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TEMPORAL AND SPATIAL ANALYSIS OF POPULATION AGEING AND GROWING YOUNGER IN SLOVAKIA

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Abstract
Population ageing is one of the fundamental features of current population development, with an evidently irreversible future impact. The intensity and importance of this process is significant on a global scale, mainly during the past hundred years. Population ageing is linked causally to the second demographic transition and its end in the more developed parts of the world. To a certain extent, this can be labelled a "success of the modernisation of life"; on the other hand, it leads to a few problems in relation to the family, to the social and economic components of society. Even though this process is irreversible from the viewpoint of the individual, it is, in fact, changeable from the viewpoint of a specific population. The main aim of the paper is an analysis of the ageing population of Slovakia with an emphasis on the temporal and spatial-temporal aspect of changes in the age structure in NUTS 4 SR territorial units. The Slovak population is affected by the ageing of the population in the context of European development. The study reveals the fact that its nature and intensity are changing. The 1990s in Slovakia are characterised by relative bottom-up ageing, with an abrupt increase in intensity. In contrast, the process of relative top-down ageing is typically of very low intensity. The main cause is a radical decline in fertility combined with the very slight improvement in mortality rates. Multiple cohorts born after the Second World War in the age structure of Slovakia shifted to over the age of 45, and this identifies the very process of ageing from the middle. The last decade (2011 – 2021) of the analysis indicates a gradual reversal in the age structure development of the Slovak population. This last decade is characterised by a population growing younger from the bottom and intensification of the ageing process at the top. Regional analysis using the Sonis method confirms Slovakia-wide trends of relative top-down ageing or growing younger from below, although identifying the causes is more difficult. The study confirms the cardinal process of the population growing younger from below in NUTS 4 around the capital of the Slovak Republic.

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Ageing, Slovakia, district/NUTS4, growing younger, Sonis graph.

INTRODUCTION

The ageing of the population currently ranks among the most common of concepts. This is the result of long-term population development and the effect of previous reproductive behaviour, migration trends as well as socioeconomic situation. This process is crucial in the modern population development of most countries. The European dimension of population ageing is viewed as the most dynamic on the global level (Káčerová and Ondačková, 2015a).

The essence of the demographic development of a specific population is subject to changes that at the current stage of population development are labelled as the second demographic transition. At the same time, the fact that the second demographic transition is the starting point in terms of the existence of the process of population ageing becomes crucial. "The phase of exceptional growth is one of the most astounding effects of the demographic transition. At the same time there are two key consequences of the transition: population ageing and growth in exceptional migratory flows" (Caselli et al., 2006).

The aim of the study is to analyse population ageing or changes in the age structure of the population of Slovakia, with specific attention on two aspects: (1) temporal and (2) temporal spatial. The study of population ageing from the temporal aspect focuses on changes in the age structure of the population of Slovakia in the years 1950 – 2021. The temporal-spatial aspect of the analysis leads to a time comparison of the population ageing of Slovakia within its local statistical territorial units (NUTS 4 or LAU 1) in the census years between 1991 – 2021 by means of a Sonis graph (Sonis, 1981).

THE THEORETICAL AND METHODOLOGICAL BASIS

Population ageing is becoming an integral feature in the present stage of population development of most countries. The theoretical and methodological foundation of this process lies in the new peculiarities of the reproductive and family behaviour of the population i.e., in manifestations of the second demographic transition. Therefore, the process of population ageing is causally connected in particular with the second demographic transition (Káčerová, Ondačková, Mládek, 2014). This is a complex of changes in the behaviour and value system of the population which overestimate individualism and personal freedom while simultaneously weakening the function of marriage and family (Van de Kaa, 1980, 1987, Lesthage, 1983, Pastor, 2002). This process is component of the changes that the countries of Northern and Western Europe have undergone in the second half of the 20th century and which at the end of the century began to

appear in certain modified forms in the countries of Southern, Central and Eastern Europe and can be considered among the most significant in population history.

The study of the process of population aging in Slovakia in its temporal and spatial scale occurs intensively in the domestic professional literature. Changes in the age composition of the Slovak population were dealt with in various time periods by Svetoň (1958), Verešík (1974), Vaňo ed. (2000, 2001,2003), Bezák, 1992, Mládek (2000, 2003) Bodnárová, (2001) and spatial units Mládek and Káčerová 2008, Káčerová et al. 2014, Káčerová and Ondačková (2015), Káčerová and Mládek (2012), Mládek and Pavlíková (1999). The specifics of the age structure of social groups, inhabitants of nationalities, cities and rural settlements were in the attention of Mládek (1995), Černý (1978 a, b), Chovancová and Mládek (1996). Defining changes in the age structure of the Slovak population in relation to the basic processes of population dynamics and the migration process are the content of the works Mašková, 1991, Káčerová, Nováková (2016), Chovancová (1995), Ondačková et. al. (2018). The authors focus on the manifestation and influence of population aging in Slovakia in the area of economic activity, consumption, or services Chajdiak (1999) Káčerová, Ondačková, Mládek (2013), Vojtko 1983, Káčerová, Ondoš, Miláčková 2021, Mitríková, Madziková, Liptáková (2013).

In an effort to synthetically reveal and explain the transformation of the age structures of the studied population and its regional units, the study utilises several methodological approaches. To define and measure the process of population ageing means to express changes in the age structure in the form of a decrease in the number or share of children in a population (ageing from the bottom) and an increase in the number or share of the elderly in the population (ageing from the top) (Mládek, 2000, Jackson, 2012, Mládek and Káčerová, 2008, Káčerová and Ondačková 2015b). Both classifications of ageing defined above need to be identified concurrently, because the terms bottom-up and top-down respect in which part of the age pyramid ageing occurs, regardless of its genesis (growth of the middle length, or the transition of variously multiple cohorts), first and foremost consider absolutely the absolute number, and relatively the relative representation, and both can have different demographic genesis (Káčerová and Bleha, 2007). Changes in the size of the productive age group (the population from age 15 to 64) are referred to as the ageing process from the middle (Mackellar, 2003).

In the study we apply two different approaches to population ageing. In the first case, we look at time changes (temporal analysis) in the age structure of one regional population unit – the Slovak Republic as a whole. The analysis uses census data in addition to annual data. We identify changes and analyse them in regard to the ageing processes as defined above. Changes in the representation of age groups have important informative value when assessing the process of ageing. In the second approach, we focus on a comparison of several regional populations (spatial analysis), focusing on knowledge about the differences in the age structure

of their inhabitants in defined spatial units. The study of regional differentiation uses above all information from the Census of Housing and Dwellings from 1991, 2001, 2011, 2021 (ŠÚ SR 1992, 2022, 2012, 2022). In geographical analyses, however, the advantage and the need to combine both approaches are shown. If ageing is understood to be a process, then its analysis must rest on its development over time, which is highly differentiated spatially. The complexity of changes in age structure is captured in a hexagonal Sonis diagram, which enables the temporal and spatial differences in population ageing to be studied (Sonis 1981). Podolák (1998) applied a Sonis graph (hexagonal diagram) in Slovakia in cities with more than 10,000 residents, and in turn Pavlíková and Mládek (2001), Mládek (2004), Mládek and Káčerová (2008), Ondačková et al. (2018) in a set of European countries. In our analysis, the essence of this method lies in the characteristics of each local territorial unit at the district level (NUTS 4 or LAU 1, with the exception of Bratislava (BA) and Košice (KE) districts, where NUTS 4 were merged and evaluated as cities) using the relative representation of three major age groups (0 – 14 years, 15 – 64 years and 65 and older) and their changes in three time periods (1991 – 2001 – 2011 – 2021). In 1991, this involved recalculated data in regard to the current system of statistical territorial units (SK-NUTS, 2004). All three periods work with the cities of Bratislava (BA) and Košice (KE) comprehensively, with no division into their city districts. Interpretation of individual combinations of differences allows 3 main types of changes in age structures to be identified (Table 2) according to the breakdown of Pavlíková and Mládek (2001). The first type (A) represents districts in which significant manifestations of population ageing can be identified. The second type (B) represents districts in which the population has been recorded as growing younger. This is manifested by an increase in the share of the children and a decrease in the proportion of people aged 65 and over, or only one of these changes. The third (C) group is represented by districts showing a mixed type of ageing of their populations.

RESULTS AND DISCUSSION

Temporal analysis of population ageing in Slovakia

The chronological aspect of the Slovak population's age structure is the result of population processes over the last hundred years and will directly affect the course of these processes over the next hundred years. Changes in Slovakia's population age structure are well observable based on the results of censuses. The share of the child component has seen a significant decline, by half (Table 1). In 1950, the share of the child component was 28.9% and by 2021 it had fallen to 15.3%. Over the long-term, this indicates bottom-up ageing. An exception to this trend is growth in the number of children (by more than 40,000), which indicates the process of the Slovak population getting younger from below. At the same time, the number of

people aged 65 and over increased by 797,000 persons between 1950 – 2021. The share of this age group grew from 4.7% to 17.1%. Between 2011 – 2021 we register a marked increase in seniors by more than 246,000.

Tab. 1 The indicators of age structure Slovakia (1950-2021)

rok	0-14 (number)	0-14(%)	65 + (number)	65 +(%)	Index of age (%)
1950	995 468	28,9	229 561	6,7	23,2
1961	1 314 508	31,5	292 322	7	23,2
1970	1 232 721	27,2	418 340	9,2	33,6
1980	1 302 072	26,1	519 388	10,4	39,7
1991	1 313 961	24,9	543 180	10,3	42,4
2001	1 015 493	19	610 923	11,5	60,2
2011	826 516	15,3	682 873	12,7	82,6
2021	867 410	15,9	929181	17,1	107,1

Source: FEDERÁLNÍ STATISTICKÝ ÚŘAD (1985), ŠÚ SR (1992). SĽDB 1991, ŠÚ SR (2002). ŠU SR (2002).

We focus in more detail on changes from the annual age structure data of Slovakia. The essence of our assessment, however, focused on population ageing in the time range from 1950 – 2020, where it was possible to focus in more detail on changes in the age structure.

Bottom-up ageing

The child component of the population (0 – 14 years old) in the observed period decreased from 29% in 1950 to 15.9% in 2020 (Fig. 1). In the years 1961 – 1991, the child component accounted for more than a quarter of the total population. In absolute terms, the number of children peaked in two periods, 1961 – 64 and 1985 – 88, and always represented more than 1,300,000 children in the population. The absolute peaks in the number of children are direct consequences of the increased number of live births (Mládek and Káčerová 2008). The first peak is a consequence of socioeconomic conditions improving immediately after the Second World War, by which we identify a compensatory period in the population development of Slovakia characterised by positive features of population reproduction lasting up to the mid-1950s (Vaňo ed., 2000). At the same time, numerous years born during the compensatory period after the First World War reached the age of highest fertility at that time. The second peak relates to the increased fertility rate in the years 1973–79. This is a secondary increase caused by the high number of women at the highest fertility age, which was reinforced by pronatal measures (Vaňo ed., 2001). From 1989 to 2020, the absolute number of Slovak children decreased by 55%,

and since 2002, the number of children in the Slovak population has been below 1,000,000, reaching a historic low of 830,409 children in 2010. This is a consequence of the radical decline in birth rates in the 1990s (Mládek, and Káčerová, 2008). We subsequently record a stabilisation and, since 2015, a very slight increase, in the abundance of the child component. For the last 7 years, we have recorded an average annual growth of 4% in the number of children. This is a consequence of halting the decline in fertility and its stabilisation along with a slight increase in fertility. In 2018, there were almost 1.6 children per woman. Slovakia thus rose above the limit of very low fertility, defined as a level of 1.5 children per woman (Šprocha, 2019). We can state that the long-term bottom-up ageing process has been replaced by a process of getting younger from the bottom.

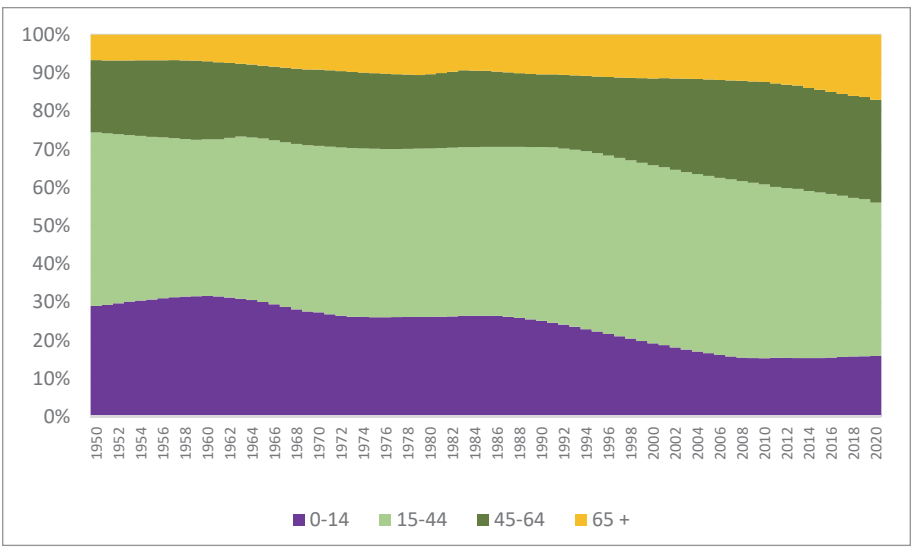

Fig. 1 The share of age groups in Slovakia
Source: ŠÚ SR (2022 - 1951). Veková štruktúra obyvateľstva SR 1950 - 2020

Ageing from the middle

The population aged 15 – 64 represents the productive age group, and its size increased by nearly 38% during the period under review (Fig. 1). In the 1960s, we observe a decline in the share of this age group, when the least numerous years in terms of fertility, those of the Second World War, move into it. Representation in this age group steadily rose from 1988 to 2008, when it reached its peak (72.5% of the total population). The reason for this growth is structural in origin, as two large "baby-boom" cohorts born after the Second World War and in the 1970s were both of working age. Since 2008, a strong post-war population cohort has reached the age of 65, which lowers the representation and abundance of the 15 – 64 age group

in the population. The essence of the assessment of ageing from the middle lies in an assessment of the internal structure of the group of citizens from 15- to 64-year-olds, i.e. in the assessment of relationships between the age groups of those 15 – 44 and 45 – 64 years old. The representation of these two partial age groups within the defined productive age group prior to 1994 more or less maintained a mutual ratio of 70:30 until this ratio changed 60:40 in 2020. The 15 – 44 years age group makes up the part of the population with the highest reproductive potential and in terms of share of the total population has maintained the value of 43 – 45% since the 1970s. Subsequently, since the mid-1990s, a decline has occurred in the proportion of 15- to 44-year-olds (currently around 40%), reflecting faster growth of the population over the age of 45. From the start of the 1970s to the end of the 1990s, the share of 45- to 64-year-olds remained at a level of 19 – 20%. Given that the population born after the Second World War moved over the age of 45 years old, the representation of 45- to 64-year-olds increased (reaching a peak of about 27% around 2013), which led to significant population ageing from the middle of the age pyramid.

Top-down ageing

The growth in number or share of the population over 65 years old has slowed in comparison with the decline in the child component. The 1950s saw a was rapid improvement in mortality, though in particular in younger age groups. The representation of seniors grew slowly; in the period under review, it increased from 6% to 7%, and in 2013 it reached the threshold of a demographically old population according to the UN classification[1]. Since the start of the 1960s, we can observe a steady, modest increase in the elderly population, which to a certain extent is related to improved mortality rates (due particularly to access to health care for broader layers of population, new treatment methods and increased drug efficiency (Srb, 2004), but on the other hand, also a falling share of the child component). By the end of the 1970s, Slovakia recorded a 10% share of the population over the age of 65. The curve for this share of population decreased in the period 1979 – 84, which is a result of the entry of a very low number of births during the First World War into this age group. After the transition of this generation, the population of Slovak seniors showed continuous growth up to 17.1% in 2020, which corresponds to a population of more than 932,000 persons over the age of 65.

1 The UN classification assesses the course of population ageing based on the proportion of people 65 years and older:
1st stage – share up to 4% → a young population
2nd stage – share 4 – 7% → a mature population
3rd stage – share over 7% → an old population

Temporal-spatial analysis of population ageing in Slovakia

The dynamics of family and reproductive behaviour as well as migratory movements are evident in changes in the age structure and various levels of ageing. The presence of a different population structures in its individual regional statistical territorial units is characteristic for every larger territorial unit. We investigated the differences in population structures at the level of local district units in Slovakia, and using the Sonis graph method, it was possible to present

Tab. 2 Type of districts by intensity of population ageing in SR (1991 – 2001)

Type of districts	class	process of ageing (younging)	vectors	number of districts			TYPE
			p, q, r^2	2001-1991	2011-2001	2021-2011	
A. Population with prevalence of ageing	I.	Ageing from bottom and top	- + +	**65**	**60**	0	A1a
			- - +	0	1	**32**	A1b
			- **0** +	0	0	0	A1c
	II.	Ageing from top	**0** + +	0	0	0	
	III.	Ageing from bottom	**0**	**2**	**0**	**0**	A3
B. Population with prevalence of younging	IV.	Younging from bottom and top	+ + -	0	0	0	
			+ - -	0	0	0	
			+ **0** -	0	0	0	
	V.	Younging from bottom	**0**	0	0	0	
	VI.	Younging from top	**0** + -	0	0	0	
C. Mixed types of populations	VII.	Younging from bottom, ageing from top	+ - +	0	0	**40**	C 7
	VIII.	Ageing from bottom, younging from top	- + -	**5**	**11**	**0**	C8
	IX.	Stable population	**0 0 0**	0	0	0	

Source: Pavlíková and Mládek (2001), edited by authors

2 The essence of the method is the characteristics of districts) using the relative representation of 3 important age categories of the population (0-14 years, 15-64 years and over 65 years) and their changes over three time periods. It is a comparison of age structures over time and their changes characterize the aging process. The result of such a comparison is a vector (Δp, Δq, Δr) characterized by three values, providing information about the relative aging of the population. If (Δp <0) it is bottom aging, if (Δr> 0) it is top aging.

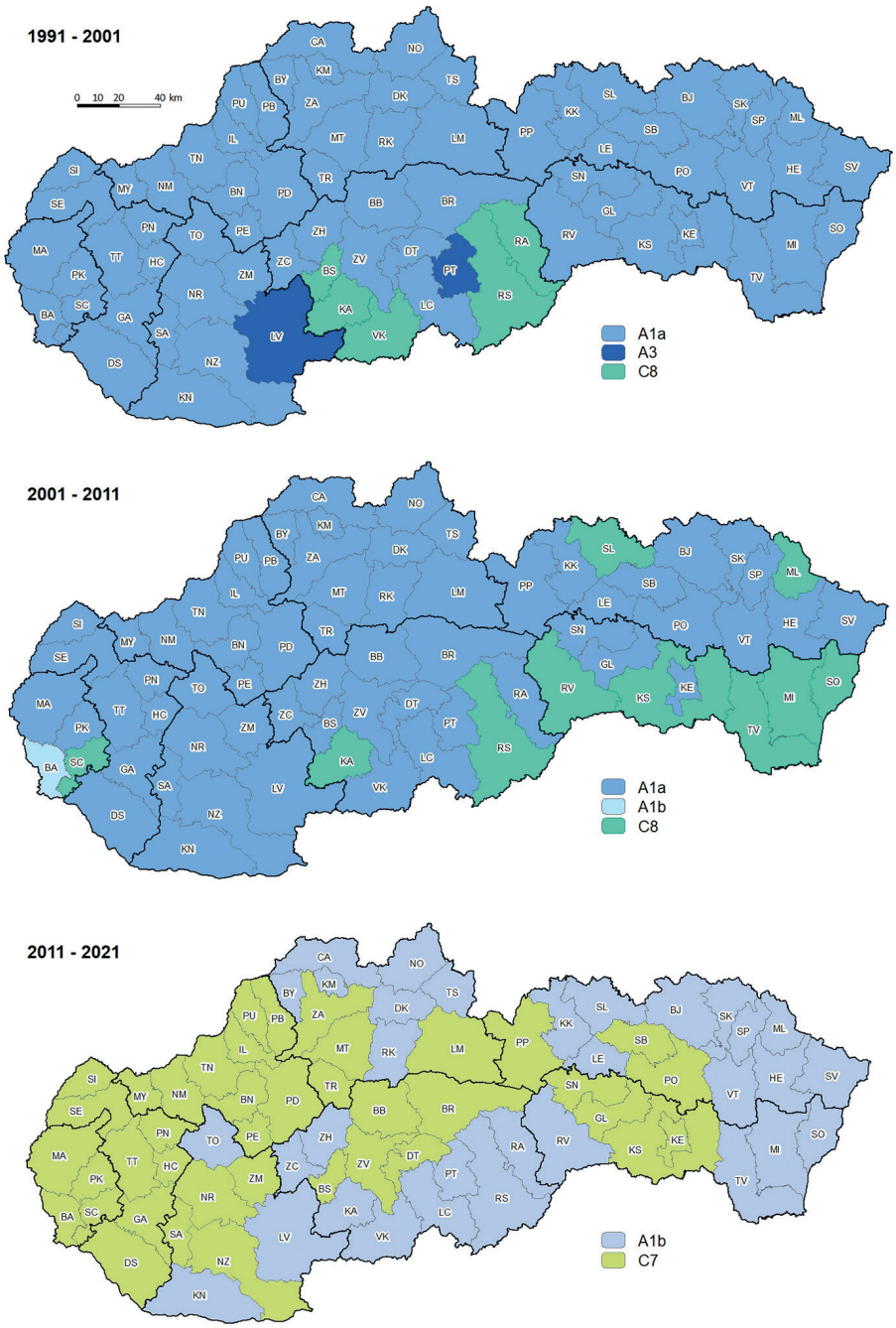

Fig. 2 Type of the district (NUTS4) by population ageing in SR (1991 – 2021)
Source: ŠÚ SR (2022), ŠU SR (2012), ŠU SR (2002), ŠU SR (1992)

changes in age structures in three-time sections. The results present changes in the types of the set of districts from the viewpoint of relative ageing. The spatial picture of the distribution of individual types of populations on the basis of the intensity of ageing or getting younger is shown in Fig. 2.

Between the first (1991 – 2001) and second (2001 – 2011) periods being monitored, only very small changes took place at the level of the districts of Slovakia. Most districts in Slovakia were characterised by (type A1a) relative bottom-up and top-down ageing (along with growth in the share of the productive age group). The second most common type of ageing (type VIII) was bottom-up ageing, top-down getting younger at the same time with growth in the share of the productive age group. The change in the last observed period (2011–2021) is radical, where the type of district populations where there are two dominant processes (type VII) bottom-up getting younger, top-down ageing are becoming the most frequent, and bottom-up and top-down ageing (A1b), whereby and the representation of the productive age in both types of districts is decreasing, is the second most widespread.

The change in the representation of the population from 0 – 14 years old indicates in the first two periods (1991–2001 and 2001–2011) a decrease in values, i.e. bottom-up ageing in all 72 spatial units. This is a consequence of the intense decline in natural population growth in the 1990s. The intensity of this decline is different, as is evidenced in the spatial picture (Fig. 3). The average value of the decrease for the whole of the Slovak Republic represents 5.9 percentage points between years 2001 and 1991. The area of the whole of Bratislava (SK010) and the Trnava region (SK021 – excepting the Galanta district (GA)) and the chain of districts from Nitra (NR) through Prievidza (PD), Žilina (ZA), Dolný Kubín (DK) up to Poprad (PP) – recorded the most significant decrease in the child component. We register the largest decrease in percentage points in Bratislava (-8.8%) and in the districts of Banská Bystrica (BB) (-8.0%) and Ilava (IL) (-7.8%), which indicates the most intensive bottom-up ageing. In contrast, we record the lowest decrease, by less than three percentage points, in the districts of Sabinov (SB) (-2.5%), Gelnica (GL) (-2.4%) and Sobrance(SO) (-2.3%), and in these districts less intense bottom-up ageing. At the same time, we register the least intensive decrease in the child component in districts with the highest share of this age group over the long-term (Námestovo (NO), Sabinov (SB), Stará Ľubovňa (SL)). We also register an equally low decline in districts where we have long talked about the advanced ageing process (Medzilaborce (ML), Sobrance (SO), Krupina (KA)). From 2001–2011, the decline in the representation of children is again becoming a dominant process, but the decline is no longer as significant. The average value for the Slovak Republic is only 3.7% of a point. From a spatial point of view, the lowest decrease took place in the districts of the Bratislava (BA) and Košice regions (SK042). The bottom-up ageing process in the results of the 2021 census show a slowing down. On a Slovakia-wide

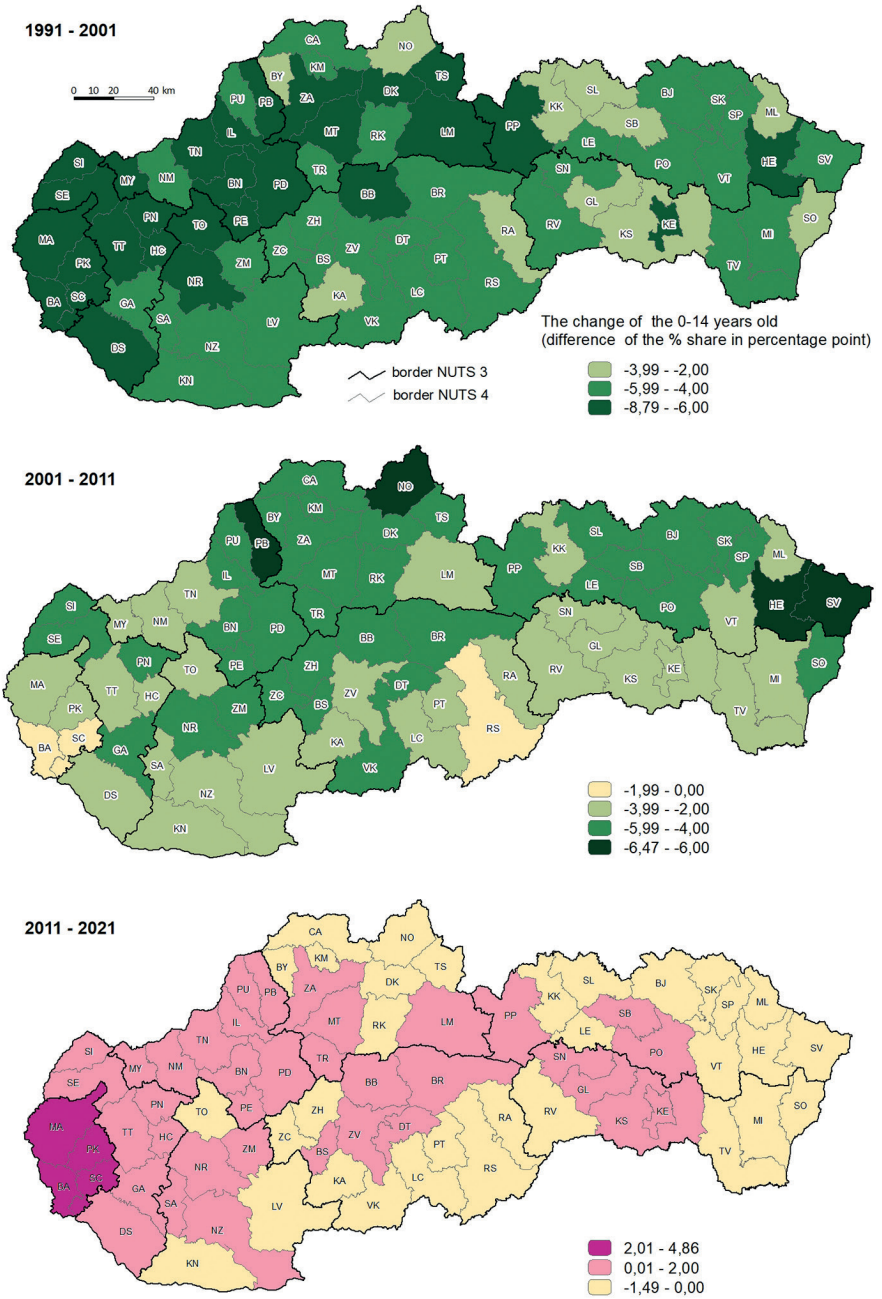

Fig. 3 Intensity of relative population ageing from the bottom in NUTS4 of the Slovak Republic (1991 – 2021)

Source: ŠÚ SR (2022). ŠU SR (2012), ŠU SR (2002), ŠU SR (1992)

level, the share and number of children grew between 2011 and 2021. At the level of the assessed regional units, however, the share of children is increasing in more than half of the districts, i.e. getting younger from below. These districts are located in the Bratislava Region (SK010) and the Trenčín Region (SK022). An explanatory factor is the rise in fertility; however, since 2002 in the case of the Bratislava Region we see a dramatic and continuous increase in fertility, the result was its inclusion among the populations with the highest fertility in Slovakia (1.7 children per woman) (Šprocha, 2020).

Fig. 4 shows the change in the representation of the population aged 15 – 64. The share of this age group grew in all districts, but only in the first two reference periods, which was a manifestation of the nationwide growth in the number of people of working age as a consequence of the two large baby boom cohorts in it. Only five districts show the largest increase in the first observed period of over 6 percentage points: Bratislava city and the Malacky (MA), Banská Bystrica (BB), Bánovce nad Bebravou (BN) and Banská Štiavnica (BS). From the other side of the spectrum, the lowest growth in this share is recorded in two districts of northern Slovakia – Námestovo (NO) and Kysucké Nové Mesto (KM) – and five districts in the east – Medzilaborce (ML), Sobrance (SO), Svidník (SK) (all three on the border), Gelnica (GL) and Sabinov (SB). In the second period (2001–2011), the largest growth in the productive age group shifts to northern Slovakia. And the area of the capital Bratislava in the context of suburbanisation processes is experiencing a decline in the share of the working-age population. Overall, in all territorial units of Slovakia we register a decrease in the share of 15 – 64-year-olds in the last census, although of varying intensity.

The change in the representation of the inhabitants aged 65 and over indicates ambiguous growth of this age group (Fig. 4). In the first monitored period we register a decrease in the share of the population aged 65 and over in five districts in the southern part of central Slovakia (Krupina (KA), Banská Štiavnica (BS), Veľký Krtíš (VK), Rimavská Sobota (RS), Revúca (RA), which indicates that their population is getting younger from above. The highest growth of representation in this population group (more than 2 percentage points) was recorded in Bratislava (BA) and the Partizánske (PE) and Ilava (IL) districts. The primary cause in the first case can be sought in the suburbanisation processes, i.e., the shift of the working-age population to the hinterland of Bratislava. The fact of top-down ageing itself is intensifying in the inner parts of Bratislava, which have formed as residential zones for families with children. In the second monitored period, the growth in the share of seniors is intensifying at the national level, but the spatial picture shows a relatively large number of districts in eastern Slovakia, as well as the hinterland of Bratislava, where the representation of seniors is declining. In the last of the census periods examined the intensity of top-down ageing is increasing. Growth of this share is evident in all districts, with the highest in the Banská Bystrica (BB) district and the

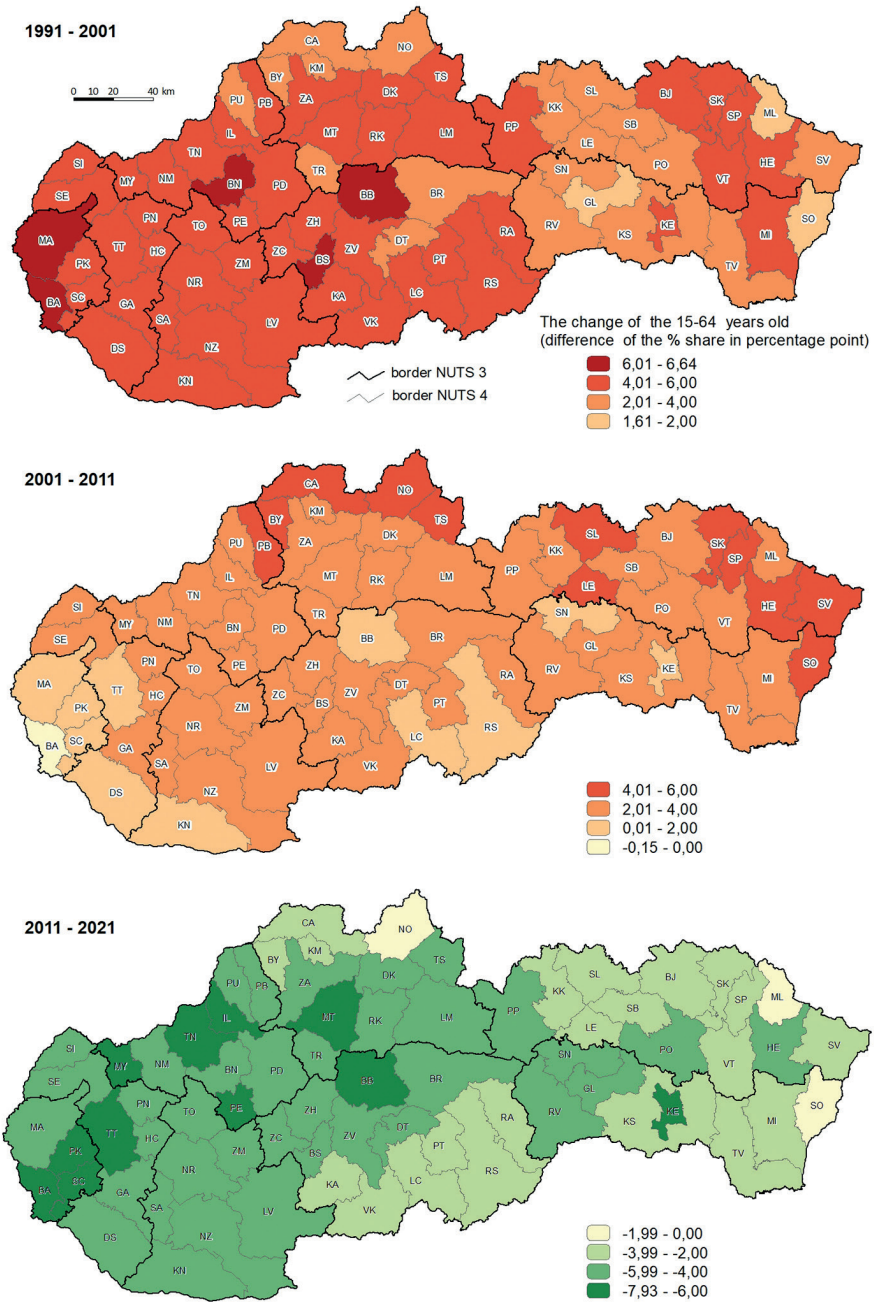

Fig 4 Change of productive age group intensity in NUTS4 of the Slovak Republic (1991 – 2021)
Source: ŠÚ SR (2022). ŠU SR (2012), ŠU SR (2002), ŠU SR (1992)

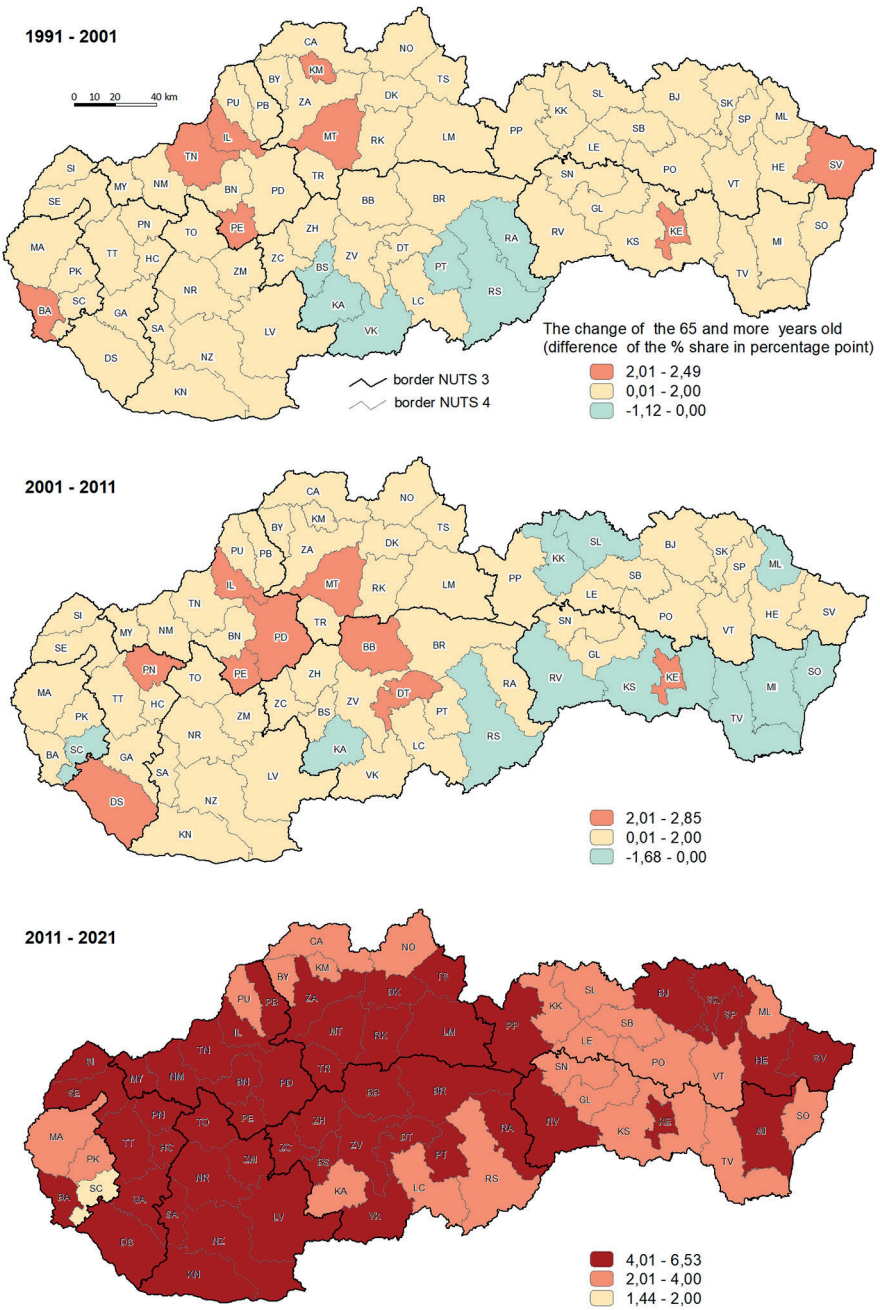

Fig. 5 Intensity of relative population ageing from the top in NUT of the Slovak Republic (1991 – 2021)

Source: ŠÚ SR (2022). ŠU SR (2012), ŠU SR (2002), ŠU SR (1992)

city of Košice (KE), where the growth of seniors is more than 6 percentage points. In contrast, the districts in the hinterland of the capital city show relatively slower top-down ageing, and the district of Senec (SC) least of all (only 1.44 percentage points). Equally, districts young over the long-term – Námestovo (NO), Sabinov (SB), Sobrance (SO) and Kežmarok (KK) – have the lowest growth in the share of seniors.

CONCLUSIONS

The ageing of the Slovak population is expressed in a long-term trend (Káčerová and Ondačková, 2015b). The second demographic transition as a principle change in family and reproductive behaviour did not spread in Slovakia until the beginning of the 1990s, and we record changes in the age structure throughout the period under review. From a development point of view, the Slovak population is the last to register a decrease in the child component in the entire Central European region. The decline in the child component was delayed by several decades in the former Eastern bloc, and we only recorded an acceleration in the decline in the representation of children at the end of the 1990s. We identify an unprecedented bottom-up ageing process through a decline in the child component, which has fallen from 28.9% (1950) to 15.9% (2021). The most significant decline began at the turn of the 1980s to the 1990s. The presented analysis revealed that the bottom-up process of ageing at the level of the population as a whole slowed between 2011–2021 and is changing very much towards a population growing younger. According to the census, the number of children under 14 years old has increased by 37,000 children in the last 10 years. The regions with the highest growth in the representation of children by over 2 percentage points are all districts of the Bratislava Region (SK010).

The productive age group in the reviewed period increased from 61.6% (1950) to 71.3% (2020), even though its growth has recently stopped and a decrease in the representation of people of working age is seen. The evident culmination in the number and share of people of productive age (until 2008) is the result of the presence of two significant population cohorts in it (born in the compensatory phase after World War II and the population boom in the 1970s). Population ageing from the middle occurred slower in the whole the region of the former Eastern bloc, because in addition to a strong post-war cohort, there was another large cohort from the 1970s in terms of age structure. From the viewpoint of ageing from the middle, the internal structure of this age group, which has seen major changes since the mid-1990s, is significant. A decrease has occurred in the representation of 15- to 44-year-olds (the reproductive group) at the expense of an increase in the representation of 45- to 64-year-olds. Those born in the years after the Second World War are moving into this age group, and this represents a significant population ageing from the middle of the age pyramid during the last

decade. Their departure from the productive age group accelerates the process of top-down ageing and will continue to do so.

The process of top-down ageing ran less intensively in the Slovak population compared to the process of bottom-up ageing. We record a steady, modest increase in the senior population since the early 1960s, which to a certain measure was related to improved mortality rates. The moderate decrease in the representation of the population over the age of 65 in the 1980s was caused by the entry of less numerous years from the period of the First World War into the relevant age group. The population over the age of 65 increased by 320%, and at present 17 of every 100 Slovaks are of senior age. In contrast, population top-down ageing in Slovak society is intensifying. The number of people over the age of 65 increased by more than 259,000 over the last decade. To view an ageing population as an opportunity is vitally important to society's progress. We require radically different approaches in every aspect of our lives, including housing, health, communities, and workplaces.

The Slovakia-wide trends of changes in age structures are rather different from those that are characteristic for lower regional units (districts). The Sonis graph method was used to analyse their population ageing (or getting younger), and the relative populations of the crucial 3 age categories were compared in three time periods (first: 1991–2001, second – 2001–2010, third – 2010–2021). By combining their changes – an increase or decrease in shares – 9 classes or types of districts with the characteristics of population ageing or getting younger were created. The first period showed a dominant representation of districts (65) which were characterised by processes of top-down and bottom-up ageing. Very similar processes dominate in the second period, too (60 districts). Only the representation of the 8th group (11 districts) with bottom-up getting younger is small. More notable changes occurred in the third period. The number of districts with top-down ageing fell to 32, and the group of districts (40) with population getting younger from below and top-down ageing became the most numerous. This also corresponds to the assessment of Slovak nationwide trends of the population getting younger.

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