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Sociodemographic Disparities in Czech Cohesion Regions after 1990

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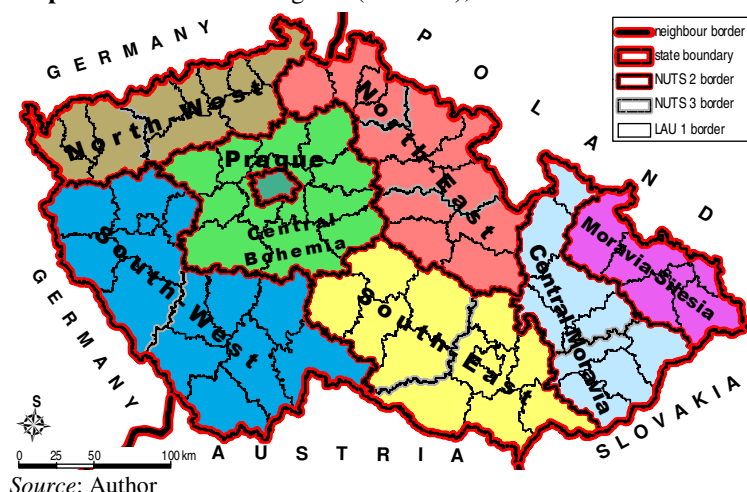
Abstract. The article is deal with the sociodemographic differences between Czech cohesion regions for the last twenty years and more. There are drew up the basic Czech population and spatial regions differencess in the preface. The spatial hierarchy of the cohesion regions is completed about its eight spatial units. There are those cohesion regions (NUTS 2) in the Czech Republic: Central Bohemia (**CBM**), Central Moravia (**CMR**), Moravia-Silesia (**MS**), Northeast (**NE**), Northwest (**NW**), Prague (**PRG**), Southeast (**SE**) and Southwest (**SW**). We are research their population size changes, demographic structures and ageing proces during last 20 years at least. The typology is given weigh of the population development changes and some choiced population compositions. The analyses on this spatial level is working with the creation of cartogram method for processing of the demographical data. We can use ArcGIS 9.2 and his version ArcMap 9.2 as a complete system for authoring, serving, and using geographic informations for better processing the spatial data by the help of cartogram method. Our principal main is to group the all eight Czech cohesion regions on the Czech territory on the basis groups according the sociodemographic disparities.

Keywords: Age distribution, ageing index, dynamic ageing index, Czech cohesion regions, dependence ratio, elderly ratio, children ratio, masculinity index, NUTS 2, population size, sex ratio, total population increase.

1 Introduction

It is very useful to anywhere when the population is unnoticed part of the science focus. Human resources are one of four the basic economic resources next to capital, soil and technology. Economic behaviour is always affected by living phase. The population is playing the important rule in all basic economic activities as consumption, production and change. And characters of these activities have a strong contexture on the population size and development. The ageing process is one of the very prominent population structural matter. Age is basic structurral characteristic on the field of demographic analysis.

The main aim of this study is to compare differences of the ageing process between Czech cohesion regions after year 1990 for the last eighteen years. This spatial level si NUTS 2. The Nomenclature of Units for Territorial Statistics (**NUTS**) was established by Eurostat more than 25 years ago in order to provide a single uniform breakdown of territorial units for the production of regional statistics for the European Union. **Eurostat** is the statistical office of the European Union situated in Luxembourg and was established in 1953 to meet the requirements of the Coal and Steel Community. Over the years its task has broadened and when the European Community was founded in 1958 it became a Directorate-General (DG) of the European Commission. Eurostat's key role is to supply statistics to other DGs and supply the Commission and other European Institutions with data so they can define, implement and analyse Community policies. Today Eurostat aids to take reliable and comparable statistics data for 27 member states and developes statistical systems in candidate countries for EU membership. The NUTS classification has been used since 1988 in Community legislation. The main reason for implementation of the classification of territorial statistical units is effort about obtaining especially economics and social informations with possibilities to compare variety of area European Union.

Map 1. Czech cohesion regions (NUTS 2), units NUTS 3 and LAU 1

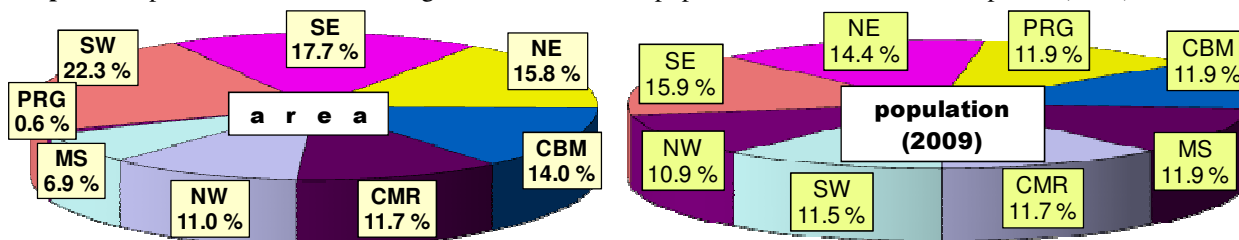
Regions (NUTS 3) came into existence in 1997 when the territories of the Regions were determined as units of state administration. In 2000 they became also units of self-government, with their own elected regional parliaments and governments. Although the decision about the delineation of the newly established regions have been reached in a relatively high level of consensus, which gave them the potential to last for longer period, they had one unfortunate feature that made the

things somewhat more complicated. On average, the new regions were found to be too small to be able to serve as **NUTS 2** regions for the EU regional policy purposes. Thus, the law on the support of the regional development instituted **cohesion regions** in 2000. Czech cohesion regions established by amendment of the act Nr. 248/2000 Sb., on regional development support are identical with the **NUTS 2** statistical units (Measure No OP13/99 on the introduction of territorial statistical units classification, declared in Chapter 33/1999 Sb.). By definition, cohesion regions were established as the units dealing with the policy of the social and regional cohesion, which meant basically administration and management of the EU regional policy programmes. Need of comparability with other European NUTS 2 regions suggested that cohesion regions should have about 1 million of inhabitants. Accordingly, some of smaller self-governing regions (NUTS 3) had to be merged together to form a cohesion region (NUTS 2), while some other regions were big enough to be able to serve as Cohesion Regions at the same time. There are eight **cohesion regions** (czech term is “*oblast*” or “*region soudržnosti*”) on the territory of our state (map 1): Central Bohemia (**CBM**), Central Moravia (**CMR**), Moravia-Silesia (**MS**), North-East (**NE**), North-West (**NW**), Prague (**PRG**), South-East (**SE**) and South-West (**SW**). Three spatial units (Moravia-Silesia, Central Bohemia and Prague) have same delimitation on the levels three (NUTS 3).

Administrative units at NUTS level 2 have alternative terms between European member states such as peripheries (Greece), regions (Denmark, Hungary, Romania, Ireland), provinces (Belgium, Netherlands), voivodeships (Poland), national areas (Sweden), oblast (Slovakia) or large areas (Finland). There are 271 NUTS 2 on the territory 27 member states of the European Union now. The maximum NUTS 2 units has Germany (39) and United Kingdom (37), France (26) and Italy (21). Only one NUTS 2 unit has Cyprus, Estonia, Lithuania, Luxembourg, Latvia and Malta.

We can notice there not so big differences between all cohesion regions from the point of view of population size (graph 1). The smallest region is North-West with 10.9 % holding in population of the Czech Republic and on the contrary the biggest region is South-East with less than 16 %. This region has nearly about 46 % more population than North-West. Moravian-Silesian region is third biggest (11.9 %), when behind South-East the North-East region (14.4 %) is larger yet. So we can compare demographic diversity of the eight cohesion region very well.

Graph 1. Proportion of the cohesion regions on the area and population size of the Czech Republic (2009)



Source: Author, based on data of Czech Statistical Office (CZSO)

Differences in size area of these territorial units are already essentially higher (graph 1). The smallest is Prague with share of the 0.6 % and biggest South-West which take away from Czech area 22.3 %. This mean that South-West is 36th time larger than Prague territory. If we want to use comparative methods is better to research the approximately commensurate regions. Most suitable spatial units are cohesions regions (NUTS 2).

Table 1. Quantity and residential hierarchy of Czech cohesion regions at year 2009

NUTS 2	area (km ²)	population	density (inh./km ²)	municipality	density mun. rate	δ (000's)	town
South-East (SE)	13 992	1 666 700	119	1 377	10	1,210	60
North-East (NE)	12 439	1 509 758	121	1 114	9	1,355	116
Prague (PRG)	496	1 249 026	2 518	1	0	1 249,026	1
Central Bohemia (CBM)	11 015	1 247 533	113	1 146	10	1,089	77
Moravia-Silesia (MS)	5 427	1 247 373	230	299	6	4,172	39
Central Moravia (CMR)	9 231	1 233 083	134	702	8	1,757	81
South-West (SW)	17 618	1 209 506	69	1 124	6	1,076	102
North-West (NW)	8 650	1 143 834	132	486	6	2,354	83
Czech republic (CZ)	78 868	10 506 813	133	6 249	8	1,681	559

Source: Author, based on data of Czech Statistical Office (CZSO)

We can see that in the Czech Republic are relatively big differences between area, density, number of municipalities and towns (table 1) of the cohesions regions. Eighteen years monitoring of changes of the ageing process is able to answer us the questions, whether population development of the Czech cohesion regions is significant different. Because no small part classification period (18 years) lay in time period a year ago 2000, was as far as of the year 1991 implement territorial unification of all territorial wholes according to spatial delimitation to year-end 2009.

That it is normally, that very high density has cohesion region Prague (more than 2,480 inhabitant per square kilometre). The Moravia-Silesia cohesion region is on the second place. There live 230 inhabitant per km². The smallest density has cohesion region Southwest (68 inh./km²). Density municipality rate is moving between 6 to 10 municipalities on the area 100 km².

2 Analytic approaches and methodology of the sociodemographic process

The total population change (total population increase, *TPI*) over time we can quantified as the number aggregate of the natural increase (*NI*) and net migration (*NM*, equation 1):

$$TPI = NI + NM , \tag{equation 1}$$

In many cases is better to work with relative weight of this process. Than we can use indicator “crude total population increase rate” – *CTPIR* (equation 2).

$$CTPIR = \frac{NI + NM}{P} \cdot 1,000 \quad (\text{equation 2})$$

$$CTPIR = CNIR + CNMR .$$

Sex or gender ratio (*SR*) is the ratio of males to females in a population (equation 3). The primary sex ratio is the ratio at the time of conception, secondary sex ratio is the ratio at time of birth. In humans the secondary sex ratio is commonly assumed to be 1050 boys to 1000 girls.

$$SR = \frac{P^m}{P^w} \cdot 1,000 \quad (\text{equation 3})$$

We will research representation of the children and the oldest people (elderly) on the population eight NUTS 2 on the Czech territory. The child is person between 0 and 14 years. The oldest citizens are most often people at the age 65 years and over.

The basic indicators which can show share of very important age groups are children and elderly ratio. Very often we can compute the percentage substitution subsequently:

$$children\ ratio = \frac{P_{0-14}}{P} \cdot 100 \quad (\text{equation 4})$$

$$elderly\ ratio = \frac{P_{65+}}{P} \cdot 100 . \quad (\text{equation 5})$$

Their common weights we can compare by the help of the ageing index (*AI*). The index show us the relatively weight of the elderly to children (equation 6).

$$AI = \frac{P_{65+}}{P_{0-14}} \cdot 100 . \quad (\text{equation 6})$$

Very special view of development trend ageing process presents indicator dynamic ageing index (*DAI*) in the case, when we want follow the time changes (equation 7).

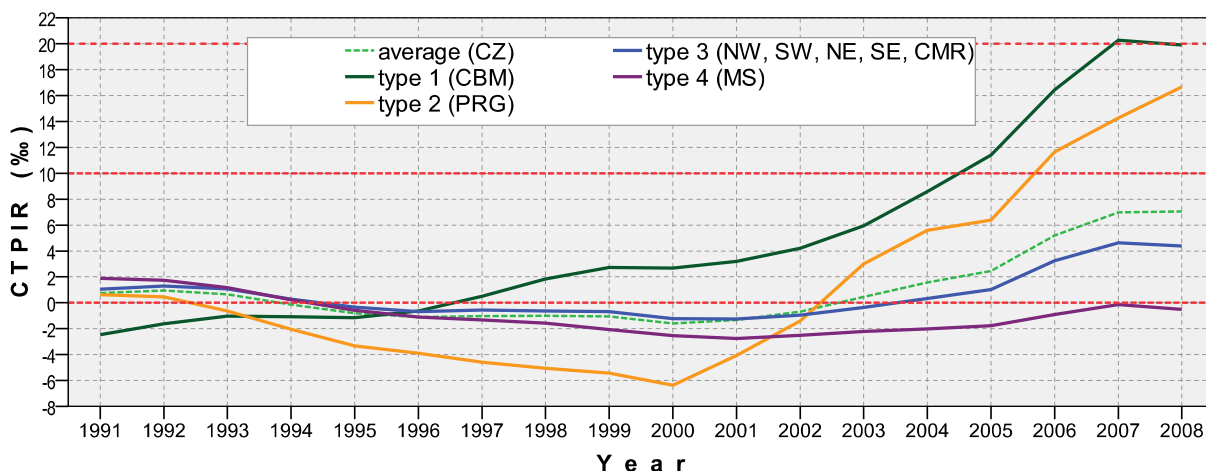
$$DAI = \left(\frac{\tau_1 P_{0-14}}{\tau_2 P} - \frac{\tau_2 P_{0-14}}{\tau_1 P} \right) \cdot 100 + \left(\frac{\tau_2 P_{65+}}{\tau_2 P} - \frac{\tau_1 P_{65+}}{\tau_1 P} \right) \cdot 100 . \quad (\text{equation 7})$$

3 Population development of the Czech cohesion regions

If we analyse the total population change by means of the crude total population increase rate (*CTPIR*) in a longer-term perspective of the last 19 years, we can distinguish four types (graph 2). There are also three time period from the point of view of the Czech population size change: before year 2002, 2003 – 2007, after year 2008. Before year 2003 was *CTIR* very low, around zero, more time below zero. The Czech population grew during the

second period between years 2004 and 2007 (average 3,5 ‰). We can give a name time after year 2007 as a period of stagnation.

Graph 2. Development of the population size change at the Czech cohesion regions after year 1990

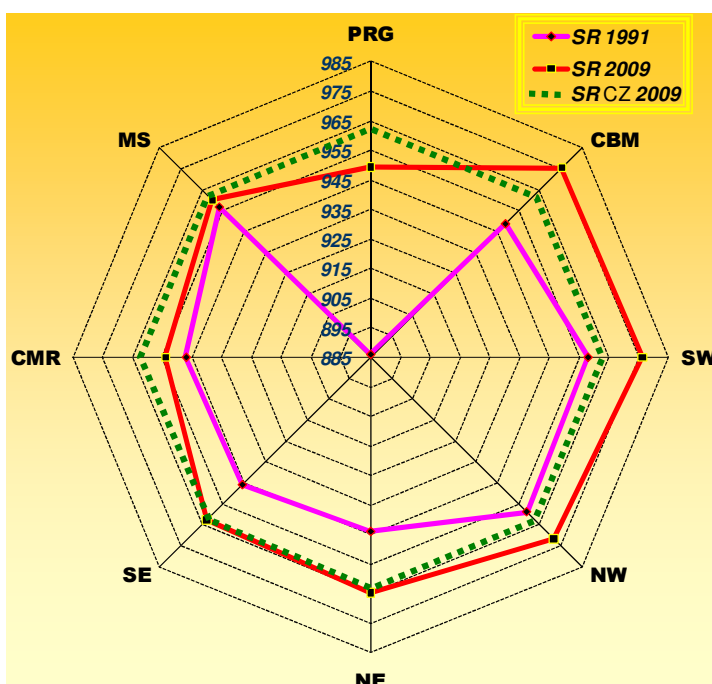


- 1st. The *first type* of the population size change it is only area of the *Central Bohemia*. Minimum and maximum values of *CTPIR* during the time interval 1991 to 2009 were between -2.6 and 23.7 ‰. Mean value was **5.6**. This cohesion region had 50 % influence to increasing the country population.
- 2nd. The *second type* of the population size change it is only area of the regions *Prague*. This cohesion region had nearly 19 % influence to increasing the country population. Mean value was **1.9**.
- 3rd. The *type 3* (regions Southwest, Southeast, Northeast, Southwest and Central Moravia) had mean value of *CTPIR* **0.7 ‰** during the long period 19th years from year 1991. Their influence to increasing the country population was around 7 % for every region.
- 4th. The *fourth type* of the population size change it is only area of the *Moravia-Silesia*. Minimum and maximum values of *CTPIR* during the period 1991 to 2009 -3 ‰ to 2 ‰. His portion on the population change was -9,7 ‰. Mean value of *CTPIR* was **-1.0 ‰** for this long time.

4 The gender disparities of the Czech cohesion regions

1. We can see (graph 3) that the most men live in the South-West, Central Bohemia and North-West. There fall on

Graph 3. Sex ratio of the Czech cohesion regions in the year 1991 and 2009



Source: Author, based on data of Czech Statistical Office (CZSO)

- every thousand women more than 970 men.
- The second group forms three cohesion regions (North-East, South-East and Moravia-Silesia). There are between 960 to 969 men for every thousand women.
 - The sex ratio between 950 to 959 has only Central Moravia cohesion region.
 - The smallest weight of the men has the Prague cohesion region. Now indicator *SR* is around 946. But it was only **886** in the year 1991.
 - It is true, that for the last nineteen years the differences between the number of the men and women is decreasing in all the Czech cohesion regions. Sex ratio in the Czech Republic was 943 in the year 1991 and now is **964** in the year 2009. Nevertheless in the middle of the 19th century was sex ratio in the Czech population around 920.

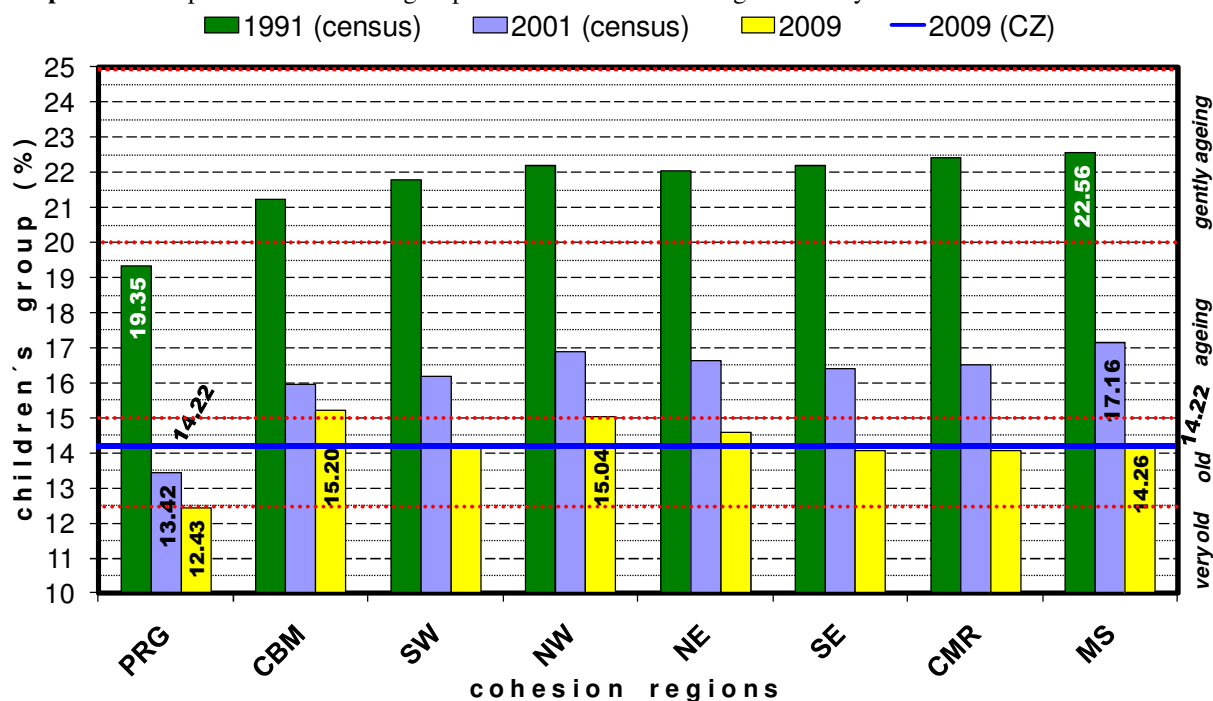
5 Child and elderly groups differences between Czech cohesion regions

The regional differences are not so extreme between eight cohesion regions (NUTS 2, graph 4) on the Czech territory, only 2.8 percent in the year 2008. This number compare cohesion regions Prague and North-West.

When we are analyse changes of the **children ratio** on the population (equation 4) we can named this situation as the ageing process from below. Our working model distinguishes the four phases in this case:

- 1st. *Gently ageing population*: percentage portion of children is between 20.0 to 24.9,
- 2nd. *ageing population*: percentage portion of children is between 15.0 to 19.9,
- 3rd. *old population*: percentage portion of children is between 12.5 to 14.9 and
- 4th. *very old population*: percentage portion of children is less than 12.5.

Graph 4. Development of children's group at the Czech cohesion regions after year 1990



Source: Author, based on data of Czech Statistical Office (CZSO)

Czech cohesion regions had gently ageing population at the beginning the nineties last century. This means that they have 20 % and more children on the population. Only Prague cohesion region had less than 20 % of the children (ageing population, graph 4). But now (for the eighteen years) five cohesion regions (South-West, North-East, South-East, Central

Moravia and Moravia-Silesia) have population old. Their relative weight of the children is between 12.5 to 14.9 percent. Only population NUTS 2 Central Bohemia (15.20 %) and North-West (15.04 %) we can identify as the ageing. Very old population has only cohesion region Prague with 12.4 % of the children’s group.

The biggest percentage decrease children’s group during last nineteen years showed NUTS 2 Central Moravia (8.4 %), Moravia-Silesia (8.3 %), and South-East (8.1 %).

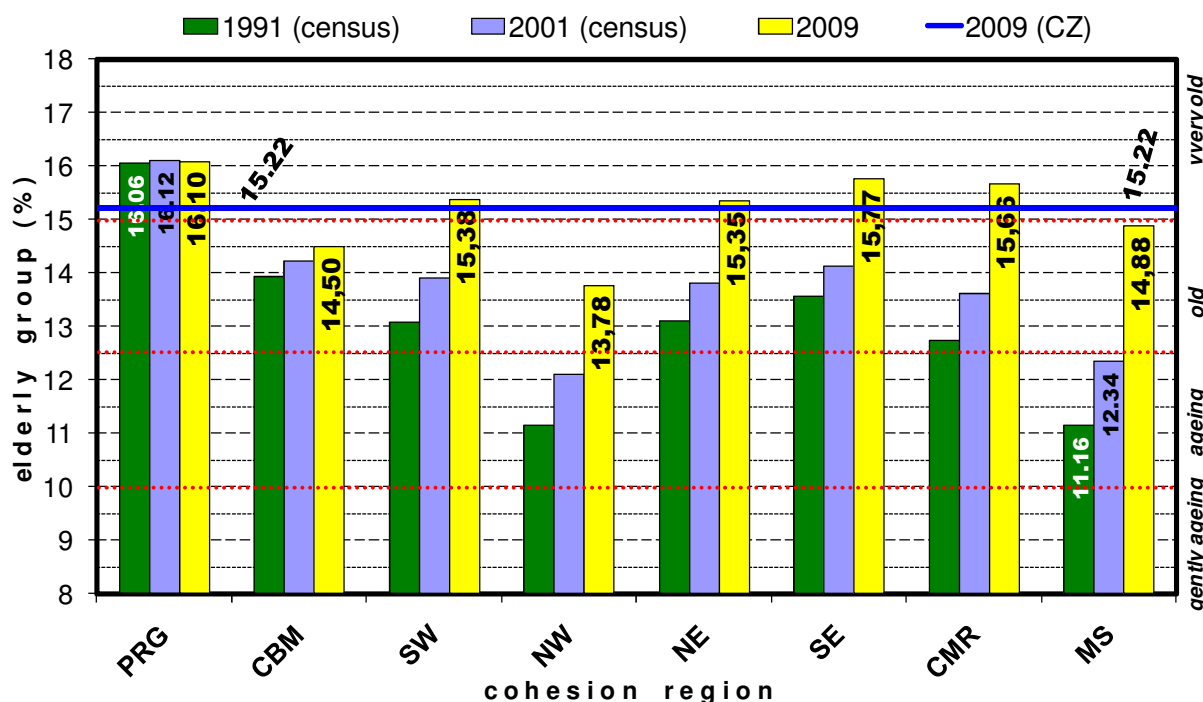
The indicator of the **elderly ratio** means how many people at the age of 65 and more are relatively (equation 5) in the population. Our second working model of the ageing process from above distinguishes (graph 5) the four phases:

- 1st. **Gently ageing population**: percentage portion of elderly is between 7.5 to 9.9,
- 2nd. **ageing population**: percentage portion of elderly is between 10.0 to 12.4,
- 3rd. **old population**: percentage portion of elderly is between 12.5 to 14.9 and
- 4th. **very old population**: percentage portion of elderly is 15.0 and more.

We were looking for ageing process during last eighteen years (graph 5). The Czech population grew old about whole two percent from 12.65 % to 15.22 %. Now we can accent some specialities, for instance:

- 1st. Very old population have five NUTS 2: Prague, South-East, Central Moravia, Southwest and North-East. Elderly people forms from their inhabitant more than fifteen percent.
- 2nd. Old population (relative scale is between 12.5 and 14.9 %) have the other three cohesion regions: Moravia-Silesia, Central Bohemia and Northwest.

Graph 5. Development of elderly group at the Czech cohesion regions after year 1990



Source: Author, based on data of Czech Statistical Office (CZSO)

The biggest percentage increase elderly group during last nineteen years showed NUTS 2 Moravia-Silesia (3.7 %), Central Moravia (2.9 %) and Northwest (2.6 %).

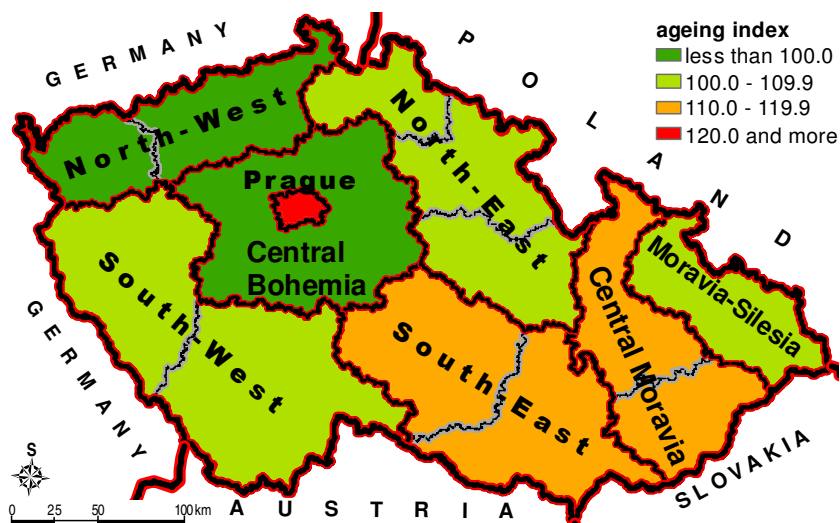
The greatest change age structure according to dynamic ageing index (aggregate of percentage decrease children group and percentage increase elderly group) registered cohesion regions Moravia-Silesia and Central Moravia (more than 10 %). The smallest change age

structure according to dynamic ageing index have cohesion regions Prague and Central Bohemia (less than 6.5 %).

6 Ageing index differences between Czech cohesion regions

Ageing index (equation 6) says how many elderly fall on every hundred children. If ageing index is less than one hundred, than on the territory lives more children than elderly. On the other hand when the ageing index is bigger than one hundred, this mean, that on the territory lives more elderly than children.

Map 2. Cartogram of ageing index of the Czech cohesion regions in the year 2009



1st. The important prevalence children above elderly is on the North-West and Central Bohemia cohesion regions (map 2). Ageing index value is less than 100.

2nd. The three cohesion regions (Moravia-Silesia, North-East, South-West) have soft majority elderly inhabitants. There are not bigger differences between numbers of children and ederly at the these three cohesion

regions.

3rd. The important prevalence elderly above children is on the Prague cohesion region. There is a great predominance elderly citizens over children (ageing index overdraw value 130 now). That’s true that population is more ageing at this region for a long time.

Table 2. Scale changes between children and elderly groups in the space of year 1991 and 2009 according to NUTS 2

demographic indicator	PRG	CBM	SW	NW	NE	SE	CMR	MS	CZ
change children ratio	-6,9	-6,0	-7,6	-7,2	-7,4	-8,1	-8,4	-8,3	-6,8
change eledery ratio	0,0	0,6	2,3	2,6	2,2	2,2	2,9	3,7	2,6
dynamic ageing index	5,9	2,3	8,8	8,9	8,8	9,8	11,0	12,9	7,9

Source: Author, based on data of Czech Statistical Office (CZSO)

Very interesting is *dynamic ageing index* (equation 7). The biggest changes of the basic age groups (table 2) took place in Moravia-Silesia cohesion region (12.9 %). Than follow cohesion regions Central Moravia (11.0 %) and South-East (9.8 %). The minimal changes of the both basic age groups went ahead on the cohesion

regions Central Bohemia (2.8 %) and Prague (6.3 %).

7 Conclusion

The cohesion regions with biggest influence to increasing the country population were Central Bohemia and Prague during the period 1991 to 2009.

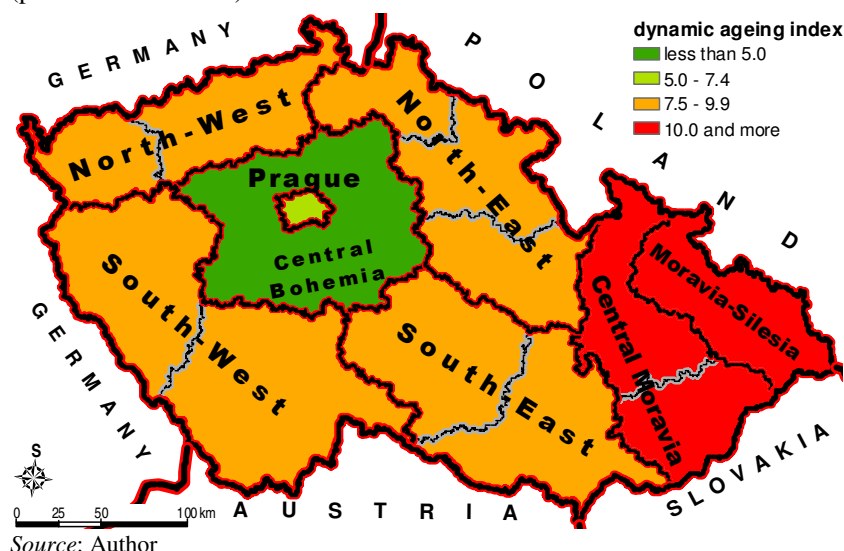
The differences in substitution of the men and women are smaller in the Czech population for the last one hundred and fifty years. The number of the men is increasing and now is sex ratio 964 men for every thousand women. The biggest weight of the women has the Prague cohesion region, where on the every thousand women is falling on only 943 men today.

There are two Czech cohesion regions (*North-West* and *Central Bohemia*) with children group around 15 percent today. The others five cohesion regions has 14 percent of children (NE, MS, SW, CMR, SE). The smallest children rate has territory of the *Prague* capitol (12 %). The greatest changes of the age structure went ahead at the cohesion region *Moravia-Silesia* and *Central Moravia* during the period 1991 to 2009. The most relative weight of the children was in the cohesion region Moravia-Silesia at the year 1991 (22.56 %) and now it is only 14.26 %. This means decrease about 8.3 %. The minimum weight of the elderly people had this region too, less than 11.16 %. The population on the age 65 and more increased about 3.7 %. That's why had Moravia-Silesia region the highest value of the indicator dynamic ageing index (*DAI*) – more than 12.8 % (map 3).

The smallest changes of the age structure went ahead at the cohesion region *Central Bohemia* during the period 1991 to 2009. There lived 21.2 % at the year 1991 and now (2009) 15.2 % of the children group and 13.9 % (1991) and 14,5 % (2009) of the elderly group. The value of the indicator dynamic ageing index (*DAI*) was around the 2.3 %.

Very old population has cohesion region *Prague*. There is only 12.4 % of the children's group and nearly 16.1 % citizens older 65 years. There is the largest overweight the elderly above children (*AI* equal to 130).

Map 3. Cartogram of dynamic ageing index of the Czech cohesion regions (period 1991 to 2009)



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