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## Population ageing patterns in Małopolskie voivodship by poviats until 2030

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**Abstract.** The aim of the paper is to demonstrate differences and similarities in population structures of the poviats of Małopolskie voivodship in the years 2010–2030, with particular attention to population ageing. To describe the ageing process two types of indicators are used, namely conventional and prospective measures. As conventional ones we assume the percentage of the population aged 65 and over, and the old-age dependency ratio expressed as the number of persons aged 65 and over per 100 persons aged 20–64. The same aspects of population ageing are expressed by a new group of measures based on a fresh concept for measuring age, the so-called prospective age. Unlike chronological (retrospective) age, prospective age takes into account the changes in life expectancy that occur in the period under consideration. Using the data coming from Demographic Years Book 2011, and from Demographic Projection 2008–2011 ([www.stat.gov.pl](http://www.stat.gov.pl)) some types of population ageing patterns in Małopolskie voivodship by poviats until 2030 are demonstrated. They count both differences in population ageing of poviats in Małopolskie voivodship and the dynamics of this process in view of conventional and prospective measures. The general features of demographic ageing in Małopolskie voivodship in 2010–2030 are formulated in conclusions.

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## 1. Introduction

Population ageing is a process that appeared at a certain stage of development of human populations, when as a result of falling fertility the share of older persons in the population started growing. R. Pressat (1966) indicates that this phenomenon may be observed in the French age pyramid as early as 1851. France entered the twentieth century as an old country (with 13% of its population in 1901 aged over 60) and had no rivals in this field until the end of the Second World War. Currently, population ageing is a typical element of the demographical landscape in developed countries. This is the result of the concurrent drop in fertility, longer life duration, and shift of the post-war boom generations to the top of the age pyramid. The occurrence of these changes was foreseeable. However, their size and rate may be surprising (Testa, 2000). Population ageing is an area of interest for representatives of various sciences including demography, geography, sociology, psychology, medicine, and economics. Different approaches to population ageing result from diverse determinants of the processes that influence its course, and from the significance of the process to other phenomena that occur in the surrounding environment. The wide body of literature on population ageing reflects these interests. In this context, the economical consequences of population ageing merit attention, and have been examined by Cutler et al. (1990), Börsch-Supan (2002), Bloom et al. (2003), Prskawetz, Fent (2004), Kotowska (2006), Mason, Lee (2006), Kurkiewicz (2007), and Stonawski (2007). Kowaleski and Szukalski (2008) study population ageing in the context of health sciences. Population ageing may be examined in various territorial configurations, i.e., at the level of countries, voivodships (provinces), poviats (counties), gminas (communes), and localities. Country- and voivodship-based approaches dominate. In smaller populations, the course and consequences of population ageing are not in most instances a direct reflection of the patterns occurring at higher aggregation levels. With the improvement of the information system and the expanding scope of

available data, studies in which authors focus their attention on poviats and gminas are becoming increasingly frequent (Długosz, 2004; Kurek, 2007; Długosz, Kurek, 2009; Knapik, 2010).

This paper aims to show differences and similarities in the population structures of the poviats of Małopolskie voivodship in the years 2010–2030, with particular attention to population ageing. We understand this process as a transformation of the age structure of the population in which the age distribution shifts towards older generations. In quantitative terms, the changes are reflected in the growing share of elderly in the whole population.

## 2. Methods of analysis and data base – measures of population ageing

We use two types of indicators to describe population ageing, namely conventional measures and new, prospective measures.

As conventional measures of population ageing, we assume the percentage of the population aged 65 and over ('proportion of elderly') and the 'old-age dependency ratio', which is the number of persons aged 65 and over per 100 persons aged 20–64. The same productive age are thus assumed for males and for females (2).

The new group of population ageing measures, introduced by Sanderson and Scherbov (2005, 2007, 2008), is based on a fresh concept for measuring age, the so-called 'prospective age'. Unlike chronological (retrospective) age, prospective age takes into account the changes in life expectancy that occur in the period under consideration. To determine prospective age, a so-called reference period is assumed and information is taken from life tables for two periods: the reference period and the studied period. The example in Table 1 illustrates the concept.

Let us assume that we wish to determine the prospective age of a male in Poland who was 65 years old in 2009, which is also the studied year. In the period life tables for males in Poland in 2009 we find that the remaining life expectancy of a male aged 65 is 14.69 years. Now we consult the period life tables for males

**Table 1.** Determining the prospective age of a males in Poland, 65 years old in 2009, assuming 1960 as the reference year.

A		=	B	
a	b		c	d
x = 65	e (65, t) = 14.69		e (x <sub>p</sub> , t <sub>0</sub> ) = 14.69	x <sub>p</sub> = 62
	e		f	

Explanation: A – Studied year 2009 (*t*), B – Reference year 1960 (*t*<sub>0</sub>), a – chronological age (in years), b – Remaining (4) life expectancy (5) (in years), c – Remaining life expectancy (in years), d – Prospective age (in years), e – Life tables for the studied period, f – Life tables for the reference period

Source: Own elaboration based on Sanderson, Scherbov (200, 2008) and the Human Mortality Database, [http://www.mortality.org/hmd/POL/STATS/mltper\\_1x1.txt](http://www.mortality.org/hmd/POL/STATS/mltper_1x1.txt) (10.01.2012)

in 1960, the reference year. We look for the age that corresponds with the remaining life expectancy of 14.69 and find that it is 62 years. This is the prospective age that we wanted to find.

Prospective measures of population ageing require the assumption of an old-age threshold that takes into account changes in life expectancy, and therefore is expressed as a certain prospective age. We assume that this is an age for which the remaining life expectancy is up to 15 years. As a result, we obtain old-age thresholds that, unlike their classical counterparts, change over time alongside the changes in life expectancy. In this paper, we use the following prospective measures: the ‘prospective percent (proportion) of elderly’ and the ‘prospective old-age dependency ratio’. The prospective proportion of elderly is the ratio of the number of persons in period *t* of an age for which life expectancy is 15 years or less, to the whole population under study. The prospective old-age dependency ratio has the same numerator as the prospective proportion of elderly. The measures

have different denominators: for the prospective old-age dependency ratio this is the number of persons in period *t* who are 20 and over and whose life expectancy is 15 years or less. The prospective old-age dependency ratio is therefore the number of persons aged over the new old-age threshold per 100 persons aged between 20 and the new old-age threshold.

The indicators presented here formed the basis for the analysis of population ageing in the poviats of Małopolskie voivodship. Groups of poviats with similar values of ageing measures (abbreviated as *M*) have been distinguished on the basis of quartile values. Table 2 presents the criteria assumed.

### 3. Discussion and research results

#### 3.1. Differences in population ageing of poviats in the Małopolskie voivodship in view of conventional measures

The classification of the poviats of the Małopolskie voivodship by proportion of elderly is illustrated in Fig. 1a-1c. Their distribution by old-age dependency ratio is presented in Fig. 1d-1f.

The results of the analysis are discussed in more detail only for the two marginal groups of poviats (the ‘younger’ and the oldest), in which the ageing process is respectively the least and the most advanced. Colours on the maps are ranged according to the advancement of ageing (from white – ‘younger’ to black – oldest). The group of poviats classified as ‘younger’ in terms of the percentage of elderly population has an almost identical composition over the whole period analysed. It includes the limanowski, myślenicki, nowosądecki, nowotarski, and wielicki poviats. Only the bocheński enters the old group in 2020, but returns to the ‘younger’ poviats in 2030. The proportion of population aged 65+ in the bocheński poviat increases and in successive periods in question is equal to: 12.14 in 2010, 15.59 in 2020, and 19.42 in 2030. The first-quartile values that characterise the ‘younger’ group are 12.34 in 2010, 15.34 in 2020, and 19.43 in 2030, and so the bocheński poviat is near the threshold, which explains the expected shifts.

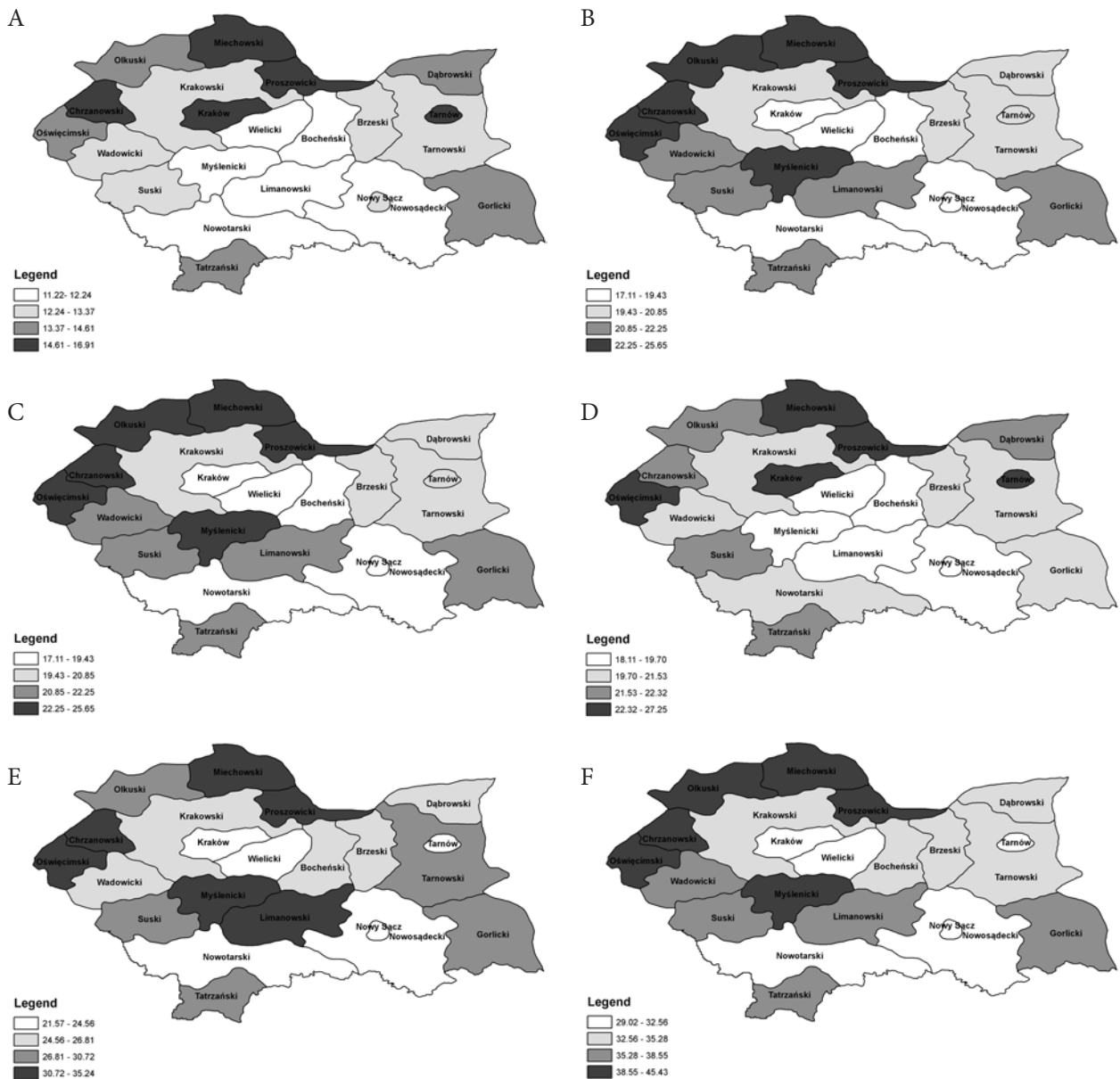
The oldest group, in which the proportion of elderly exceeds third-quartile values in each year under consideration, comprises the following poviats: chrzanowski, Tarnów (3), miechowski, and oświęcimski. Cracow is included among them in 2010 and 2020. Over the whole period under study, the percentage of population aged 65+ in Cracow increases, equaling 15.74 (2010), 19.48 (2020), and 21.32 (2030).

**Table 2.** Criteria for distinguishing groups of poviats

Group I	Group II	Group III	Group IV
Value of numerator <i>M</i>			
$M \leq Q_1$	$Q_1 < M \leq Q_2$	$Q_2 < M \leq Q_3$	$M > Q_3$
‘younger’ poviats	old poviats	older poviats	oldest poviats

Explanation: *Q*<sub>1</sub> – quartile I; *Q*<sub>2</sub> – quartile II (median); *Q*<sub>3</sub> – quartile III

Source: Own elaboration



**Fig. 1.** Spatial differentiation of ageing process in Małopolskie voivodship in 2010–2030 according to the conventional measures

Explanation: A – proportion of elderly in Małopolskie voivodship in 2010; B – percentage of elderly in Małopolskie voivodship in 2020; C – percentage of elderly in Małopolskie voivodship in 2030; D – old-age dependency ratio in Małopolskie voivodship in 2010 (the number of persons aged 65 and over per 100 persons aged 20–64); E – old-age dependency ratio in Małopolskie voivodship in 2020 (the number of persons aged 65 and over per 100 persons aged 20–64); F – old-age dependency ratio in Małopolskie voivodship in 2030 (the number of persons aged 65 and over per 100 persons aged 20–64)

Source: Own calculations based on Demographic Yearbook of Poland 2011, and Demographic Projection 2008–2011 ([www.stat.gov.pl](http://www.stat.gov.pl))

However, in 2030 the percentage is below the third quartile of 22.25. The proszowicki, olkuski, and Nowy Sącz also change position. In 2010 the olkuski, with a percentage of 14.28, belonged to the older group, but was comparatively near to the upper threshold set

by the third quartile of 14.53. In 2020 and 2030 it is classified as oldest with 20.28% and 25.27% of elderly population respectively. The proszowicki powiat was included among the oldest as it was characterised by a percentage of elderly population of 14.74, which was

only 0.21 percentage points above the third quartile. In 2020 and 2030 it is classified among the poviats referred to as older. The ageing of Nowy Sącz population may be observed as successive moves of the territorial unit from the older group in 2010 to the old group in 2020, and to the oldest group in 2030.

In 2010 the old-age dependency ratio was the lowest in the following poviats: bocheński, limanowski, Nowy Sącz, myślenicki, nowosądecki, and wielicki. In 2020 and 2030 the place of limanowski, myślenicki, nowosądecki, and wielicki in the set of poviats remains unchanged despite an increase of the old-age dependency ratio. In the approaching two decades, the bocheński powiat moves to the old group, remaining in it in 2030. Nowy Sącz moves to the older group in 2020, and to the oldest group in 2030. The poviats with the highest old-age dependency ratio in all the years under consideration are: chrzanowski, miechowski, oświęcimski, and Tarnów. In 2010 and 2020 the group also includes Cracow. The dependency ratio is expected to be lower in 2030, so that the town would be in the older group. The shift of the proszowicki from the oldest to the older group occurs 10 years earlier, i.e. in 2020. Meanwhile, the olkuski and Nowy Sącz will join the oldest group.

### 3.2. Dynamics of population ageing in the poviats of the Małopolskie voivodship

The dynamics of the proportion of the elderly measured by relative growth for 2020 in comparison with 2010 and for 2030 in comparison with 2020 is presented in Fig. 2a–2b. Figures 2c–2d illustrate the development trends of the old-age dependency ratio.

The greatest dynamics of the percentage of population 65 and over in the years 2010–2020 typify the following poviats: olkuski, Nowy Sącz, Tarnów, and chrzanowski. The lowest indicators of dynamics occur in the dąbrowski, nowosądecki, limanowski, and tarnowski. Among territorial units with the highest dynamics of ageing in the second decade of the 21<sup>st</sup> century, attention should be paid to Tarnów and chrzanowski poviats, which belong to the oldest group both in 2010 and in 2020. The nowosądecki, limanowski, and tarnowski, where the growth of the proportion of the elderly is the lowest, have relatively young age structures in both of the analysed periods. The 2020–2030 period, with a growing share of the elderly, is characterised by a lower intensity of changes than the years 2010–2020. The dynamics become less varied and the distribution of poviats by relative

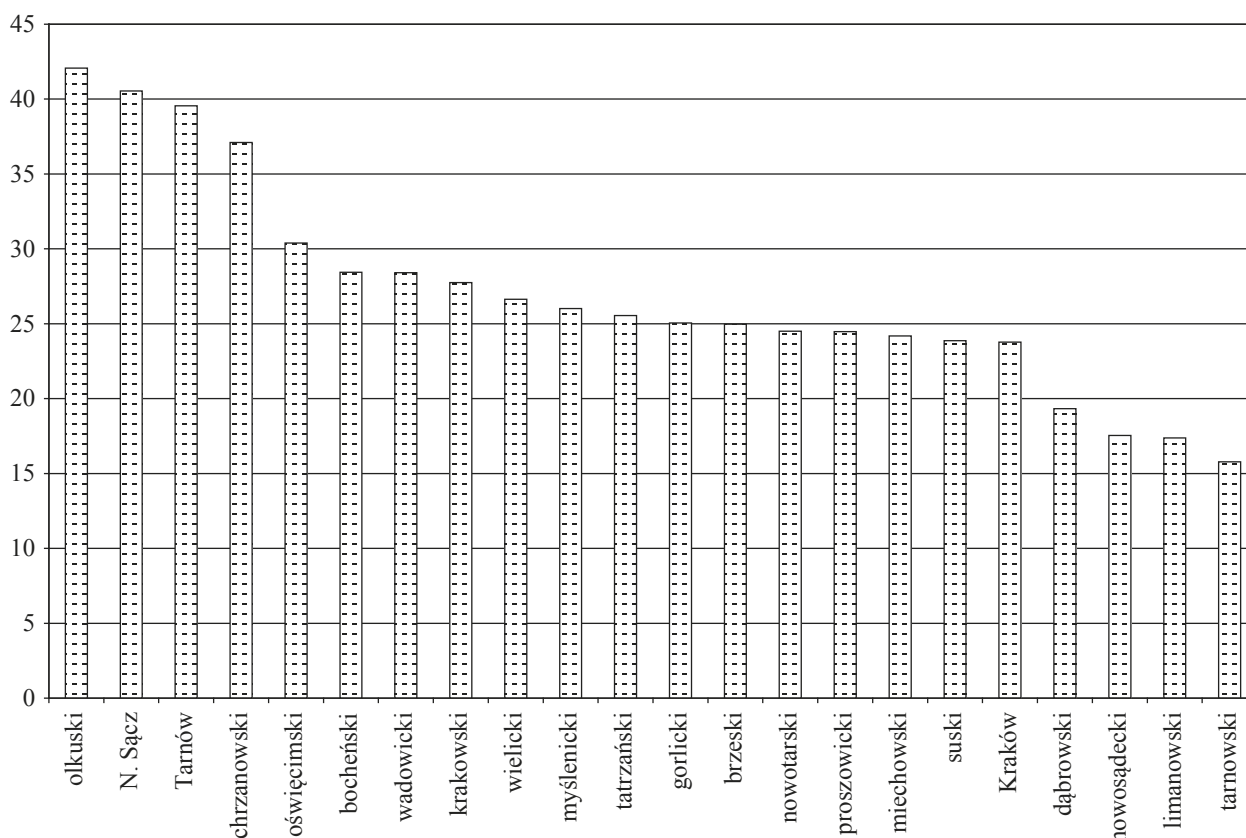


Fig. 2a. Dynamics of proportion of persons aged 65 and over in 2020 in comparison to 2010 (in percent)

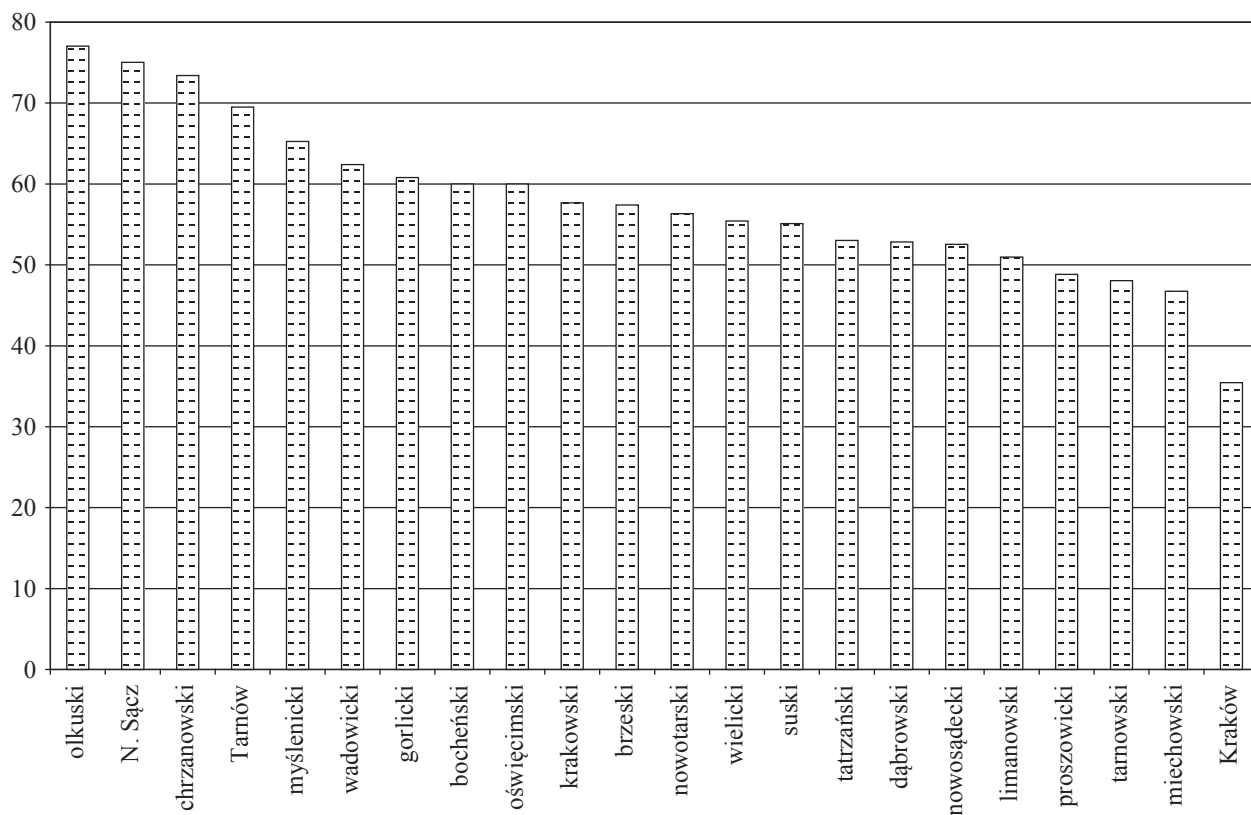


Fig. 2b. Dynamics of proportion of persons aged 65 and over in 2030 in comparison to 2020 (in percent)

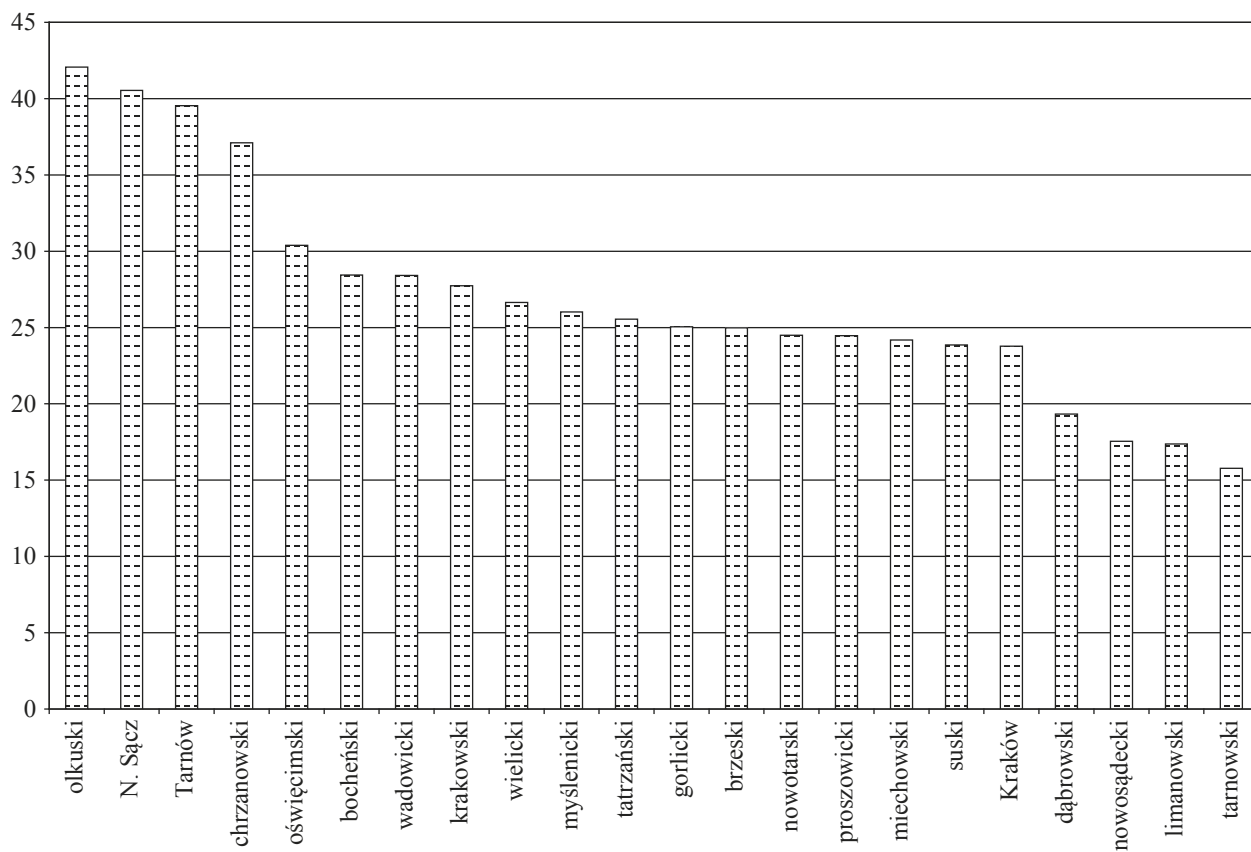


Fig. 2c. Dynamics of old-age dependency ratio in 2020 in comparison to 2010 (in percent)

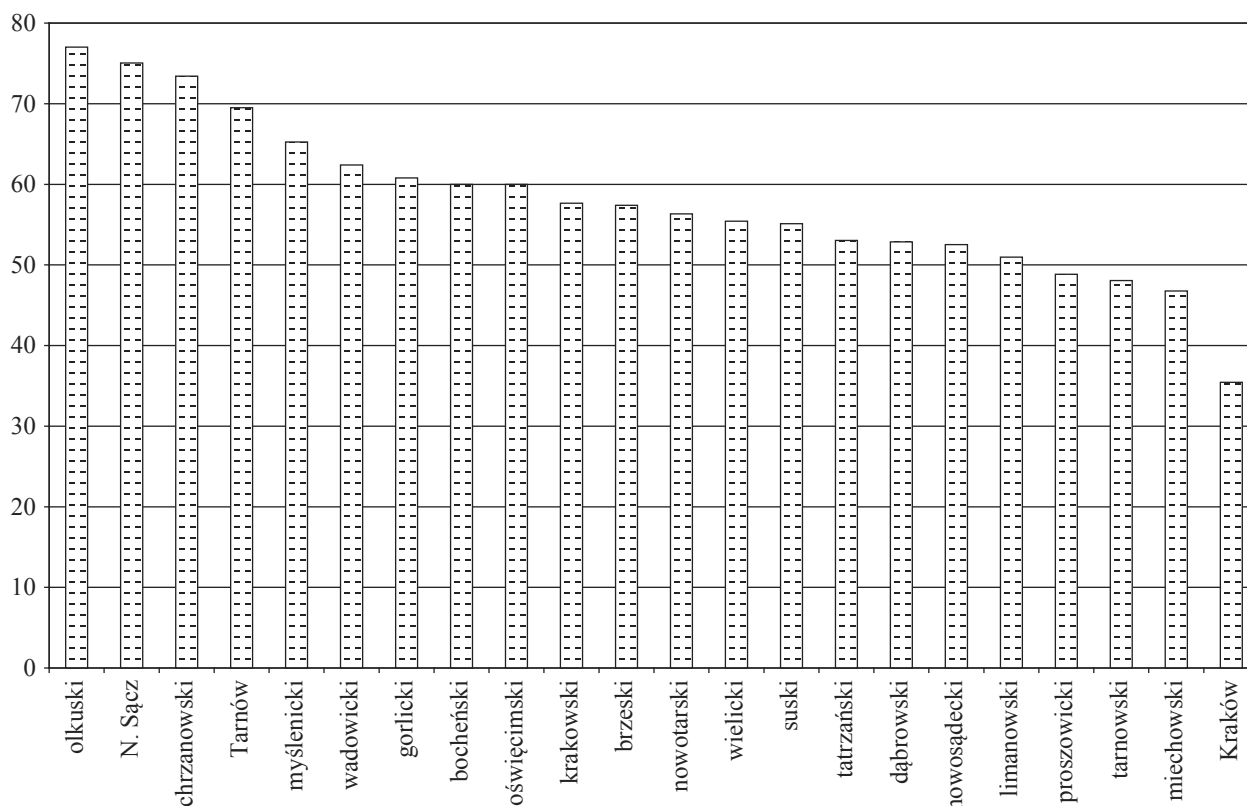


Fig. 2d. Dynamics of old-age dependency ratio in 2030 in comparison to 2020 (in percent)

Source: Own calculations based on Demographic Yearbook of Poland 2011, and Demographic Projection 2008–2011 ([www.stat.gov.pl](http://www.stat.gov.pl))

growth of the measure in question changes. In general, a higher rate of ageing is noted in poviats that have a lower percentage of elderly population in 2020. The greatest dynamics in the third decade of the 21<sup>st</sup> century are observed in poviats that in the previous decade were placed in the second ten by descending order, namely: myślenicki, nowosądecki, limanowski, gorlicki, dąbrowski, and tarnowski. The poviats in which the growth rate of the percentage of population aged 65+ in the years 2010–2020 is the largest will be ranked from ten up in the next decade. Cracow is worth discussing as it is expected to be characterised by the lowest growth rate (9.43%) of the percentage of the elderly in 2030.

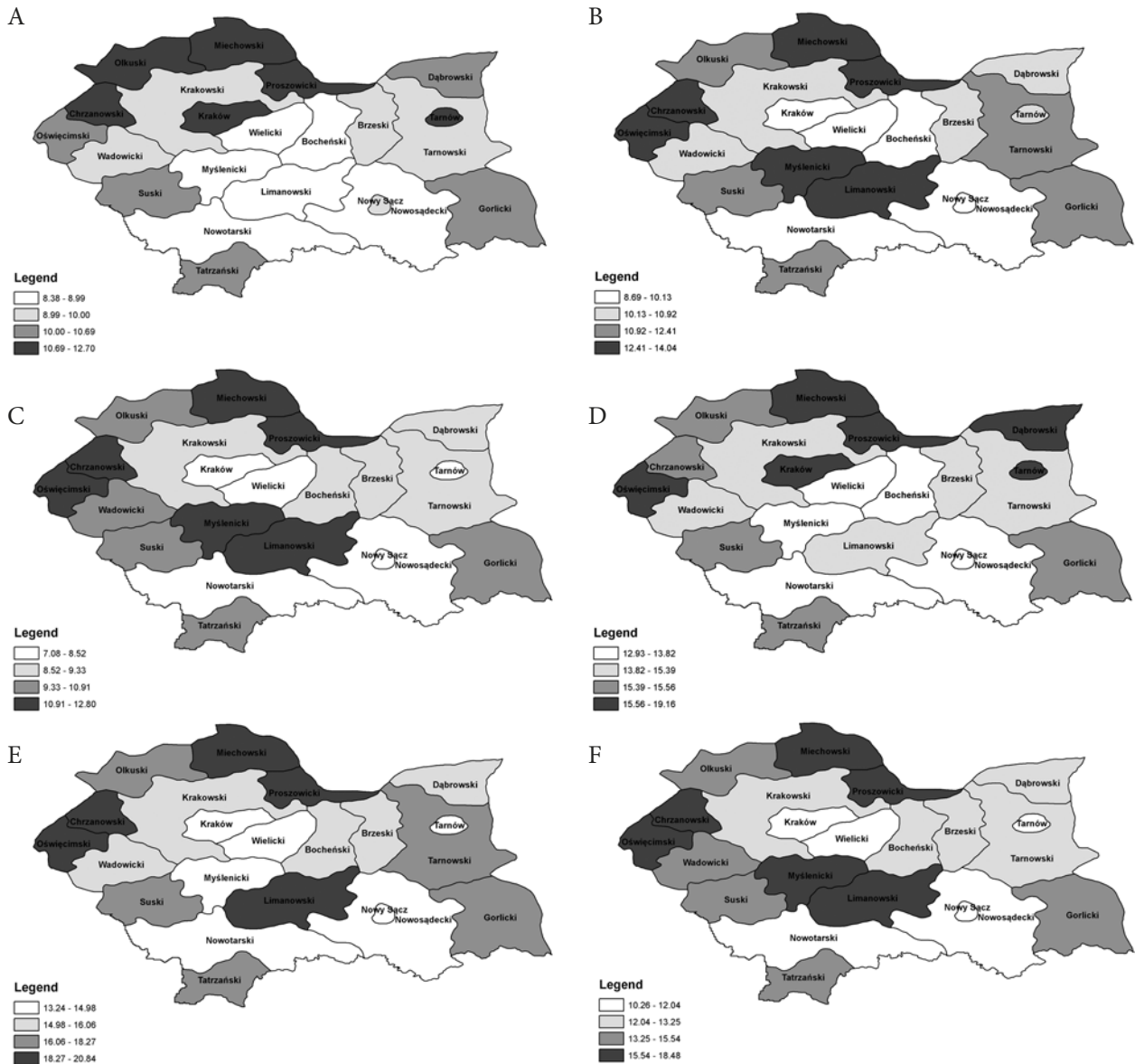
Over the whole period under consideration, the old-age dependency ratio is generally characterised by a higher growth rate than the share of the elderly. In the years 2010–2020 the groups with the highest and the lowest rates have identical compositions with regard to the dynamics of both measures. In poviats with the highest rates, the dependency ratio has a greater rate of growth than the percentage of the elderly, while units with the lowest rates have a higher growth rate of the percentage of population aged 65+.

The patterns observed in the years 2020–2030 are not so distinct. While, as in the previous decade, the growth rate of the dependency ratio is higher than that of the percentage of the elderly (the opposite trend is observed in Cracow and the miechowski and bocheński poviats), the distribution of poviats by the rate of changes is more varied. The greatest similarities can be found in the group of poviats with a lower growth rate of the measures under discussion. In both cases these are: krakowski, Cracow, Tarnów, miechowski, oświęcimski, proszowicki, tatrzański, and wielicki.

### 3.3. Differences in population ageing of poviats in the Małopolskie voivodship in view of prospective measures

The classification of the poviats of the Małopolskie voivodship by prospective proportion of elderly is illustrated in Fig. 3a–3c. The distribution based on the old-age dependency ratio is presented in Fig. 3d–3f.

As in the case of conventional measures, only two groups of counties are analysed in detail, namely the ‘younger’ and the oldest. The composition of the poviat



**Fig. 3.** Spatial differentiation of aging process in Małopolskie voivodship in 2010-2030 according to the prospective measures

Explanation: A – prospective percentage of elderly in Małopolskie voivodship in 2010; B – prospective percentage of elderly in Małopolskie voivodship in 2020; C – prospective percentage of elderly in Małopolskie voivodship in 2030; D – prospective old-age dependency ratio in Małopolskie voivodship in 2010 (the number of people above the old-age threshold to 100 persons aged 20 to the old-age threshold); E- prospective old-age dependency ratio in Małopolskie voivodship in 2020 (the number of elderly per 100 persons aged 20 to the threshold of old age); F – prospective old-age dependency ratio in Małopolskie voivodship in 2030 (the number of people above the old-age threshold to 100 persons aged 20 to the old-age threshold)

Source: Own calculations based Demographic Yearbook of Poland 2011, and Demographic Projection 2008-2011 ([www.stat.gov.pl](http://www.stat.gov.pl))

group classified as ‘younger’ in terms of the prospective percentage of elderly population will undergo changes over the whole period under consideration. In each of the periods studied, this group includes the nowotarski, nowosądecki, and wielicki. Apart from the units listed above, in 2010 also the limanowski

and wielicki powiats, which would be included among the oldest in 2020, belong to this group. In 2020, their place among the ‘younger’ powiats is taken by units whose prospective proportion of elderly in 2010 was on the borderline between the ‘younger’ and old group, namely the bocheński powiat and Nowy Sącz.



Nowy Sącz also keeps its place in the 'younger' poviats group in 2030. However, the bocheński moves from the 'younger' group to the old group in 2030. The first-quartile values that characterise the 'younger' group are 8.99 in 2010, 10.13 in 2020, and 8.52 in 2030, and so the bocheński is near the threshold, which explains the forecast shifts. In Cracow the prospective proportion of the elderly falls over the whole period, equalling 11.47 (2010), 9.10 (2020), and 7.36 (2030). As a result, Cracow, which starts in the oldest poviats group, moves to the 'younger' poviats group in 2020, and holds its place there in 2030.

In all the years under consideration, the oldest poviats group, in which the prospective share of the elderly is above the third quartile, includes the poviats chrzanowski, proszowicki, and miechowski (the oldest poviat in the whole period under study). Cracow belongs to them only in 2010. The oświęcimski poviat moves to the oldest poviats group in 2020, and remains there also in 2030. In Tarnów the prospective proportion of the elderly falls over all of the periods under study equalling 10.93 (2010), 10.20 (2020), and 8.36 (2030). Thus in 2020 Tarnów leaves the oldest group for the older group, and in 2030 it moves to the 'younger' group. The limanowski and myślenicki move to the oldest poviats group in 2020 and remain there in 2030. The olkuski, which is in the oldest group, moves to the older group in 2020, and remains there in 2030. The third-quartile values that distinguish the oldest group are 10.69 in 2010, 12.41 in 2020, and 10.91 in 2030, and so the olkuski poviat is near the threshold, which explains the expected shifts.

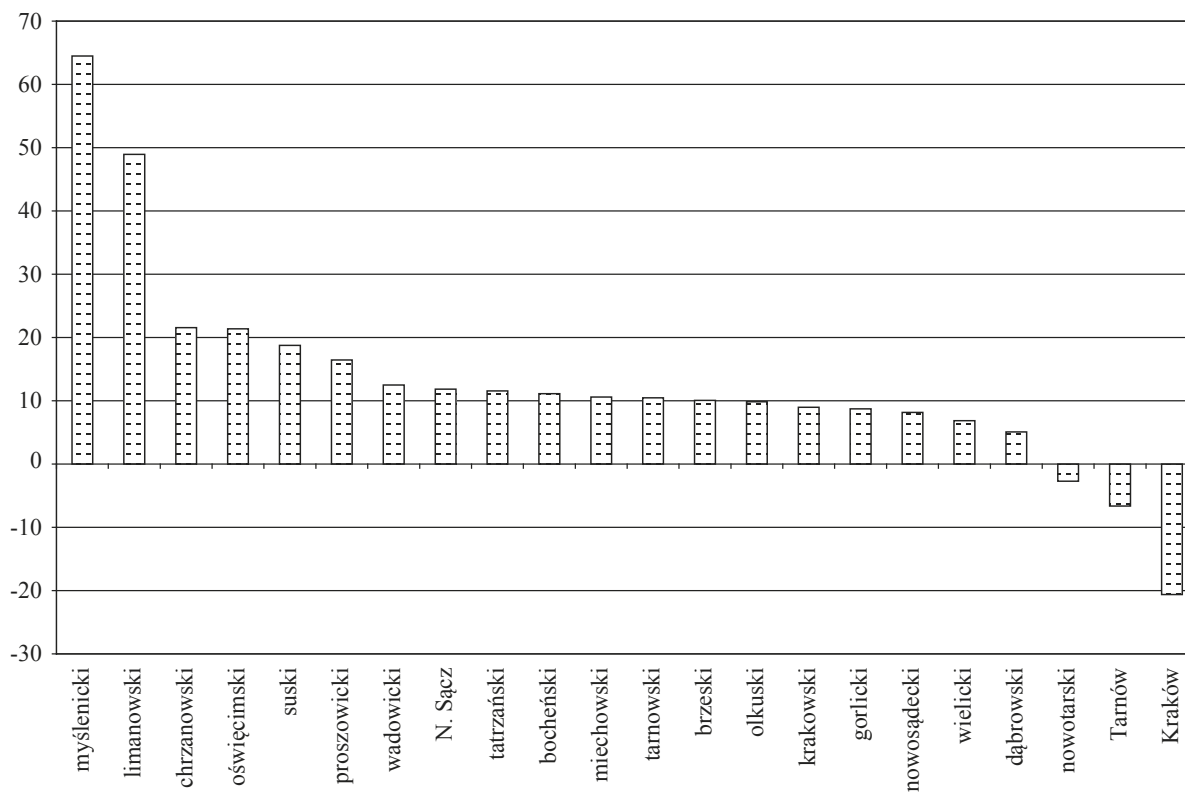
In 2010 the prospective old-age dependency ratio was the lowest in the following poviats: myślenicki, Nowy Sącz, wielicki, nowosądecki, bocheński, and nowotarski. In 2020 and 2030 the places of nowotarski, nowosądecki, Nowy Sącz, and wielicki in the set of poviats remain unchanged. Over the two approaching decades, the myślenicki poviat moves to the oldest group, remaining there in 2030. The bocheński moves to the older group in 2020 and stays there in 2030. The prospective old-age dependency ratio in Nowy Sącz first rises from 13.8 (2010) to 14.95 (2020), and then falls to 11.91 (2030). In turn, in Cracow the measure in question falls over the whole period: from 16.20 (2010) to 14.03 (2020), and then to 10.76 (2030). As a result, Cracow moves from the oldest group in 2010 to the 'younger' group in 2020 and stays in it in 2030. The situation in Tarnów is similar. In 2010 it is part of the oldest group (15.73), and moves to the group of poviats classified as 'younger' in terms of the prospective old-age dependency ratio in 2020 (14.96) and 2030 (11.91).

The poviats with the highest old-age dependency ratio in all the years under consideration are: proszowicki, oświęcimski and miechowski. In terms of the measure in question, the miechowski poviat was the oldest in 2010 and 2030. In 2020 its place goes to the myślenicki, which will move there from the 'younger' poviat group. The limanowski poviat will move from the old group to the oldest in 2020 and stay there in 2030. The chrzanowski poviat will also join the oldest group in 2020, leaving the older group.

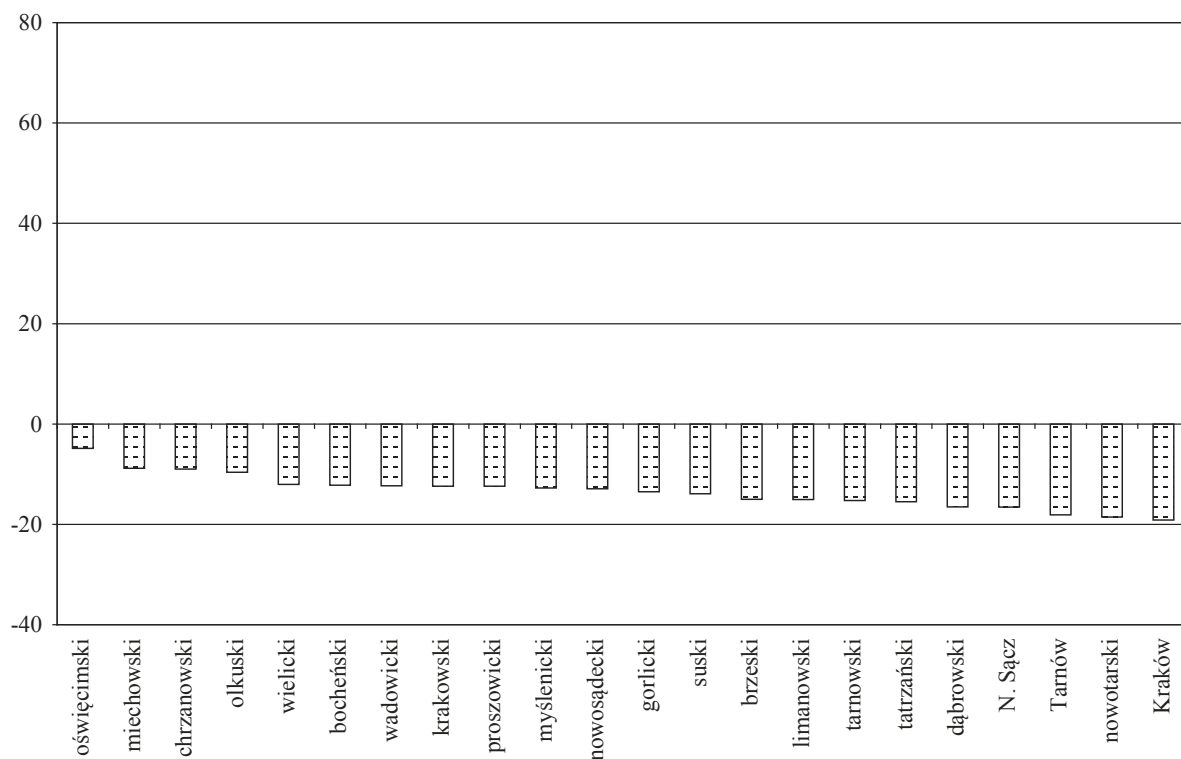
#### 3.4. Dynamics of population ageing in the poviats of Małopolskie voivodship in view of prospective measures

The dynamics of the prospective proportion of the elderly measured by relative growth for 2020 in comparison with 2010, and for 2030 in comparison with 2020 are illustrated in Fig. 4a–4b respectively, while Fig. 4c–4d present the development trends of the prospective old-age dependency ratio.

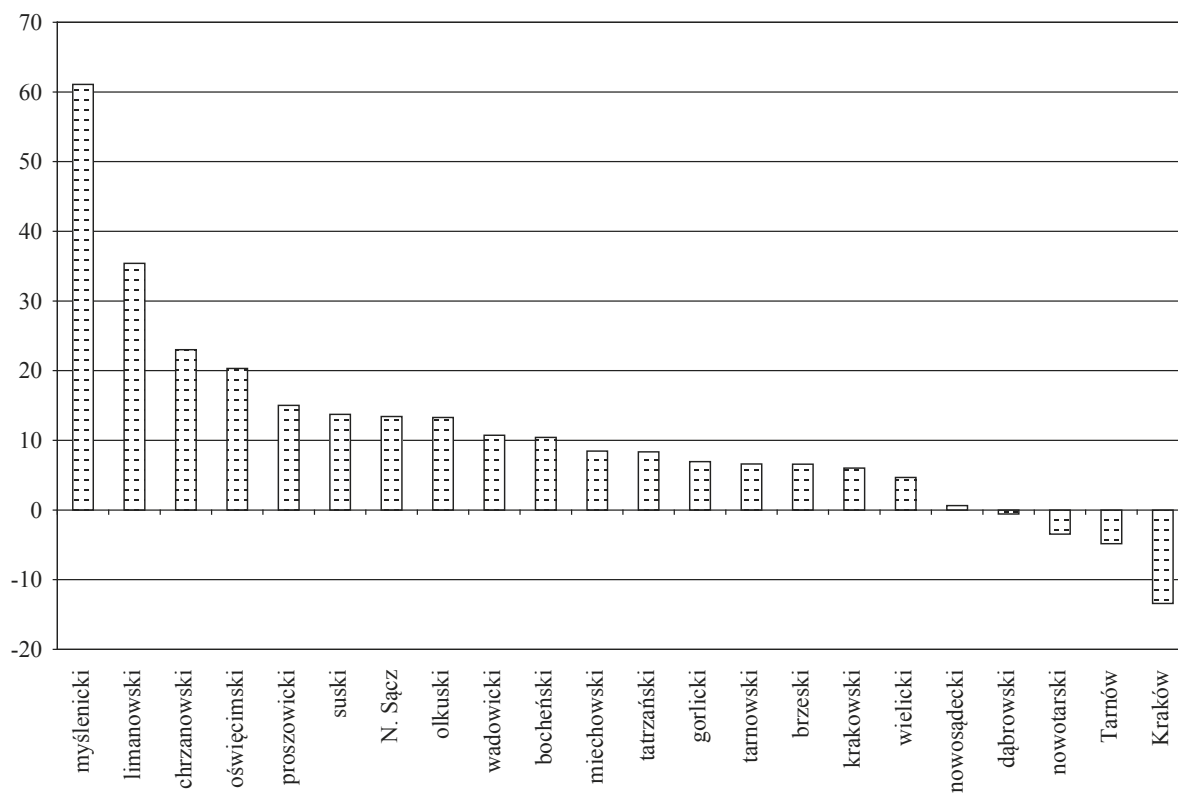
The greatest dynamics of the prospective proportion of the elderly in the years 2010–2020 characterise the myślenicki and limanowski poviats. The lowest indicators of dynamics, in terms of their absolute value, are noted in the poviats: wielicki, dąbrowski, nowotarski, and Tarnów. It should be noted that unlike the conventional measure, its new counterpart shows that in the 2010–2020 period both increases and decreases of the measures discussed may be observed in the poviats under study. In an overwhelming majority of the poviats, the ageing process will progress. The exceptions are found in the nowotarski, Tarnów, and Cracow, where the values of the measure in question decrease. Among the territorial units with the highest dynamics of ageing in the second decade of the 21<sup>st</sup> century, the myślenicki and limanowski poviats are worth noting as their rate of ageing results in a shift from the 'younger' group in 2010 to the oldest group in 2020. Cracow and Tarnów, which have a decreasing prospective proportion of elderly, move from the oldest group to the 'youngest' in the period in question. The 2020–2030 period, with a falling prospective percentage of elderly population, is characterised by a lower intensity of changes than the years 2010–2020. The dynamics become less varied and the distribution of poviats by relative growth of the measure in question changes. In this period, relative growths have negative values only, and so the prospective proportion of the elderly falls. In general, a higher rate of ageing in terms of absolute value is noted in the poviats with a lower prospective percentage of elderly population in 2020. The greatest



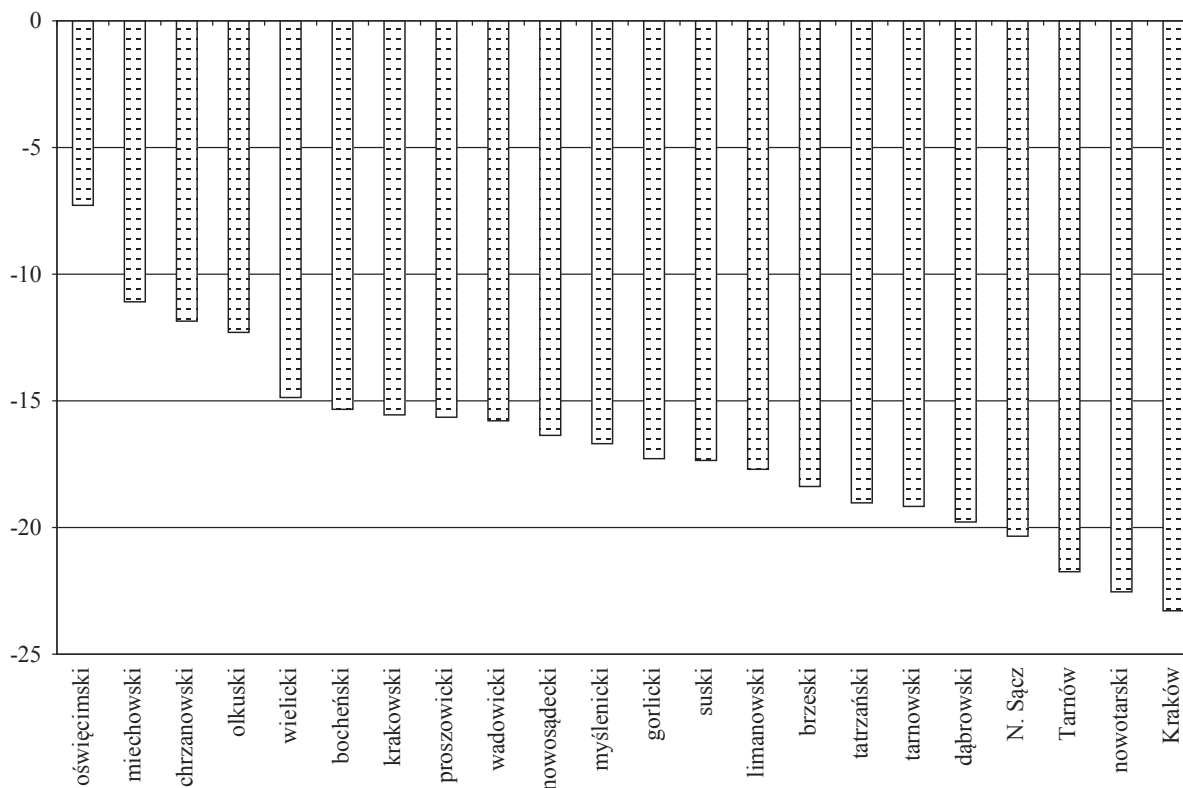
**Fig. 4a.** Dynamics of prospective proportion of persons aged 65 and over in 2020 in comparison to 2010 (in percent)



**Fig. 4b.** Dynamics of prospective proportion of persons aged 65 and over in 2030 in comparison to 2020 (in percent)



**Fig. 4c.** Dynamics of prospective old-age dependency ratio in 2020 in comparison to 2010 (in percent)



**Fig. 4d.** Dynamics of old-age dependency ratio in 2030 in comparison to 2020 (in percent)

Source: Own calculations based Demographic Yearbook of Poland 2011, and Demographic Projection 2008–2011 ([www.stat.gov.pl](http://www.stat.gov.pl))

dynamics in the third decade of the 21<sup>st</sup> century is observed in poviats which were characterised by a decrease of the prospective proportion of the elderly in the previous decade. These are Tarnów, Cracow, and the nowotarski poviat. Those poviats in which the growth rate of the prospective percentage of population aged over the new old-age threshold in the years 2010–2020 is the greatest will be placed in the middle of the ranking in the next decade. The oświęcimski poviat is worth noting as it is expected to be characterised by the lowest rate of decrease in terms of the absolute value (–4,85%) of the prospective percentage of elderly population in 2030.

In the 2010–2020 period the dynamics of the prospective old-age dependency ratio is very similar to that of the prospective proportion of the elderly. In the years 2010–2020 the groups with the highest and the lowest rates have identical compositions in terms of dynamics of both measures. The patterns observed in the years 2020–2030 are quite different. We notice that changes of the prospective old-age dependency ratio are larger, in terms of the absolute value, than those of the prospective proportion of the elderly. As in the instance of the prospective proportion of the elderly, the largest changes are found for poviats with negative values of relative growth in the 2010–2020 period. These are the Cracow, nowotarski, and Tarnów poviats. Attention should be paid to the projected change of the trends in the oświęcimski poviat from a significant growth in the 2010–2020 period to a slight fall in the 2020–2030 period.

#### 4. Conclusions

##### I. Methodological approach

1. In a situation where mortality is decreasing, conventional measures of population ageing do not provide a full picture of population ageing, irrespective of their cognitive value. They reflect changes in mortality through changes in structure – the increase of the numbers of elderly population. Their weaknesses include a solely retrospective approach, and assumes a fixed old-age threshold expressed in chronological age.
2. Sanderson and Scherbov have proposed to supplement the traditional approach recognising that for a fuller understanding of

population ageing, age must be considered in two dimensions: retrospective and prospective. This approach releases us from assuming a fixed, arbitrary old-age threshold.

##### II. Population ageing patterns in poviats of the Małopolskie voivodship until 2030

1. The process of population ageing in the Małopolskie voivodship will progress, as both the values of conventional and of prospective measures will increase.
2. Prospective measures demonstrate a lower level of population ageing than conventional ones.
3. It is possible to indicate such poviats in the Małopolskie voivodship that hold the same position in terms of population ageing in the 2010–2030 period regardless of the approach assumed (conventional or prospective). According to the proportion of the elderly these are:
  - a. always **'younger'**: nowosądecki, nowotarski, and wielicki,
  - b. always **old**: brzeski, and tarnowski;
  - c. always **older**: tatrzański, suski, and gorlicki;
  - d. always **oldest**: miechowski and proszowicki.

The population of Małopolskie voivodship is not homogeneous by virtue of the ageing process. Thus the analysis of demographic phenomena and structures on the level of poviats and gminas are justified.

#### Notes

- (1) Voivodship – administrative region of the 1<sup>st</sup> order; poviat – administrative region of the 2<sup>nd</sup> order; gmina – administrative region of the 3<sup>rd</sup> order.
- (2) Therefore, these age group cannot be interpreted as the period of economic activity.
- (3) Tarnów (city) and Nowy Sącz (town) are units that have poviat status (in Polish *miasta na prawach powiatu*).
- (4) The term 'remaining' is introduced in order to avoid confusion with the life expectancy at birth.
- (5) Drawn from period life tables for males in Poland in 2009.

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