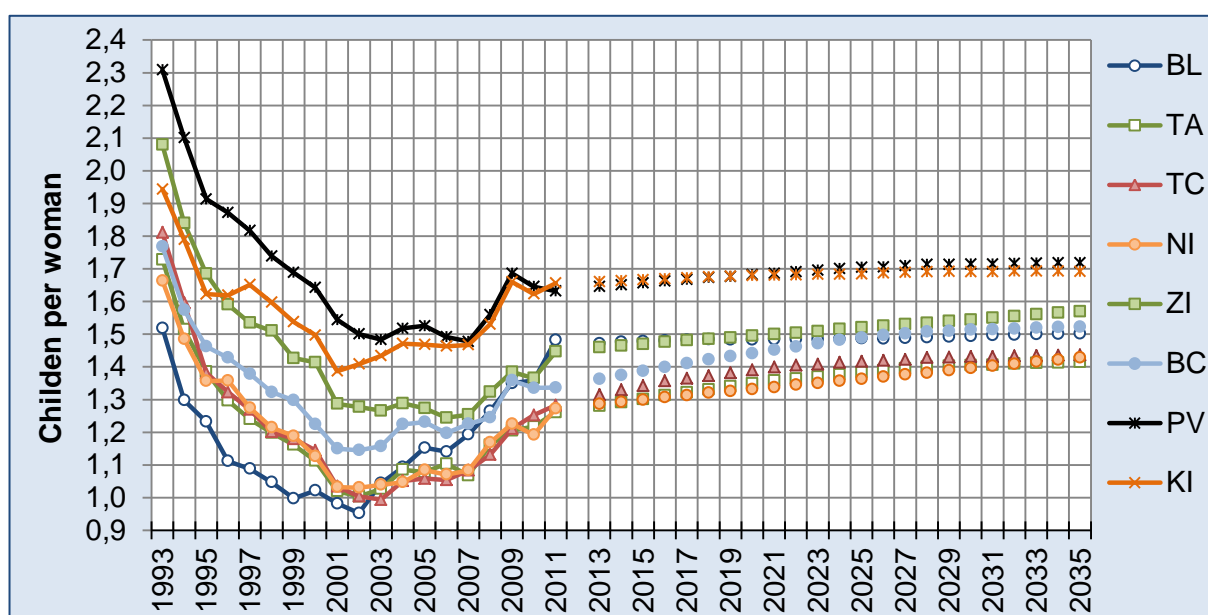


Figure 44: Total fertility rate in NUTS-III populations, Statistical Office of the Slovak republic, own calculations

Mortality is highly differentiated across regions. The general assumption is based on the increase of life expectancy of both males and females. Single and multidimensional decomposition confirms a big potential for further lowering of mortality. This is true especially for middle and higher ages due to the high level of cardiovascular diseases. Therefore, the higher contribution to the growing life expectancy will be induced by the ages over 50. As the most problematic seems a significant male over-mortality, though some slight decrease in difference has been observed recently. Some convergence within the set of regions is predicted, however the regional heterogeneity will continue.

The variation of female life expectancy is predicted to be lower in comparison to the male population. The male life expectancy will approach the level of 78-79 years in some region (Bratislava, Trenčín, Trnava), on the bottom of the ranking will stay the regions of Košice and Žilina. As for females, the life expectancy will grow to 73-75 years (Figure 45, 46).

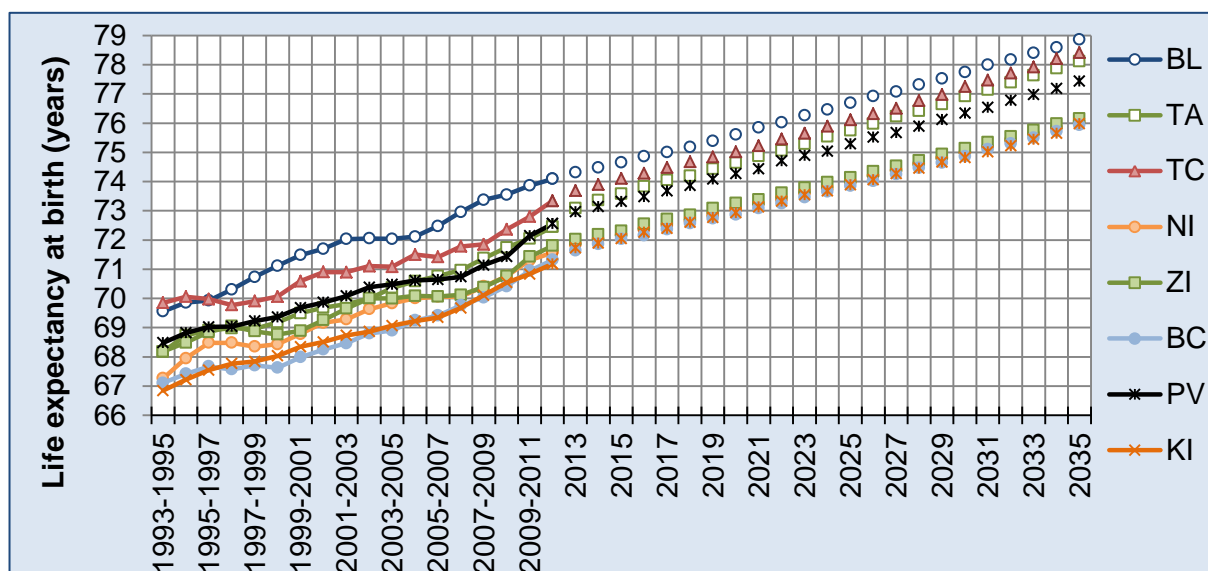


Figure 45. Male life expectancy at birth in NUTS-III populations, Statistical Office of the Slovak republic, own calculations

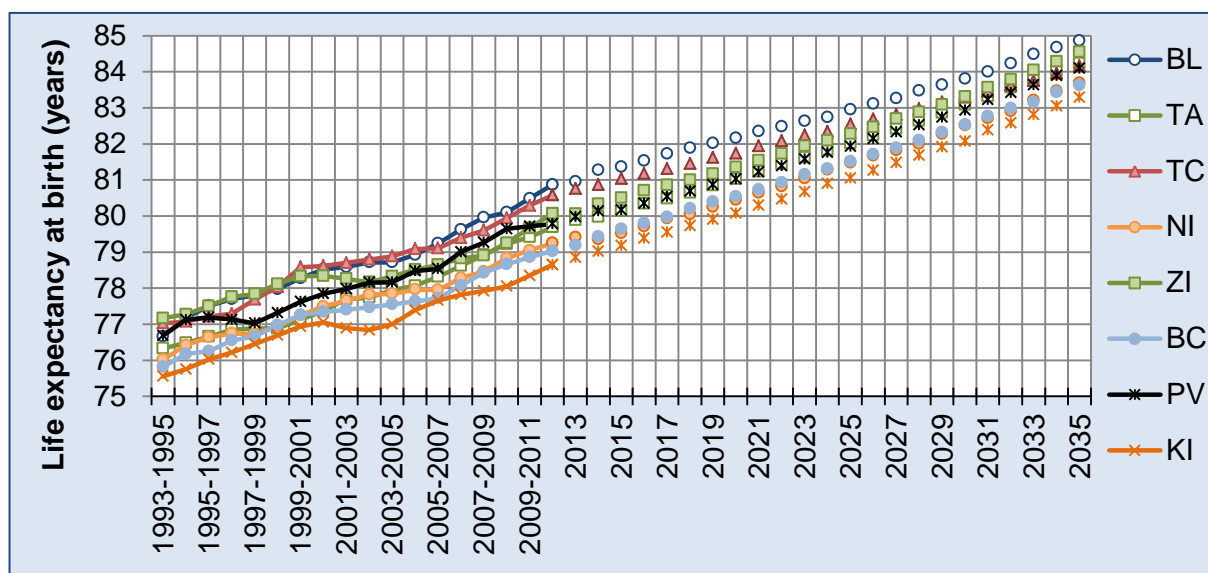


Figure 46. Female life expectancy at birth in NUTS-III populations, Statistical Office of the Slovak republic, own calculations

The process of migration does not change the age structure of regional populations significantly. On the other hand, it may cause relevant changes in population size. The very recent analyses show growth of intra-state (inter-regional) mobility of population together with a significant increase of

Eastern – Western migration flows. In general, the Eastern and Central part of Slovakia represent the source areas of out-migration to the destination regions in the Western part of the Slovak Republic, namely Bratislava and its wider surrounding area. Among major reasons of that, the unceasing regional inequality is very likely the most important one. The differences in wages, unemployment rates, social security are massive in the Slovak Republic. For instance, the value of average salary varied from 717 to 1110 EUR in 2013. The unemployment rate in Bratislava-region was registered at level of 6 per cent, whereas in Prešov-region and Banská Bystrica-region exceeded 19 per cent in January 2014 (Statistical Office of the SR). Push factors are well developed in the Eastern part of the country. On the other hand, the economy of Bratislava-region dealt with the economic crisis quite satisfyingly. It seems that the economic crisis have preserved, or even reinforced the regional inequalities and disparities thus inducing the process of heightening mobility. The labour migration is the fundamental engine of inter-regional migration with no doubt. The importance of international migration has slightly lowered in the crisis period. Anyways the primary targets of in-migration represent the Bratislava region and major urban centres in the Western Slovakia, Košice-city and some others.

The most mobile population is that aged 25-40 years in all regions. We predict stable development of migrants' age-structure, though the absolute mobility of the older population segment will rise bounded with the population ageing. A net migration in regions has been relatively volatile in recent decades, nevertheless the essential features has remained stable. The dispersion of predicted values is very likely to grow in coming decades, and variation at the end of forecasting period will be bigger in comparison to the current state (Figure 47).

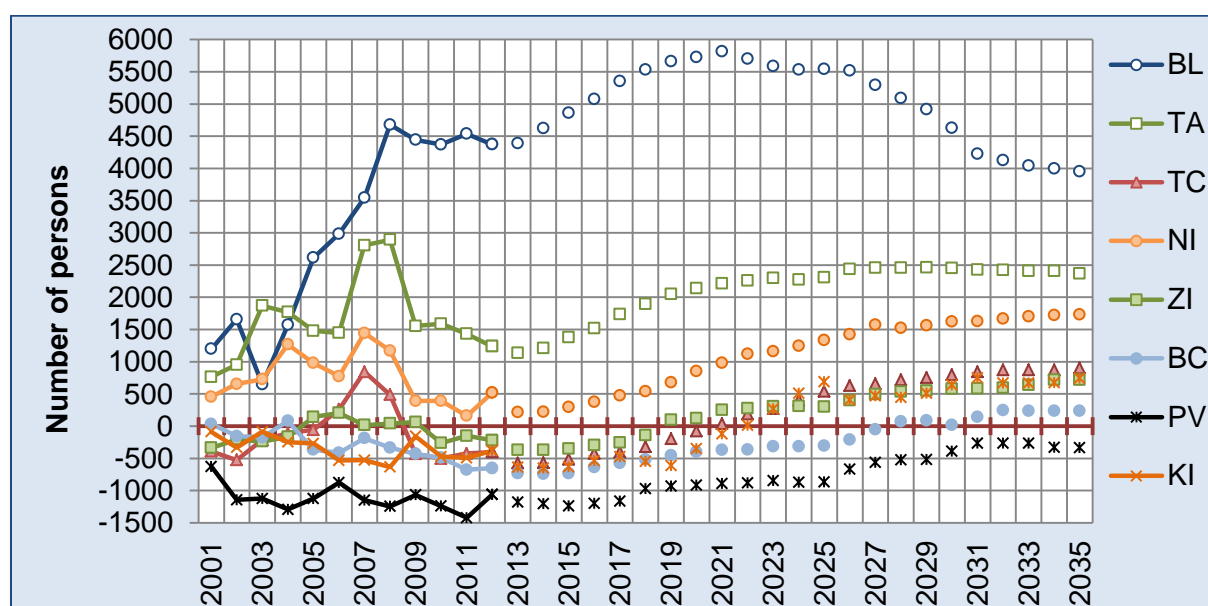


Figure 47. Net migration in NUTS-III populations, Statistical Office of the Slovak republic, own calculations

No distinct change in population size is predicted in NUTS-III regions except Bratislava-region because of positive net-migration in the region. Its population size should grow by approximately 20 per cent. The biggest decrease in population size is expected in the region of Banská Bystrica. This is influenced by natural decrease and migration loss as well. The most stable development should face the Žilina-region. The most populated regions are Prešov and Košice region. The values will vary from 570 thousand to 850 thousand inhabitants. In general, no radical changes are expected. The changes are more relevant with respect to the natural increase. Much more distinctive changes are expected with respect to the population ageing. This development corresponds with the national development, meaning that all regions will face natural decrease in horizon of 2035 with the exception of Prešov-region. Though the natural increase is expected as very lowering in time, still balanced numbers of births and deaths are very likely in the horizon of this forecast.

As for population size and natural increase (Figure 48 and 49), the most gaining region is Bratislava thanks to the positive net-migration during the entire forecasting period. Downward trends will be typical for all eight regions, in some of them double-effect of both negative natural increase and negative net-migration will cause the more distinct de-population. Migration is more influencing factor of the overall population change with respect to the differences across the regions.

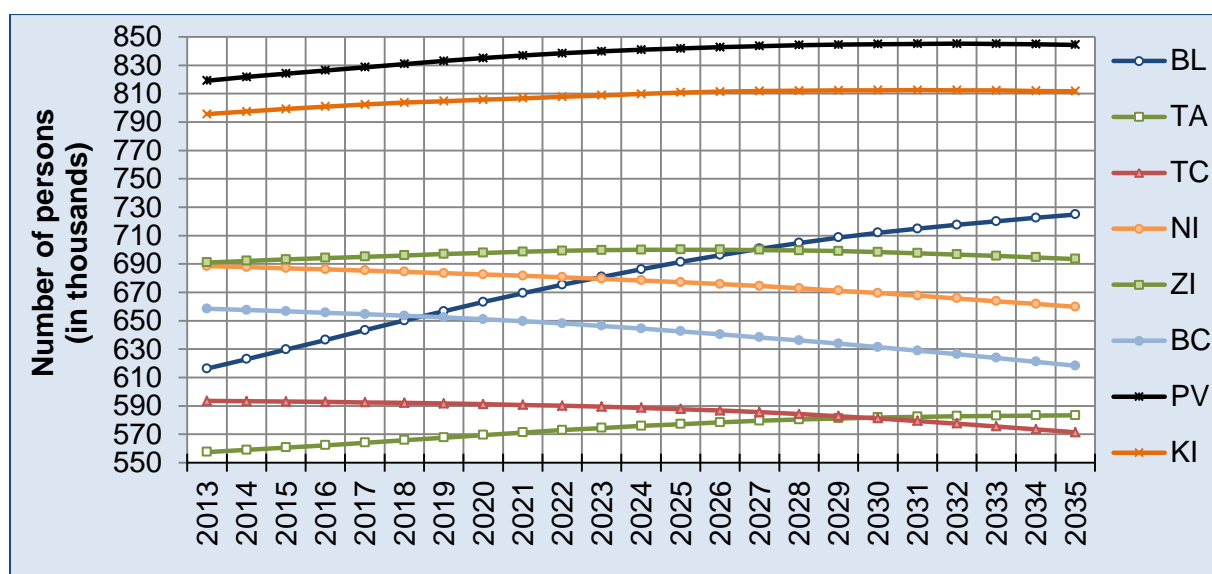


Figure 48. Predicted population size of the NUTS-III populations, own calculations



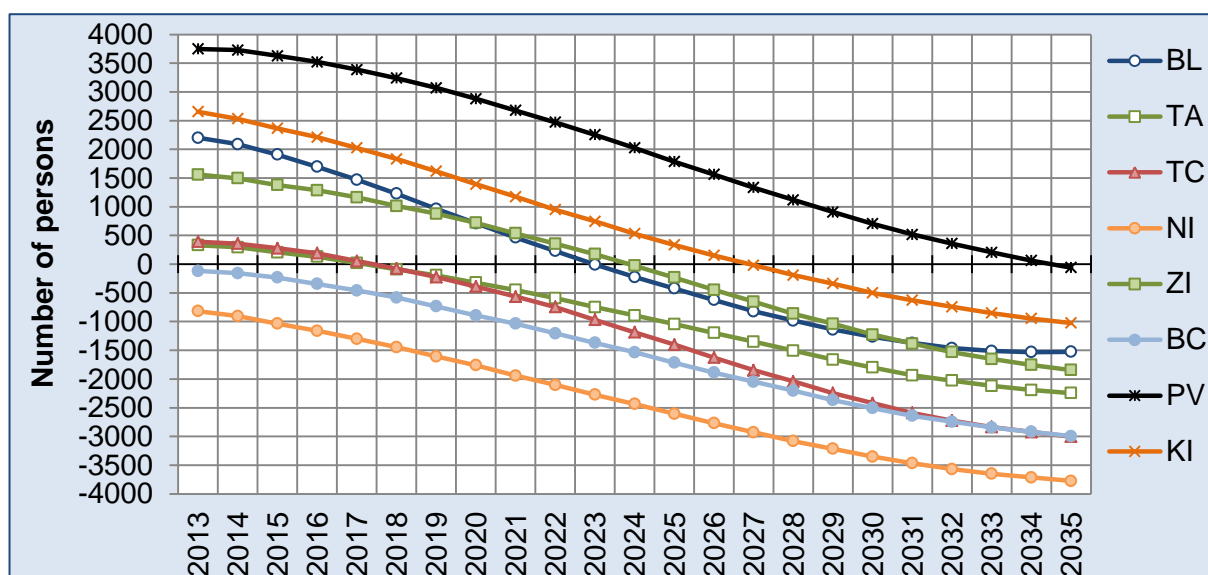


Figure 49. Predicted natural increase (annual number of births minus number of deaths) of the NUTS-III

Looking at changes in the age structure (Figure 50, 51 and 52), population ageing is confirmed as the universal demographic process in Slovakia. All regional populations will be ageing with similar intensity. On the other hand, the variation among regions remains. Migration will affect age-structural changes only partially. Such changes will be most visible in regions prone to a more intensive migration. For instance, ageing in the Bratislava-region will be mitigated by the migration inflow. In general, the low fertility, increase of the life expectancy going hand in hand with the time-structural shifts (big cohorts of baby-boom waves) will represent the principal factors of the population ageing. Prešov and Košice-region will stay in position of the youngest regional populations with the ageing index below 120 persons aged 65 and more to 100 persons aged 0-14. Trenčín and Nitra-regions will be at the opposite end of the ranking. The ageing index will grow up to 170. The mean age will exceed 47 years, whereas in case of Prešov-region the value of 43 years is predicted.

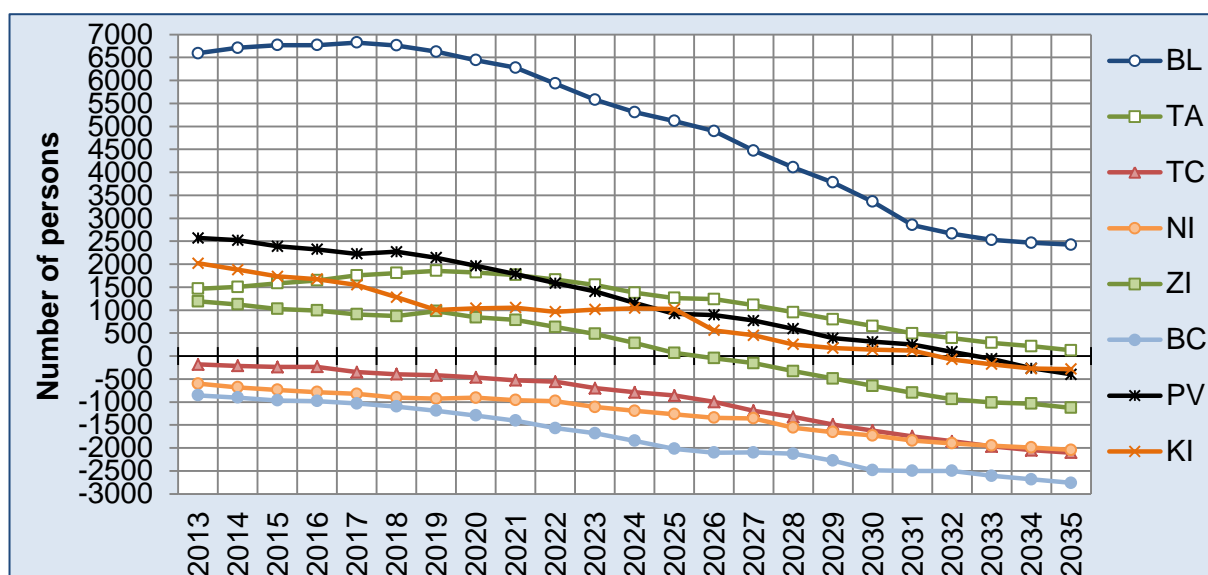


Figure 50. Predicted total increase of population (natural increase + net migration) of the NUTS-III populations, own calculations

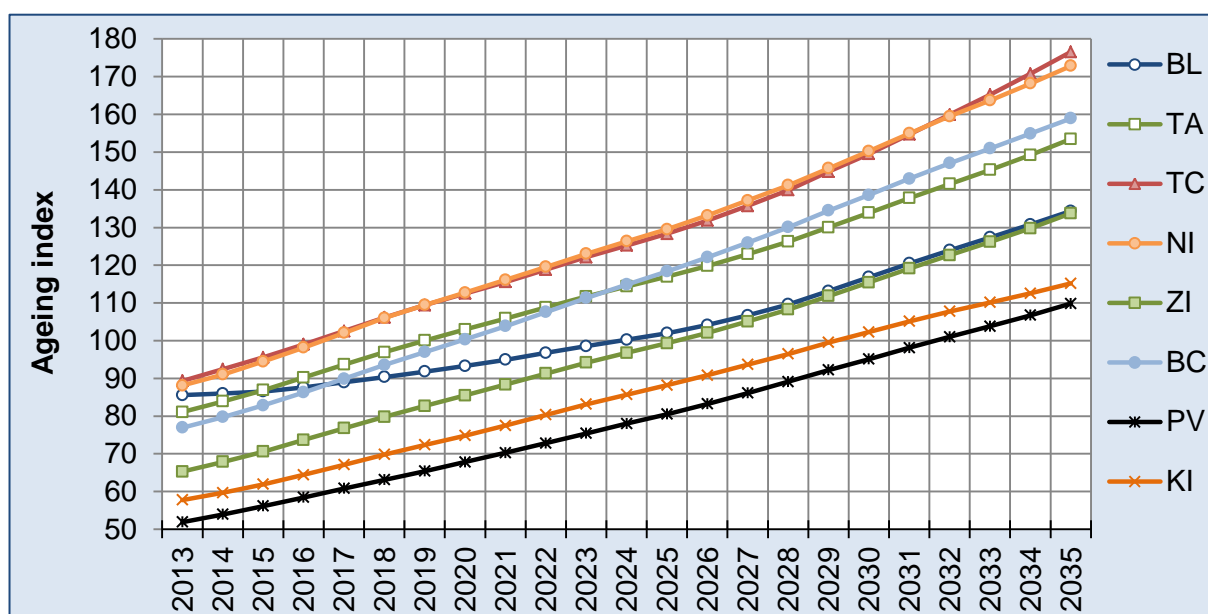


Figure 51. Predicted ageing index (Pop. 65+/Pop. 0-14) in the NUTS-III populations, own calculations

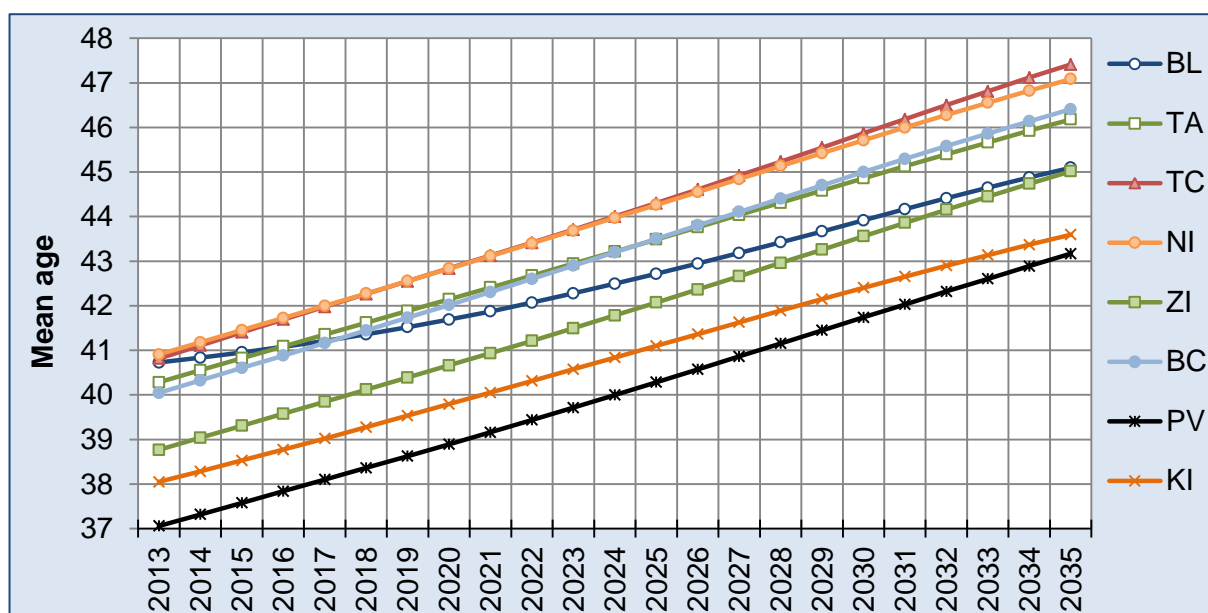


Figure 52. Predicted mean age in the NUTS-III populations, own calculations

## 6. 2 Sub-national forecast of Hungary

The regional population forecast on NUTS-III level was calculated for 19 counties and the capital city of Hungary, that is, for 20 territorial units. The differences between the counties are significantly high, both according to economic factors and socio-demographic characteristics. The highest difference can be found between the capital, Pest county and the other counties: the capital and Pest county are in economically better but demographically worse situation than the other counties. Counties situated in the north-western part of Hungary are more developed economically than the average, while counties situated in the north-eastern part of the country are less developed.

According to 2012 data, GDP per capita is two times higher in Budapest than the national average, 1.2 times higher in Győr-Moson-Sopron county and is equal to the national average in Komárom-Esztergom county. This value is lowest in Nógrád county where it is less than half of the national average, but it is significantly lower than the national average in Jász-Nagykun-Szolnok, Somogy, Borsod-Abaúj-Zemplén, Békés and Szabolcs-Szatmár-Bereg counties as well (Figure 53).

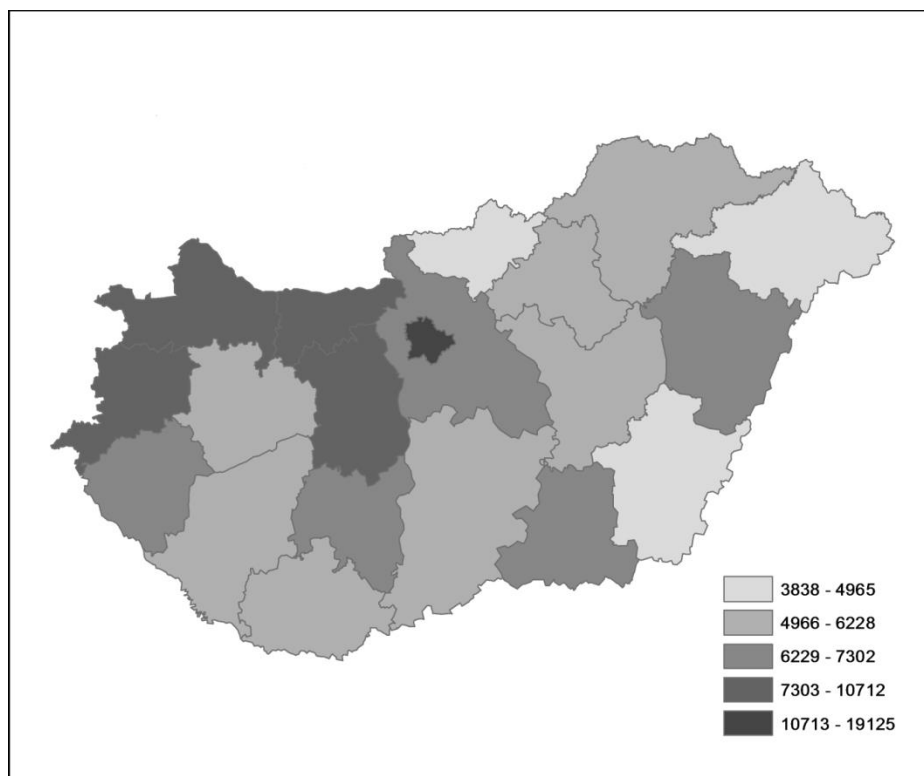


Figure 53. GDP per capita (EUR) in NUTS-III regions 2012, Hungary

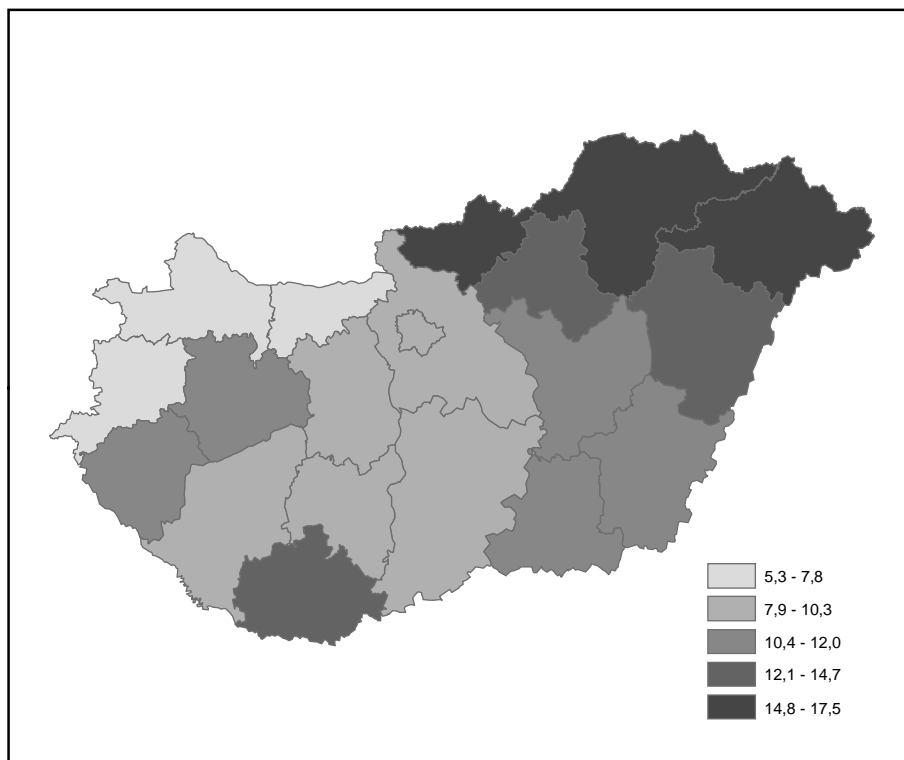
Unemployment rate is partly similar to GDP per capita. According to 2012 data again, this rate is lowest in Győr-Moson-Sopron, Vas and Komárom-Esztergom counties, but it is somewhat lower than the national average in Budapest and Pest, Bács-Kiskun and Tolna counties. Unemployment rate is highest in Szabolcs-Szatmár-Bereg, Borsod-Abaúj-Zemplén and Nógrád counties, but it exceeds the national average in Hajdú-Bihar, Heves és Baranya counties too (Figure 54).

There are considerable territorial differences in the rate of graduated persons, too: while one third of people living in the capital have university or college degree, this rate is only one tenth in Nógrád county.

Concerning economic activity, the differences are also significant: economic activity rate is 50 percent in Budapest, 48 percent in Komárom-Esztergom county, but this rate is only 41 percent in Borsod-Abaúj-Zemplén and Szabolcs-Szatmár counties, which are in the worst situation in this respect.

According to the latest census<sup>5</sup>, Budapest and Pest county was the most, while Somogy county was the least densely populated part of the country.

<sup>5</sup> 2011. évi népszámlálás. 3. Országos adatok. KSH Budapest, 2013.



*Figure 54. Unemployment rate (%) in NUTS-III regions 2012, Hungary*

The population of Pest county reached one million at the time of the previous census, and the number of its population further increased by 12 per cent between 2001 and 2011. The population of Győr-Moson-Sopron county has also increased, although the extent of this increase was much smaller. Except these two counties, the population of all the counties decreased between the last two censuses. The volume of population loss was highest in Békés county, but population loss was higher than the average in Nógrád, Tolna, Borsod-Abaúj-Zemplén and Jász-Nagykun-Szolnok counties as well.

Fertility is lowest in Budapest, among the counties Csongrád shows the lowest fertility. Fertility is higher than the national average in Szabolcs-Szatmár-Bereg, Borsod-Abaúj-Zemplén and Jász-Nagykun-Szolnok counties.

The number of deaths exceeds the number of births in each county in the last decade, but the volume of natural increase was different across the counties: Békés, Somogy and Zala counties showed the lowest value, and it was the highest in Szabolcs-Szatmár-Bereg and Pest counties.

The result of migration processes increased population size in almost half of the counties. Significant positive net migration was experienced in Pest county in the last decade, somewhat lower in Győr-Moson-Sopron county, but population was not decreased by migration either in Csongrád, Fejér, Hajdú-Bihar, Heves, Komárom-Esztergom, Somogy, Vas and Zala counties. More substantial

population loss as a result of migration occurred in Borsod-Abaúj-Zemplén, Szabolcs-Szatmár-Bereg, Békés, Jász-Nagykun-Szolnok and Tolna counties.

Budapest closed the previous decade with small positive net migration, besides the negative natural increase. This balance was a result of two counteracting processes: emigration continued – mostly into the agglomeration, but besides this a new return-migration process also began, and the attractiveness of the capital remained stable against other counties of the country.

In order to develop the assumptions of the population forecast, socio-economic and demographic situation of the counties were taken into consideration on the one hand, and the assumptions developed in the national population forecast on the other. The population forecast was calculated by cohort-component method, separately for each county.

In order to develop fertility assumptions, the fertility characteristics of each county were carefully analyzed in the last two decades, including the number of births and the age of women at birth. The relative position of the counties was taken into account, but there was no significant convergence between the counties, the most important differences between the counties remained stable – this is why the convergence was not assumed in the projected period either. The only exception is Budapest where total fertility rate was by far the lowest in the country in 1991, but it approached the fertility of other counties in the middle of the 2000s, although it was still low. Besides the stability of differences between the counties in fertility, the assumption was that the intensity of change in fertility is similar to the national trends in all counties. The highest fertility is expected in northeastern counties Borsod-Abaúj-Zemplén and Szabolcs-Szatmár-Bereg, where the TFR will be about 1.7-1.8 in 2035. Pest county also belongs to the counties with highest fertility: the TFR is 1.65 in 2035. Fertility situation is the worst in Budapest where total fertility rate will be about 1.34, but the TFR is hardly higher in Vas, Zala and Csongrád counties either. Fertility is highest in Borsod-Abaúj-Zemplén county where 100 women give 179 births, but the TFR is also similar to this in Jász-Nagykun-Szolnok and Szabolcs-Szatmár-Bereg counties (Figure 55).

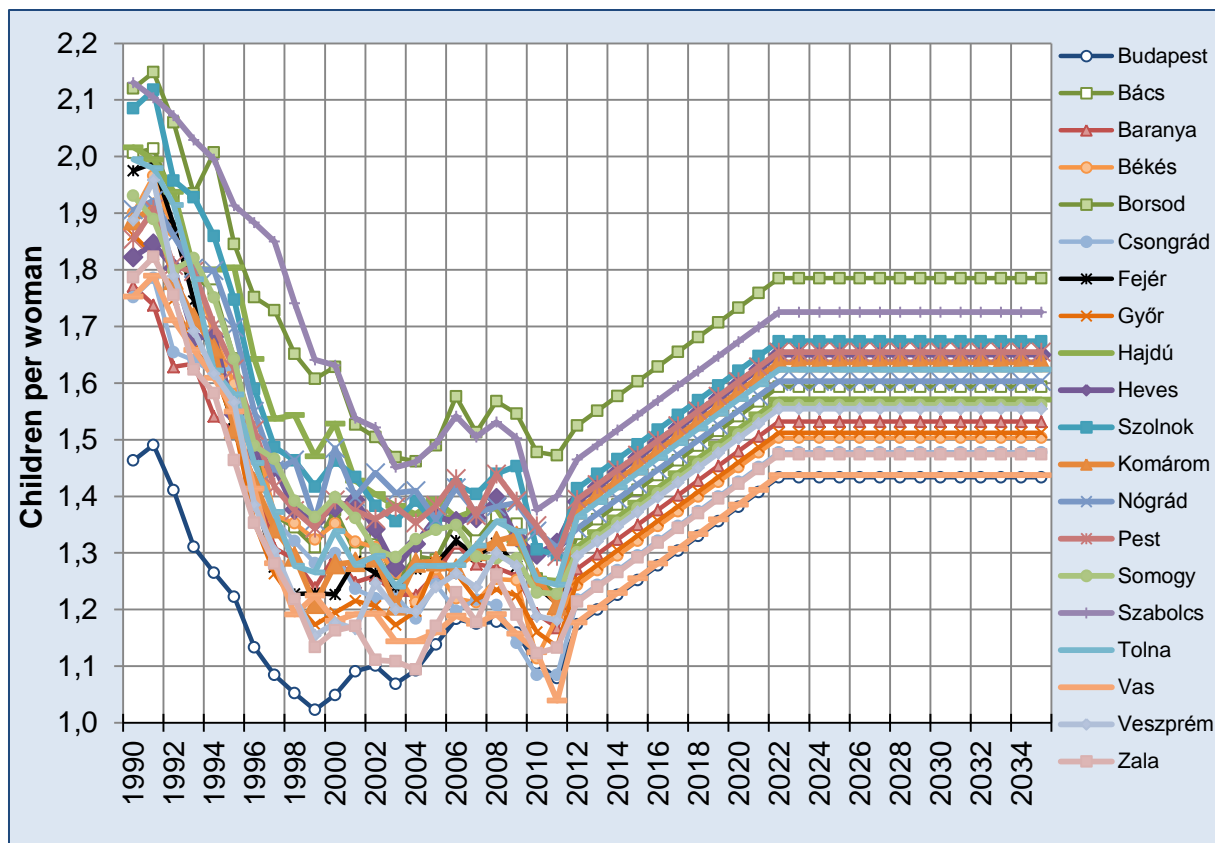


Figure 55. Total fertility rate in NUTS-III populations, Hungarian Central Statistical Office, own calculations

Mortality indicators also show important differences across the counties, but life expectancy increases in all the counties unambiguously. According to the mortality assumption of the population forecast, the rise of life expectancy will continue both for men and women. The mortality of the counties did not get closer to each other in the last two decades, so convergence is not assumed in the projection period either. Life expectancy changes in accordance with national mortality assumptions.

In case of men the life expectancy assumption was 77-78 years in Budapest in 2035 which is an extremely high value compared to the other counties in Hungary. The expected life expectancy is more than 76 years higher than the national average in Zala, Győr-Moson-Sopron, Pest and Hajdú counties. The projected life expectancy is one year lower than the national average and this way it does not reach 75 years in Somogy, Nógrád, Komárom-Esztergom and Jász-Nagykun-Szolnok counties. The life expectancy of men is the lowest in Borsod-Abaúj-Zemplén county, it is 73.3 years in 2035 which is 4 years less than the life expectancy of men in Budapest.

Women living in Hajdú-Bihar county and Budapest can count on a life expectancy of more than 83 years in 2035, but this value is not much less for women living Veszprém, Tolna and Zala counties. Women's life expectancy does not reach 82 years in Nógrád, Komárom-Esztergom, Békés and Jász-

Nagykun-Szolnok counties according to the mortality assumptions in 2035. The situation is the worst in Borsod-Abaúj-Zemplén county where women generally live for 81.1 years, which is far from the life expectancy expected in other counties (Figure 56 and 57).

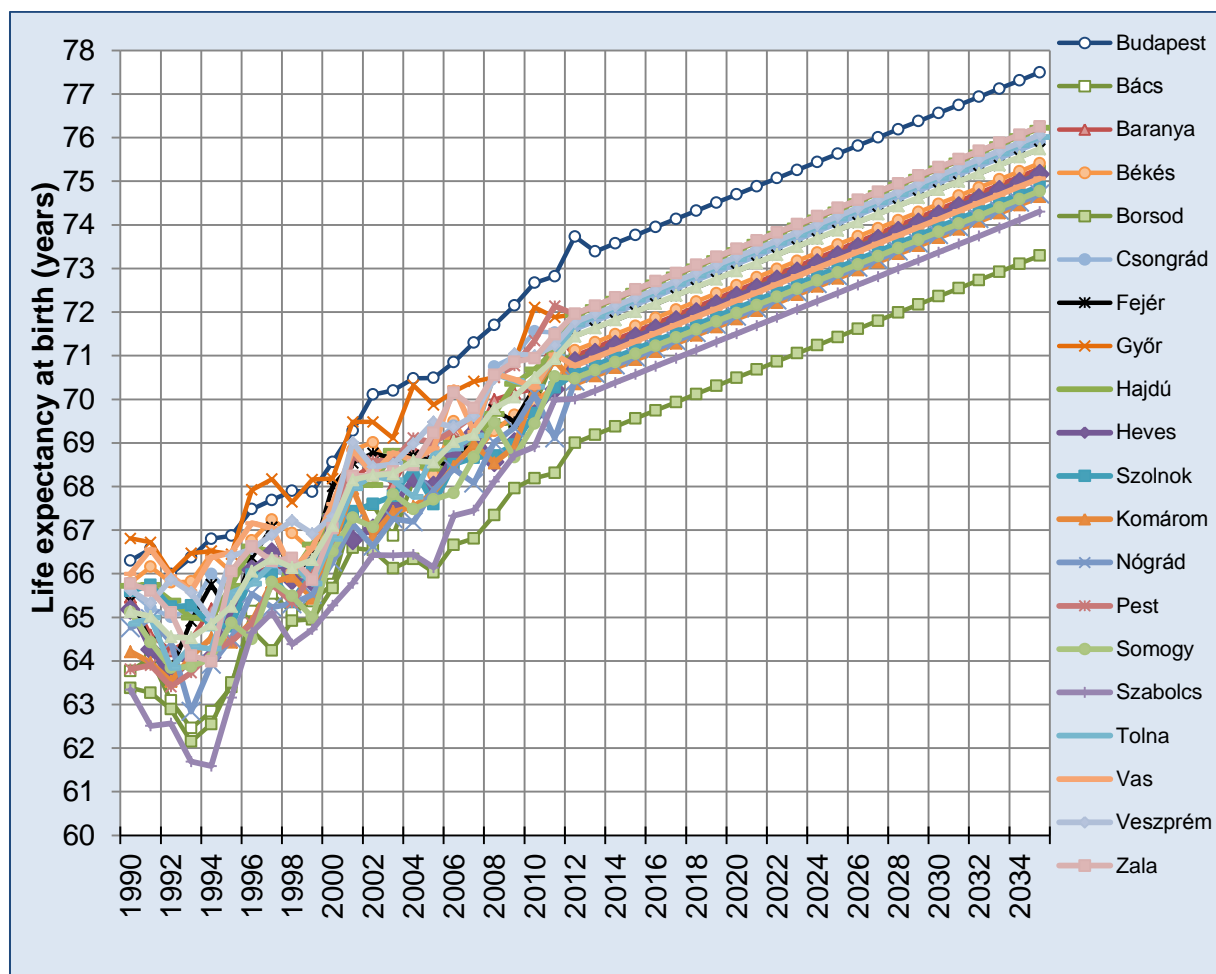


Figure 56. Male life expectancy at birth in NUTS-III populations, Hungarian Central Statistical Office, own calculations

Internal migration in Hungary is not too significant compared to population size, and mostly Budapest and Pest county is affected by migratory processes. The direction of international migration is again mostly Budapest, and larger cities of the country situated near the country border.



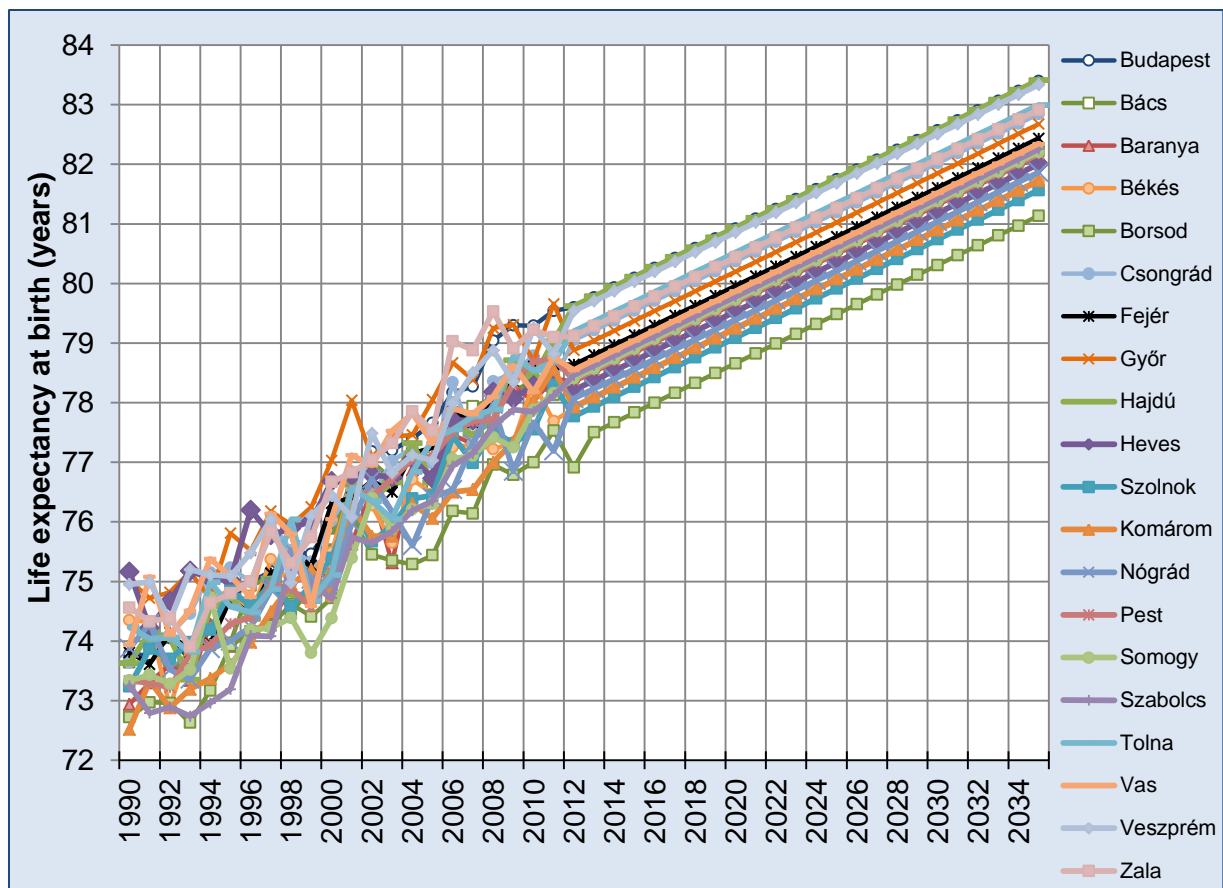


Figure 57. Female life expectancy at birth in NUTS-III populations, Hungarian Central Statistical Office, own calculations

Assumptions for migration were developed on the basis of earlier tendencies of internal and international migration, as well as the economic characteristics of each county, in accordance with the national migration assumptions. The motivation of migration is to find a more favourable labour market position and migration because of education. This means that the migrant chooses economically better situated counties and cities functioning as education centers as destinations (Figure 58).

Budapest had the highest positive net migration in the last decade and the forecast assumption is a continuation of this tendency in the future, until 2035. Pest county can also be characterized by positive net migration, although it is much less in numbers than it was in case of Budapest. According to the migration assumption of the forecast, the population of Győr-Moson-Sopron and Zala counties will grow as a result of migration processes. The same is true for Hajdú-Bihar and Somogy counties to less extent. The population loss because of migration is highest in Borsod-Abaúj-Zemplén county, but it is also significant in Heves, Nógrád and Szabolcs-Szatmár counties, and it is also important in Veszprém and Komárom-Esztergom counties.

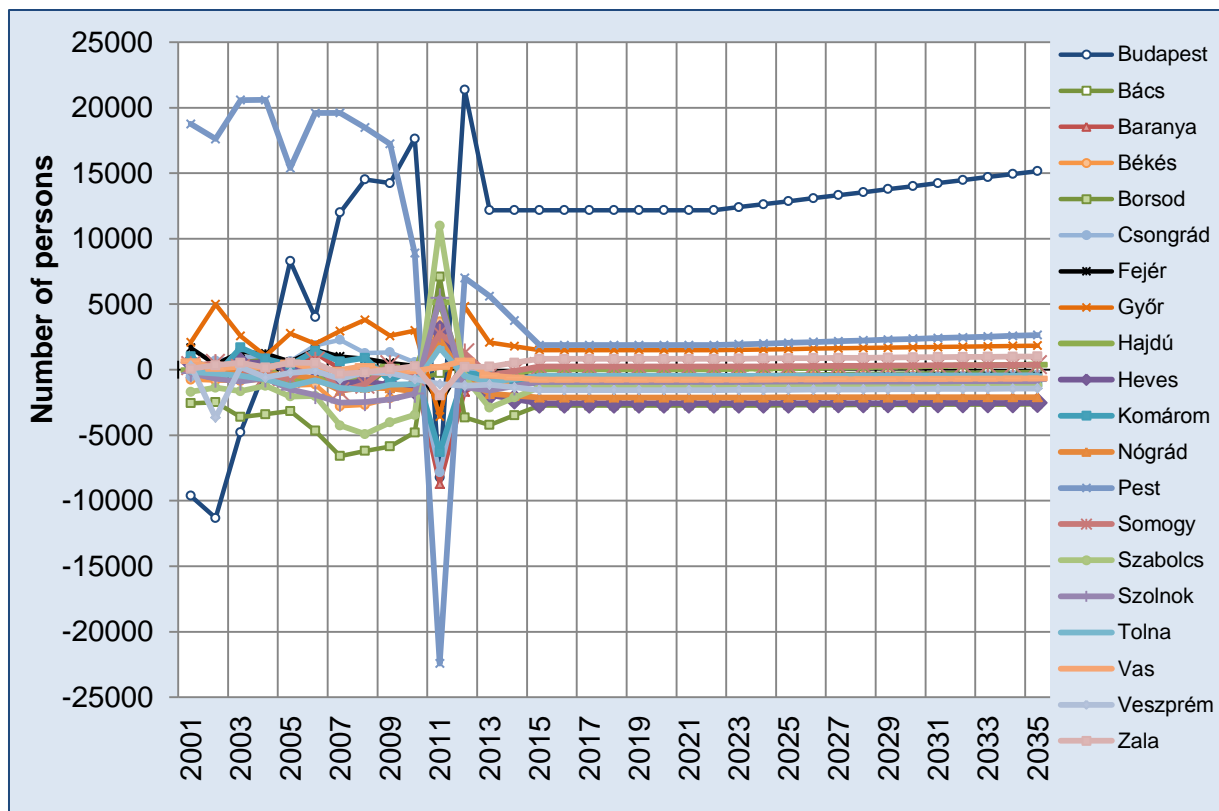


Figure 58. Net migration in NUTS-III populations, Hungarian Central Statistical Office, own calculations

The results of the national population forecast show significant population loss during the next two decades. In accordance with these results, decrease is expected in the size of population in most counties, especially those where the effect of negative natural increase and negative net migration can be experienced at the same time, for example in Borsod-Abaúj-Zemplén or Nógrád counties.

The population of Budapest is likely to grow significantly because of positive net migration during the next two decades, while the population of Pest county shows a very moderate population loss in the projected period. As for other counties, there will be some population growth in Győr-Moson-Sopron country, mostly as a consequence of favourable economic position and positive net migration.

The density of population is highest in Budapest: about 17-18 percent of the inhabitants of Hungary live here, which means nearly 1.7 – 1.8 million persons. The most densely populated county is Pest, the number of its inhabitants is about 1.2 million persons and it will be about the same at the end of the projected period. The population number in the other counties shows great variety: between 680 and 200 thousand persons at the beginning of the projection period and between 580 and 130 thousand persons in 2035 (Figure 59).

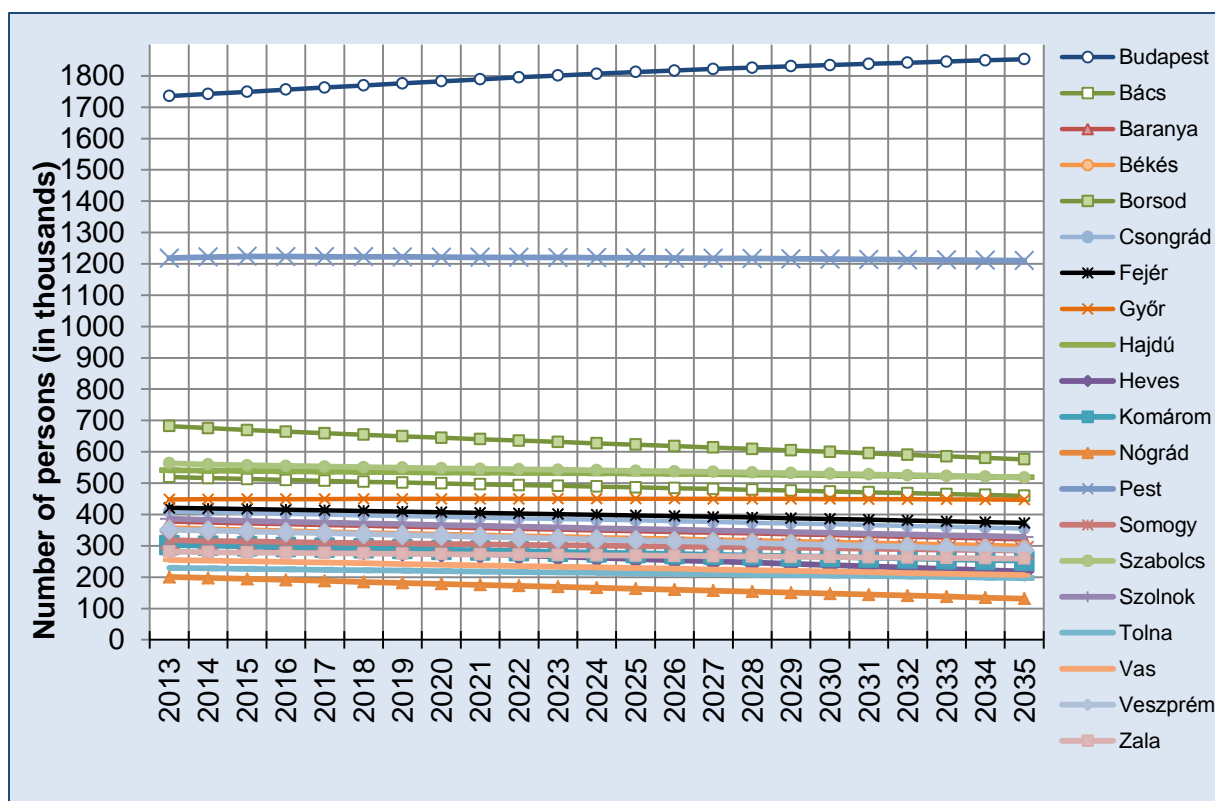


Figure 59. Predicted population size of the NUTS-III populations, Hungary, own calculations

The natural increase is negative in each county, that is, the number of deaths exceeds the number of births in a given year. The negative balance will grow further in most counties until the end of the projection period, to the greatest extent in Pest county, where the growth is twofold. There are some exceptions to this: Békés, Borsod-Abaúj-Zemplén, Heves, Nógrád and Jász-Nagykun-Szolnok counties, but the moderation of the negative balance of natural increase is not really significant even in these counties.

In case of Budapest the population loss of 5.5 thousand persons coming from natural increase will be about 11 thousand persons by 2035, which is about two times higher than it was at the beginning of the projection period.

The predicted volume of the total increase of population is highest in Budapest, and this is the only case when the total increase of population is permanently positive during the projection period because of the significant positive net migration: the city can count on 4-7 thousand persons total population increase per each year until 2035. As for the counties, the only county is Győr-Moson-Sopron where the total increase will be near zero. In all other counties the total increase will be negative during the whole projection period. Population loss emerging from total increase is highest in Borsod-Abaúj-Zemplén and Heves counties.

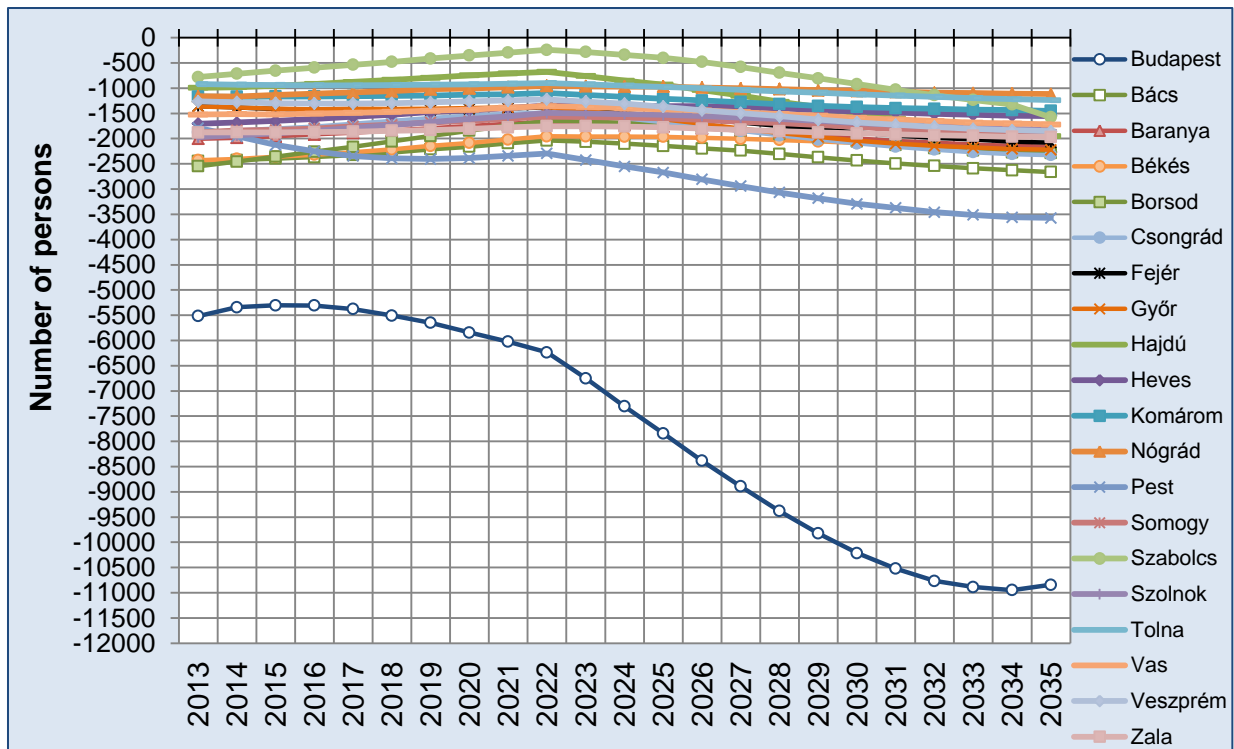


Figure 60. Predicted natural increase (annual number of births minus number of deaths) of the NUTS-III populations, Hungary, own calculations

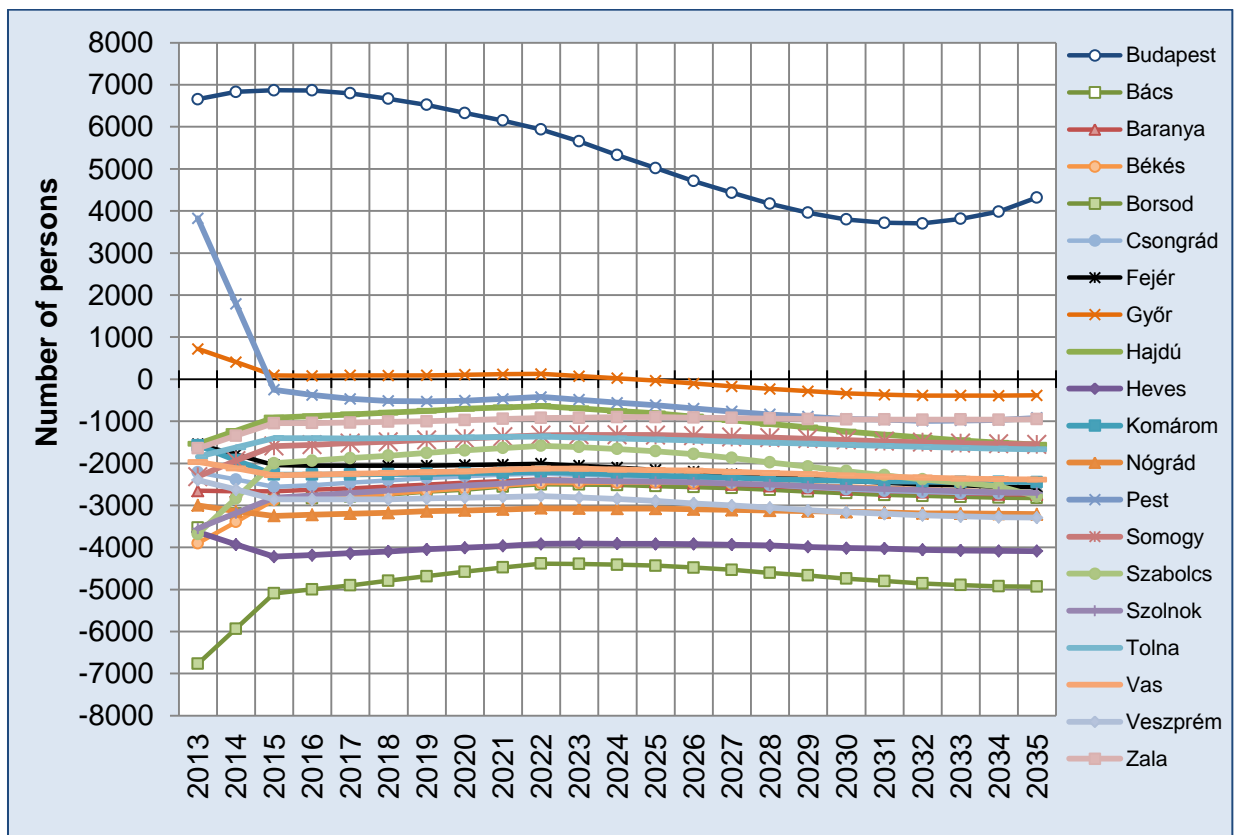


Figure 61. Predicted total increase of population (natural increase + net migration) of the NUTS-III populations, Hungary, own calculations

The change in the age structure of the population reveals dynamic ageing in all the counties, similarly to the national population forecast.

The starting value of the ageing index is between 80 and 150 in 2013 and it goes up to between 140 and 220 – that is, not only a remarkable rise occurs, but the differences across the counties become higher as well. In two “youngest” counties, Borsod-Abaúj-Zemplén and Szabolcs-Szatmár-Bereg the ageing index goes up to 140 persons aged 65+ for 100 person aged 0-14 by 2035, while in the two “oldest” counties, Zala and Vas this value is about 215.

The ageing index will rise with almost the same intensity in all the counties, although some variety can be found. For example, the originally low ageing index will increase more slowly in Borsod-Abaúj-Zemplén than in the other counties, the main cause of which is the relatively high fertility in this county. Budapest is also an exception from the general tendency, but the slower increase of ageing index here is due to the higher volume of positive net migration because of the younger age structure of migrants. The ageing index is 150 in 2013 in Budapest and it rises to 190 by 2035.

The average increase of mean age is 4 years between 2013 and 2035, but the increase of that is a bit different in various counties. The mean age is lowest in Szabolcs-Szatmár-Bereg and Pest counties, because of the causes mentioned previously; it is highest in Zala and Vas counties – in these latter cases the cumulative effect of negative net migration and low fertility prevails. The mean age rises to the smallest extent in Borsod-Abaúj-Zemplén, Jász-Nagykun-Szolnok and Somogy counties, as well as in Budapest: the increase is about 3 years during the projection period. The highest increase will be found in Nógrád, Vas and Veszprém counties: the mean age goes up by 5 years until 2035 (Figure 62 and 63).

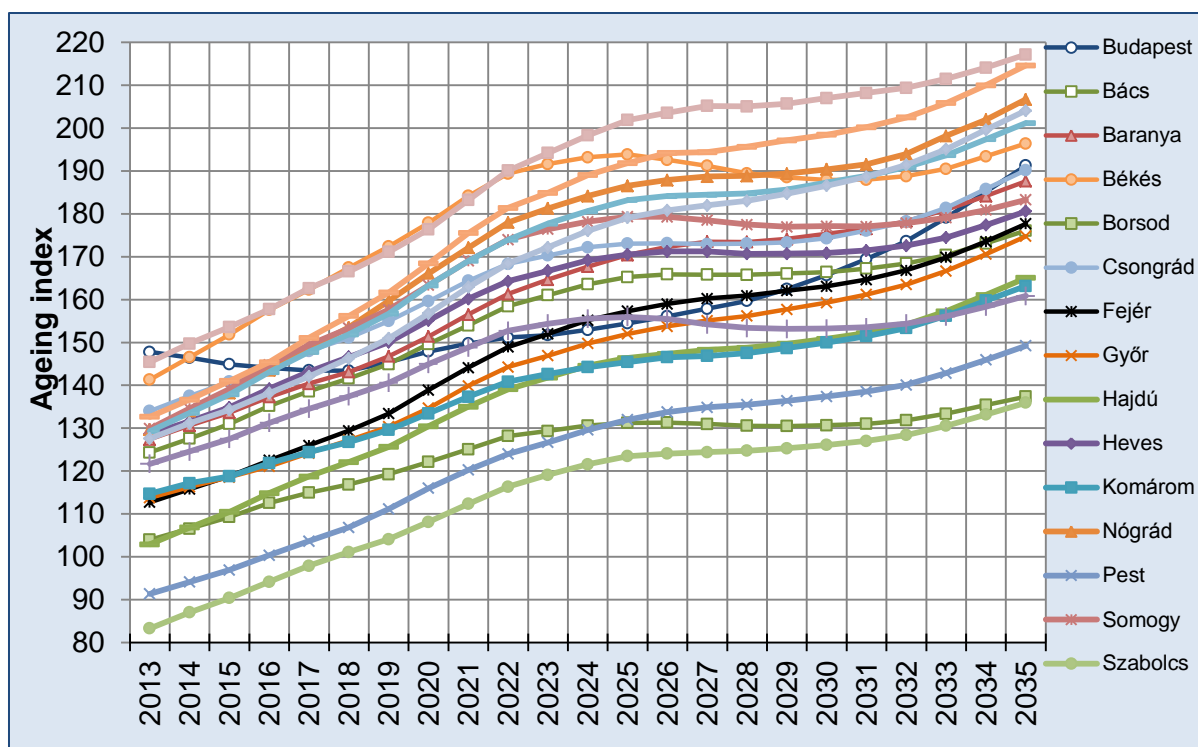


Figure 62. Predicted ageing index (Pop. 65+/Pop. 0-14) in the NUTS-III populations, own calculations

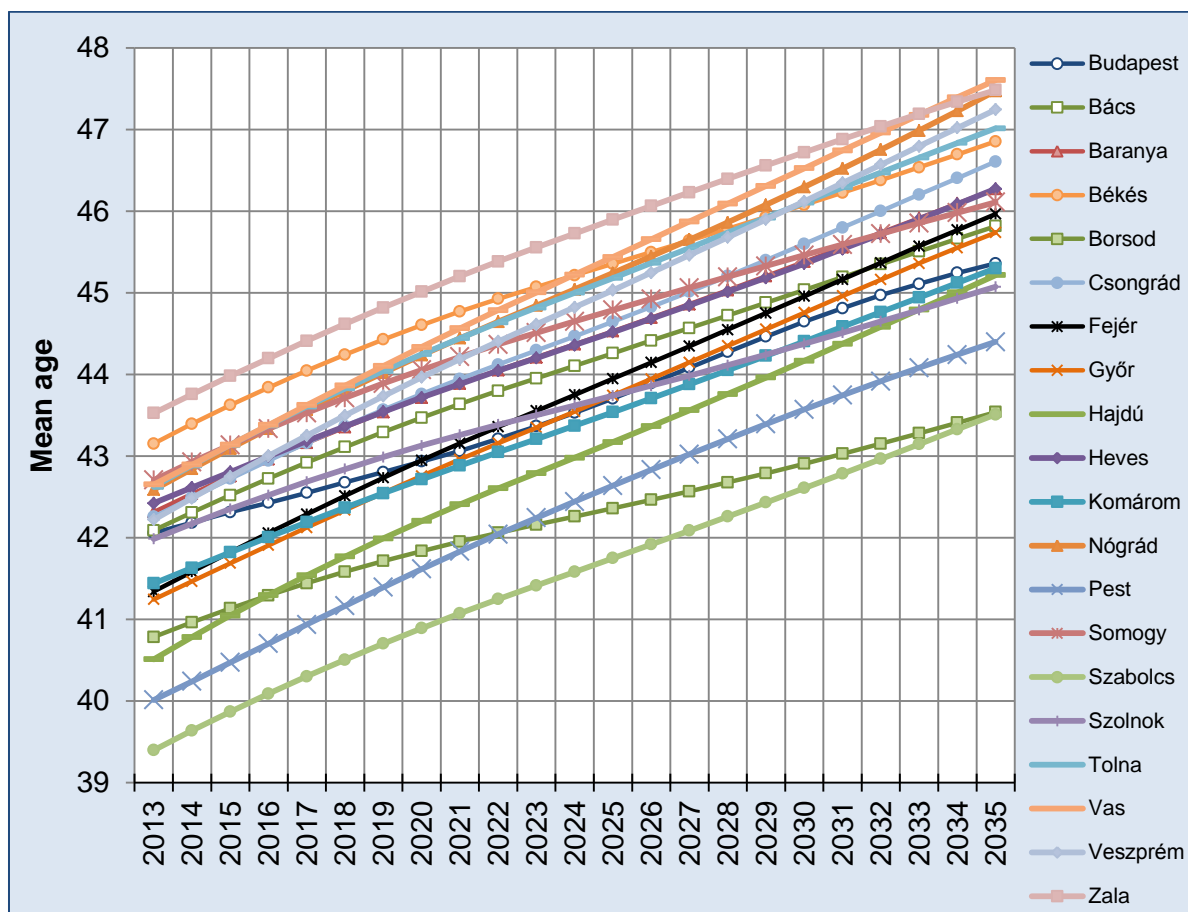


Figure 63. Predicted mean age in the NUTS-III populations, own calculations

## 7. Local forecasts

### 7.1 Local forecast of the city of Turčianske Teplice

Turčianske Teplice is the small town in the Northern part of the Slovak republic. With the population number of 6570 inhabitants (2013) is at the 98<sup>th</sup> place in the ranking of Slovak 138 cities and towns. There are also some villages without statue of city with bigger population number. Anyway, Turčianske Teplice obtained the statue of the centre of homonymous district in 1996. The town lies in the southern part of Žilina NUTS-III region. One of the most important eastern-northern communications crosses the town, however, some of other bigger cities in Žilina region have better geographical position on the most important connection from Bratislava to Košice, and from the Czech republic to the East. Turčianske Teplice is part of the region with over-average GDP, under-average unemployment and general better social situation but does not belong to the absolute top of the region from this point of view. The district Turčianske Teplice belongs to the lesser regions with respect to the population size and area. The district is part of the wider functional urban region of Martin city, town of Turčianske Teplice represents the lesser complementary node within. The distance to Bratislava is about 210 km, depending on the selected route. Distance to the city of Žilina (centre of the NUTS-III region) is about 55 km.

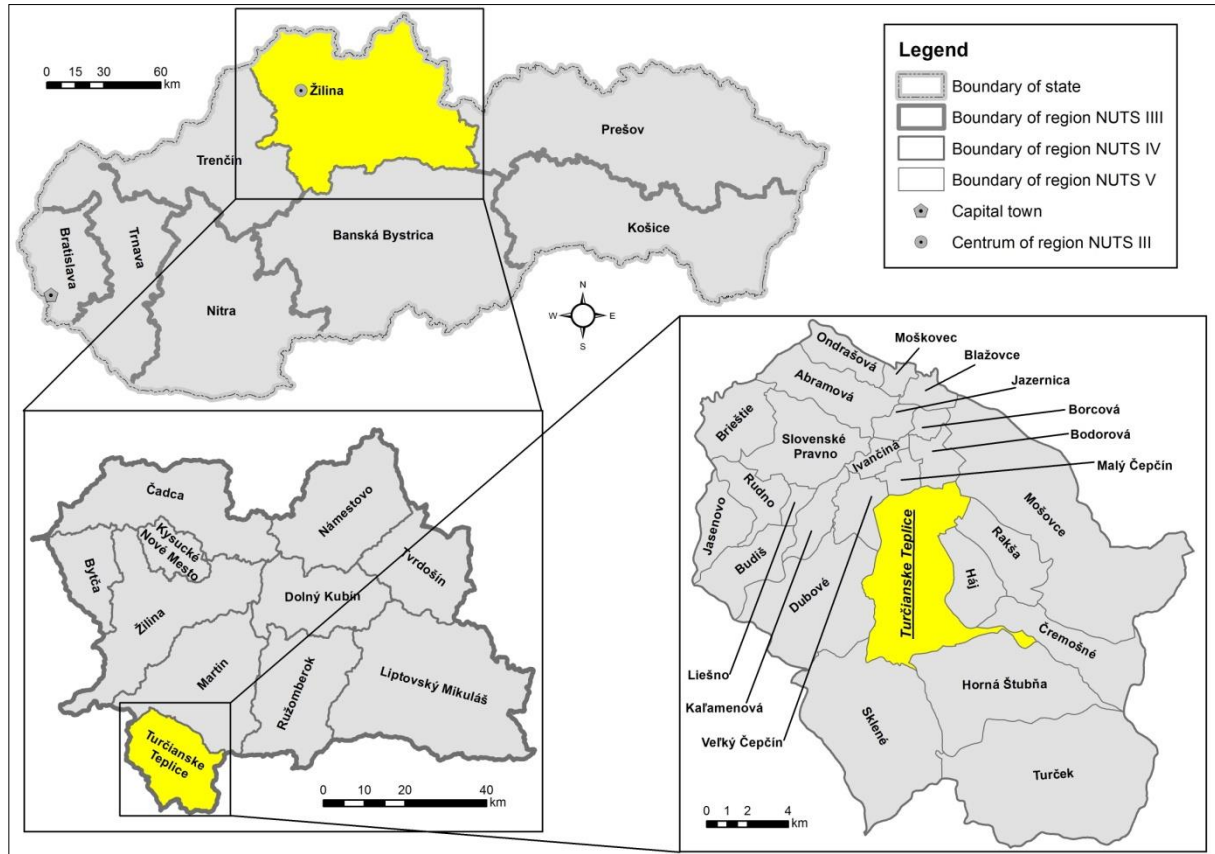


Figure 64. The geographical location of Turčianske Teplice within Slovakia

From demographical point of view, the town and surrounding region belongs to the de-population areas with a very low fertility and quicker demographic ageing (Mládek et al., 2006, Jurčová et al. 2010). The level of fertility is one of the lowest in Slovakia, whereas the timing of fertility is quite similar to the Slovak population. The mean age at first child birth is 27.5 years approximately. The life expectancy is about 1 year lower than the national average is. The net migration is positive in the city and district, most of the migration in-flows come from the internal migration. The international migration is slight.

The unfavourable situation with respect to the major demographical processes (besides migration) is likely to represent some potential for an enhancement. The convergence to the country-average values is predicted until 2025. Migration could be the driving force for this, as younger population (families) is moving to the town. The source areas are representing by distant rural areas within the district of Turčianske Teplice. Some flows come also from the northern district of Martin. Perhaps, we can very carefully talk about some forms of starting amenity migration, since the region is very advantageous in terms of the natural environment. Altogether, the region is relatively close, surrounded by mountains. The Turčianska kotlina (basin) was identified by geomorphologist to be the closest in Slovakia. Thus, we shaped the intensity and timing of fertility and mortality towards the national ones in future. There is also some potential for increasing net migration as was mentioned above. The major results with respect to the population dynamics are depicted in figure 65.

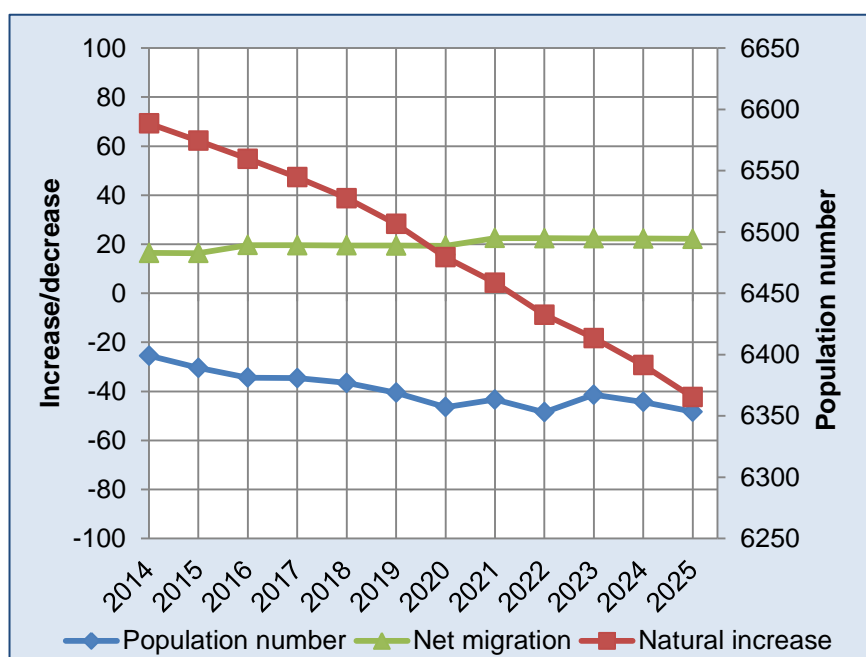


Figure 65. Major results until 2025, population Dynamics, the Turčianske Teplice town



The natural increase will change in natural decrease due to the ageing population. The number of births will lowering, whereas the number of deaths will growing in time. The population number will face the downward trend. The positive net migration will slow down the trend partly. The decrease in population size is about 200 persons in total by 2025.

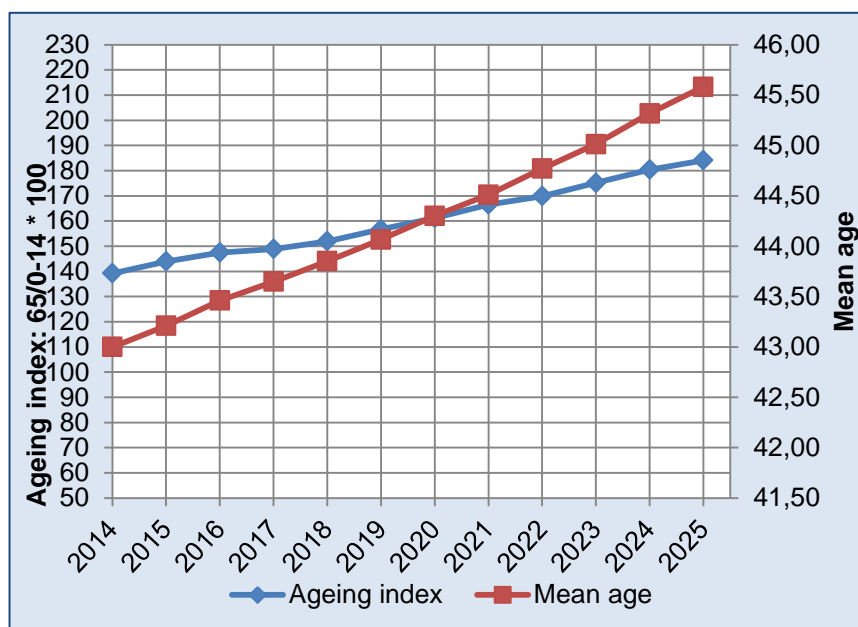


Figure 66. Major results until 2025, age structure, the Turčianske Teplice town

The population ageing (Figure 66) is very evident in the population of the town . The town belongs to the oldest cities in Slovakia concerning mean age, and the value will increase by 3 years until 2025. The ageing index will grow up to 184 persons aged 65+ over 100 persons aged 0-14, thus being significantly over the national average.

## 7.2 Local forecast of the city of Pécs

Pécs is situated in the south-western part of Hungary, about 200 km from the capital city. The number of its inhabitants is nearly 150 thousand persons, this making Pécs the fifth biggest city in the country, chief town of the county and a regional center as well. Most of the regional functions of Pécs extend to three counties of the Southern Transdanubia region (Baranya, Somogy and Tolna counties), but in case of some special functions, the southern part of Zala county and southwestern part of Bács-Kiskun county also belong to the agglomeration of Pécs. Out of its regional funtions, education, health system and culture are especially strong in the city.

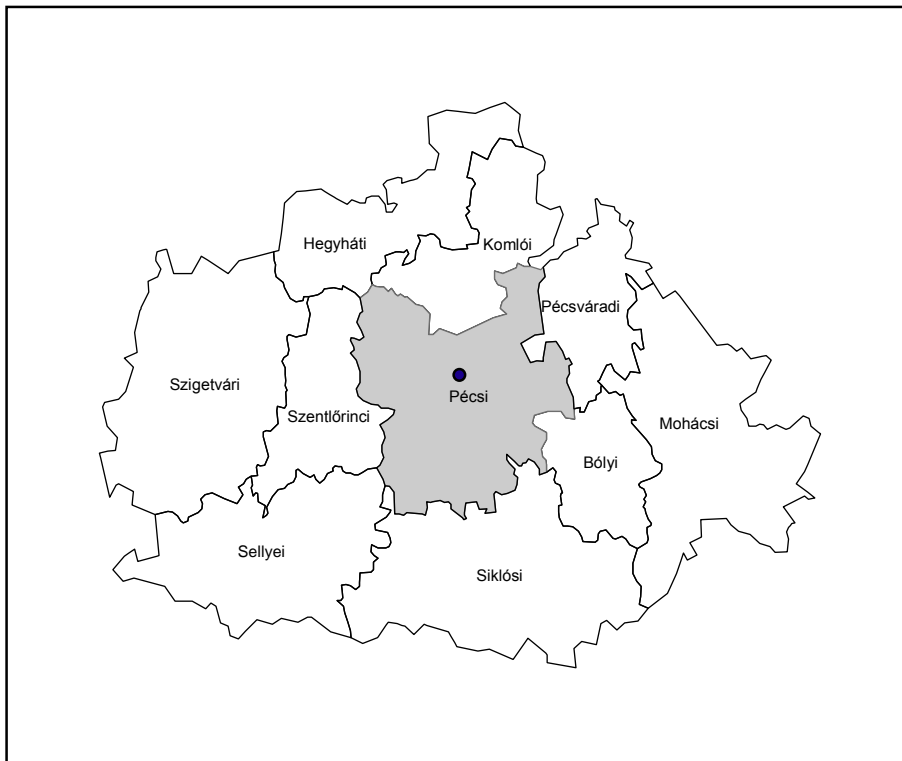


Figure 67. Baranya county (Pécs, small areas)

No other city in its 100-150 kilometer surrounding can compete with the cultural values, architecture and natural surrounding of Pécs. However, some cities situated relatively far from Pécs and some of the middle towns of the regional ring of cities around Pécs has become economically stronger in a relative or absolute way since the democratic change. The development trend of Pécs was broken by the loss of its economical potential after the democratic change. The city was not able to renew and create a new, competitive economic structure. Neither the process of infrastructure development in the country nor the changes taking place in international traffic corridors in the last two decades had positive effects on city development.

Pécs was out of greenfield investment in the second half of the 1990s because of lack of important factors for settling new industrial plants, especially the lack of appropriate infrastructure for transport. A significant improvement has occurred in developing industrial infrastructure only, which would make the settling of industrial firms possible in great volume.

The University of Pécs is a determining actor of economy in Pécs. The spendings of the university and its students total up to 15-20 percent of the GDP of Pécs. The deteriorating financial situation of the university as a tendency and a significant drop in the number of university students have serious effect on the economy of Pécs as well. It is also an important tendency that the city is less and less

able to keep graduated students in the city, because Budapest and other cities with central role have strong attractive effect for labour force.

When data for Baranya county are applied to the society of Pécs it can be seen that the monthly average salary of employees is equal to no more than 84 percent of that in the country. This average salary is hardly equal to the 1.9 minimal wage and 1.5 subsistence level. The situation is even more serious because the difference between incomes has become higher, and more and more people live in poverty or even deep poverty. Unemployment is also high in the city.

Pécs and its surrounding areas were characterized by suburbanisation process in the last few decades. The population of Pécs decreased in line with the increasing number of inhabitants in settlements around Pécs, because of moving out of Pécs.

As a consequence of suburbanisation the development of the agglomeration ring was more favourable compared to development of Pécs city. Mostly the settlements in the southern part of the agglomeration were the destination area of migration, and it is also true nowadays. The population gain of the whole agglomeration was about 9 thousand persons.

The decreasing population of the city shows the signs of dynamic ageing. The balance between natural increase and migration was negative in the last decades. The emigration of young people, especially with professional degree is significant in number.

Concerning other demographic characteristics, total fertility rate in Pécs was 1.13 in 2012 which is much lower than the average total fertility rate in the country. Life expectancy is lower than the national average, both for men and women; the difference is bigger for men than for women.

Working out the assumptions of the population forecast for Pécs, the socio-economic and demographic characteristics and data compared to the national figures were taken into account. As for fertility, the assumption was that it develops in line with the national trends and it will be about 1.41 in 2025. The assumptions for life expectancy show increasing trends, similarly to the national forecast. As a result of this increase, life expectancy will be about 74.9 years for men and 81.1 years for women in 2025. Migration can be most closely linked to economic processes of the settlement. On the basis of the city development plan the migration assumption is that net migration remains at the present level until the beginning of the planned improvement of economy, and after that period the population loss coming from migration decreases, while it will be around zero in 2025.

The results of population forecast show continuously decreasing population: the population of Pécs is 148 thousand persons in 2013, and 127 thousand persons in 2025, at the end of the projected period – that is, the population loss is 20 thousand persons during one decade (Figure 68).

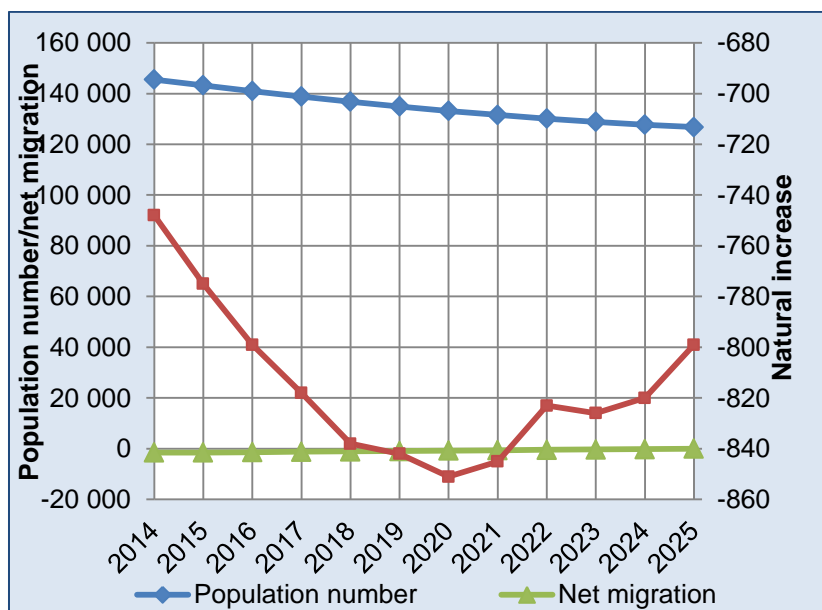


Figure 68. Major results until 2025, population dynamics, the Pécs city

The highest value of natural increase is -750 persons per year, the lowest value of it is -850 persons per year, that is the natural increase remains negative during the whole projected period, in spite of rising fertility. The number of births decreases from 1200 to 1000 births per year, the number of deaths drop from 1900 to 1800 per year. Negative net migration further strengthens the tendencies of population loss and ageing.

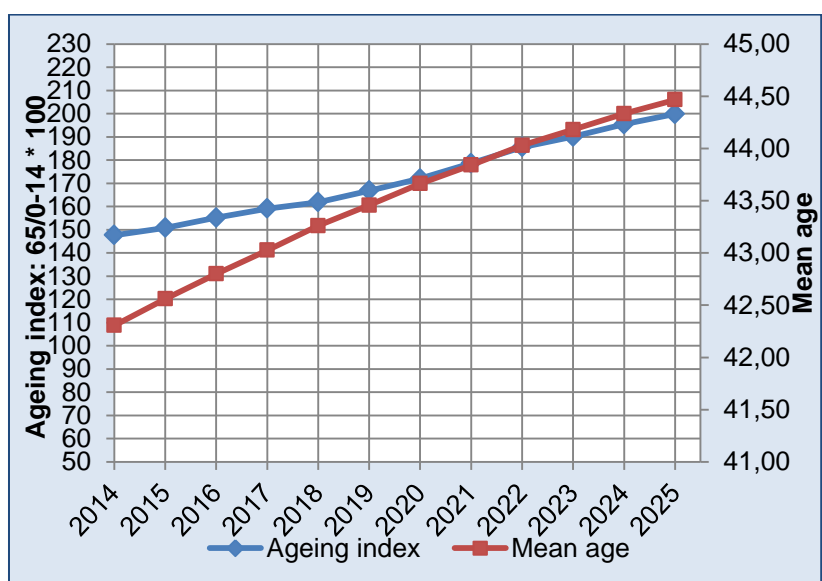


Figure 69. Major results until 2025, age structure, the Pécs city

Ageing index and mean age also show the ageing process of the population (Figure 69). The ageing index, that is the proportion of the elderly (65+ years old) compared to children (0-14 years old) rises from 144 percent to 200 percent during the period between 2013 and 2025. This means that the number of persons 65 years old or older living in Pécs in 2025 is two times higher than the number of persons younger than 15 years living there. The ageing index of Pécs is much higher than the national average.

In accordance with previous findings, mean age is also relatively high in Pécs: the mean age is 42.1 years in 2013 and it increases to 44.5 years in 2025; the rise is about 2.5 years. The mean age in Pécs is one year higher than the national average.

## **8. Comparison of Hungary and the Slovak republic with concluding remarks**

There are many similarities as compared the assumptions and results of the forecasts at national level. Both forecasts predict the slight increase of the total fertility in medium scenario. The Hungarian forecast is slightly less optimistic in medium scenario as well as in high and low ones. However, the difference is not remarkable when compared to the Slovak Republic. In any case, neither one of the compared populations is expected to reach replacement level of fertility. Therefore fertility will contribute to the depopulation as the first of three major factors identified in this paper.

The second major factor shall be derived from the expected results of increasing life expectancy. This causes and will continue to influence the process of ageing at the top of the age pyramid in future. Both forecasting assumptions are optimistic in case of mortality, and the increasing trend seems to be irreversible. Difference between females, when comparing the two countries at a regional level, are slight and less significant. Differences are substantial when we get into the comparison of male populations. The current situation in Hungary in case of males is worse than in case of male mortality in Slovakia.

Finally, the third factor, referred to as rapid ageing, is caused in both populations by the age-structural momentum. As for migration, the Hungarian assumption seems to be less optimistic. The low scenario tells about zero-net migration whereas the medium and high ones are at those levels as in the Slovak Republic (being a lesser population). The migration affects the future population numbers in a distinct way. Except the low scenario for Slovakia, all scenarios presuppose population loss with an ascending tendency towards the time-horizon of the forecasts. The population decline is stronger in case of Hungary. The natural decline will be too strong to be replaced by the anticipated migration surplus. In addition, both populations will face a rapid population ageing. In case of the

Slovak Republic, in 2060 the mean age will approach the level of 50 years, making its population one of the oldest ones in Europe. There is a strong effect of the age-structural momentum. This means that the big cohorts born in 1970s will be replaced by the small cohorts of the post-communist transformation period.

Several aspects of migration are important for the investigation of population changes. This is the reason why a number of alternative migration-related scenarios have been prepared. The zero-migration scenario for instance shows what population trajectory (population size) would take place if migration surplus is absent. In addition, since Slovakia has a more optimistically designed medium scenario, the difference between medium and zero-migration scenarios is higher in the case of Slovakia than in the Hungarian case.

The replacement migration demonstrates another aspect of migratory influence on population change. It is expected in both countries that eventually several thousands of migrants will be needed to avoid a negative population change. The upward trend of the “replaced” immigrants is more dramatic in case of Slovakia, since the population decrease will gain velocity towards the time horizon in medium scenario.

The real migration scenario is perhaps the most relevant output of this analysis. Even though it lacks forecasting features, it generates valuable information for the construction of assumptions. The analysis shows beyond doubt that there is undocumented migration in vital statistics of Hungary and Slovakia, as well as in most European countries. This is well known in European institutions and research bodies. In the presented analysis we made a shift from “just claiming inaccuracy due to undocumented migration” to “finding the most accurate figures under the circumstances”. An estimation, elaborated with a high degree of precision shows, that the “real” migration is significantly lower in both countries. We expected this result in spite of the fact that estimation of concrete figures using the precise methodology was executed in both countries for the first time. Nevertheless, there is a need for further methodological developments in this field.

Regional forecasts produced also interesting results. Although the proposed time-horizon is closer due to a higher degree of uncertainty in the sub-national forecasting process, the information is very important for the local and regional strategies. The results demonstrate that the regional heterogeneity of demographical processes (including migration) is substantial in both countries. Migration plays the important role in shaping current and future population change, especially the increase/decrease of population. Besides the quantitative aspect, there is a need for discussion of the qualitative aspects and these can be subsequently incorporated it into the forecasting assumptions.

Forecasting case studies for the cities of Pecs and Turčianske Teplice demonstrate the way to make forecasts at local levels at a minimal standard. The results show that the natural decrease and population ageing is a characteristic feature of the population development also at local level. Like at national level, decrease could be reduced by immigration, yet, the population ageing remains irreversible. Finally, demo-geographical approaches might prove useful for making analyses and predictions on future population changes in cities and towns. Many stochastic “micro-level” factors can affect the population trajectories, therefore comprehensive multidisciplinary approach might be needed, especially in case of migratory predictions.

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