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AGEING INDICATORS IN SELECTED COUNTRIES OF THE EUROPEAN UNION

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ABSTRACT

Population ageing is a process of increasing proportion of seniors in the population, i.e. people in the age of 65 years and more. It can be widely observed in all developed countries over the world. Ageing is accompanied by growing economic dependency carried by productive part of the population, which has to support still larger non-productive part consisting mostly from seniors. This burden can be measured by increasing proportion of senior in the population, median age, total dependency ratio, young-age and old-age dependency ratio and other indicators. Currently, old-age dependency ratio in the Czech Republic is on the level of 0.216 in 2009. In other European countries the ratio ranges from 0.168 (Ireland, 0.169 (Slovak Republic) to 0.313 (Germany). Using existing population projection, old-age dependency ratio is forecasted to reach the threshold of 0.68 in the year 2060. This means that one person in productive age has to support additional 0.68 individual in post-productive age. Comparison of European countries of both historical and future trends is provided in the paper using population distribution and population projections from EUROSTAT. In all cases, increase of old-age dependency ratio and other indicators is projected. Consequently, European countries have to solve problems arising from population ageing and growing proportion of post-productive generation.

JEL CLASSIFICATION & KEYWORDS

■ J11 ■ J14 ■ AGEING ■ EUROPEAN UNION ■ POPULATION

INTRODUCTION

European countries continue in experiencing a demographic transition headed toward older structure of the population. Ageing of population is usually defined as increasing proportion of old people in the population (old people are individuals in the age of 65 years and more) (Binstock, George, 2011: p. 33). This trend is heterogeneous, different countries achieve different stages of the demographic transition.

Ageing process, considered as process when demographic structure becomes older, usually consists of two simultaneous processes: *absolute ageing* means that mortality characteristics improve and life expectancy grows, there are more seniors in population - it is also called ageing from top of population pyramid; and *relative ageing*, which is caused by natality decline and growing proportion of older people in population, called ageing from bottom of population pyramid.

Process of population ageing became one of widely discussed issues with significant consequences on economic, social, technical and political life with extensive impacts on pension system, health care, seniors' support system, level of economic activity etc. (Arltová, Langhamrová, 2010; Fiala, Langhamrová, Langhamrová, 2009; Langhamrová, Fiala, 2007; Langhamrová, Fiala, Langhamrová, 2009; Quality of Life in Old Age. National Programme of Preparation for Ageing for 2008–2012, 2008). It affects people's lives, families and communities as well. Currently, the Czech Republic discusses impacts of the population ageing upon social, health and pension systems. Some of visible impacts are changes of parameters within the pension system and health insurance conditions.

Definition of Indicators

Impact of the population ageing and its impact on economic activity could be analyzed from many perspectives. It is possible to present population pyramid, trends of life expectancy at births and in higher ages (for example in the age of 65 years, 80 years, 90 years or even 100 years), proportion of people in the age of 65 years and more to the total population (and similarly proportion of people in the age of 80 years and more, 90 years and more or even 100 years and more from the total population), median age, dependency ratios and other indicators.

Dependency ratios are calculated based on large population groups, which comes out of population distribution into so called 'economic generations' (Koschin, 2005):

- pre-productive generation, Ist economic generation, I_{eg}: age 0–14 or 0–19,
- productive generation, IInd economic generation, II_{eg}: age 15–64 or 20–64,
- post-productive generation, IIIrd economic generation, III_{eg}: age 65 and more.

Different definition of limits depends on specifics in each country, it corresponds for example with usual length of education and preparation for work, age of retirement and length of economic activity. For the case of the Czech Republic and European countries will be used the same limits 0–14, 15–64 and 65 years and more (denoted by "65+").

It has to be mentioned that assumptions of full economic activity of people aged 15–64 is not correct. First, young people start their job later, education and preparation for work prolongs significantly, proportion of people in the tertiary stage of education grows. Second, smaller part of people do not participate on economic activity, they are economically inactive – from various reasons, for example health conditions. Third, age of retirement is set differently in EU countries, somewhere even separately for males and females. For example, real retirement ages in the Czech Republic were defined as 60 years for males and 54–57 for females according to the number of raised children. Since 1997, these limits are gradually extended with different dynamics for males and females and with no upper boundary. Thus, decision about changes of pension system should be based on calculations that reflect real participation rates and retirement ages.

Proportion of Seniors

Proportion of people in the age of 65 years and more: $III_{eg} / (I_{eg} + II_{eg} + III_{eg})$

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This indicator expresses percentage of seniors in entire population. It is used as very simple and straightforward characteristics of dependency.

Proportion of people in the age of 80 years and more within the population

Median Age

Median age is the age that divides the population into two equal groups – groups of the same size, i.e. half of the people are younger than this age and half are older. Median age grows during the process of population ageing.

Ratios of Dependency

Increasing proportion of people in the age of 65 years and more brings substantial economic burden in the society. Assuming that individuals in the age of 65 years and more and children and young people under 20 years are economically inactive and people in the age of 20–64 years are economically active, there are introduced several ratios between economically inactive and economically active part of population:

- young-age dependency ratio: I_{eg} / II_{eg}

It expresses how many people from pre-productive (i.e. first) economic generation are dependent on one individual in economically active age. (Koschin, 2005: p. 30)

- old-age dependency ratio: III_{eg} / II_{eg}

It expresses how many seniors in post-productive (i.e. third) economic generation are dependent on one individual in economically active age. (Koschin, 2005: p. 30)

- total dependency ratio: (I_{eg} + II_{eg} + III_{eg}) / II_{eg} or (I_{eg} + III_{eg}) / II_{eg}

It expresses how many people in the population depend on one individual in economically active age or how many of economically inactive people depend on one individual in economically active age. Mathematically, it is clear that total dependency ratio consists of young-age dependency ratio, old-age dependency ratio and 1 (according to the first definition). (Koschin, 2005: p. 30; Langhamrová, Langhamrová, Miskolczi, 2011; Population Statistics, 2006: p. 175; Pour, 2011) If total dependency ratio overcomes threshold of 2, then one productive person is responsible for himself/herself and one other individual. This is called “overpopulation”.

- ratio of productive part to non-productive parts of population: II_{eg} / (I_{eg} + III_{eg})

This is reciprocal value of the total dependency ratio according to the narrower (second) definition. It shows how many people in economically active age belong to one person in economically inactive age, either from pre-productive or post-productive part of the population.

- potential support ratio: II_{eg} / III_{eg}

This is reciprocal value of the old-age dependency ratio. It is used as “... an alternative way of expressing the numerical relationship between those more likely to be economically productive and those more likely to be dependants. ...” (World Population Ageing 1950-2050, 2002: p. 20)

Data

In the article, data form EUROSTAT (1990-2009, projection 2010-2060) will be used to compare selected countries from European Union (EU). Projection prepared by EUROSTAT and used in the article is based on the Eurostat Population Projections 2010 (The Europop2010) based on convergence scenario with horizon 1. 1. 2061. It is assumed that net migration converges to zero and socio-economic and cultural differences among 27 EU countries will diminish in the year of convergence set as 2150.

Proportion of Seniors in the Population

Proportion of Seniors in the Age of 65 Years and More

Proportion of people in the age of 65 years and more ranged from 10.0 % (Poland) to 17.8 % (Sweden) in 1990. In 2009, the proportion shifted to the range starting at the level of 11.0 % (Ireland) to 20.4 % (Germany). EU average increased by 3.5 percentage points from 13.7 % to 17.2 %. The fastest jump reported Slovenia, Estonia, Latvia, Italy, Lithuania and Germany.

Proportion of Seniors in the Age of 80 Years and More

Ageing populations publish statistics regarding proportion of people aged 80 years and more, 90 years and more or even 100 years and more from the total population.

In the European Union it is projected to have 12.1 % people aged 80 years and more in 2060, whereas in 2009 this proportion was 4.5 %. Increment of 7.6 percentage points is compensated by decrease in pre-productive and productive groups of population. In absolute values this means 61 million of people from the total population of 506 million people in the EU. In the Czech Republic, the proportion of people aged 80 years and more from the total population was 3.5 % in 2009 and is projected to be 13.4 % in the year 2060. The highest proportion in 2060 is planned for Italy (14.9 %) compared to the situation in 2009 (5.6 %); and Spain (plan in 2060: 14.5 % compared to the proportion in 2009: 4.7 %).

Median Age

Median age grows in all European countries in recent decades. An average for 27 EU countries was in 2009: 40.6 years. The highest values reached Germany (43.7 years) and Italy (42.8 years) and the lowest values Ireland (33.8 years) and Cyprus (35.9 years).

In the Czech Republic, median age in 2009 was 39.2 years, which means increase by 1.9 years in comparison with the year 2000 (37.3 years) and by 4.1 years in comparison with the year 1990 (35.1 years). Median age in 2011 is forecasted to reach 39.6 years.In Slovakia, median age in 2009 was 36.5 years with the forecast of 37.2 years in 2011, which is higher by 0.7 years and thus, it is faster grow compared to the Czech Republic. In 1990, Slovak median age was 31.2 years and in 2000: 33.9 years.

The average for the European Union reached the level of 35.2 years in 1990 and 38.0 in 2000.

Old-Age Dependency Ratio

Old-age dependency ratio shows how many seniors depend on productive part of population. According to EUROSTAT methodology, it is defined as the number of persons aged 65 and over expressed as a percentage of the number of persons aged between 15 and 64.

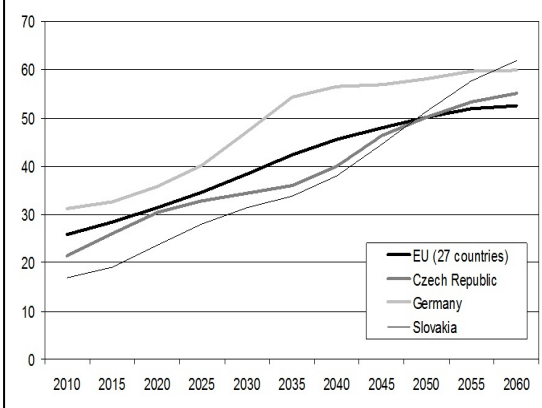
European Union average starts at the level of 26 %, which means t7hat one productive person is responsible for 0.259 senior. This ratio is projected to grow quite fast with slowdown after 2045. It reaches level of 0.33 before 2025, level of 0.50 in 2050 and finally stops at the level of 0.526 in 2060. In 1990 this ratio was only 0.205.

Table 1: Projected old-age dependency ratio (EU and selected countries, 2010-2060) in %

Country	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
EU (27 countries)	25,92	28,48	31,37	34,57	38,33	42,31	45,52	48	50,16	51,82	52,55
Belgium	26,03	27,99	30,25	33,23	36,68	39,3	40,95	41,69	42,48	43,07	43,83
Bulgaria	25,44	28,86	32,46	35,8	38,69	41,63	45,96	51,55	56,06	60,11	60,32
Czech Republic	21,57	26,02	30,37	32,78	34,32	35,91	40,07	46,4	50,14	53,29	55
Denmark	24,87	28,83	31,42	33,85	37	40,13	41,91	42,45	41,79	42,04	43,52
Germany	31,26	32,52	35,78	40,22	47,21	54,2	56,44	56,92	58,11	59,57	59,89
Estonia	25,18	27,21	30,07	33,12	35,83	37,61	40,48	43,59	48,33	54,28	55,54
Ireland	16,82	19,98	22,79	25,09	27,59	30,04	33,07	36,3	39,66	38,62	36,65
Greece	28,41	30,6	32,57	34,91	37,74	42,45	47,83	53,35	57,45	57,65	56,65
Spain	24,69	27,04	28,94	31,57	35,52	40,6	46,7	53,26	56,91	57,25	56,37
France	25,66	29,22	32,71	35,81	39,06	41,95	44,37	44,77	45,48	46,34	46,58
Italy	30,78	33,13	34,76	37,02	41,14	46,5	51,73	55,13	56,34	56,58	56,65
Cyprus	18,64	21,59	24,88	28,22	30,79	31,99	33,32	35,52	39,82	43,76	47,57
Latvia	25,19	26,63	28,84	32,24	36,17	39,17	43,27	47,56	54,25	63,34	6799
Lithuania	23,28	24,41	26,58	30,42	35,2	38,76	41,79	43,74	47,25	52,73	56,65
Luxembourg	20,43	21,31	23,12	26,04	29,98	34,07	37,08	39,57	41,94	43,58	45,05
Hungary	24,2	26,15	29,98	32,79	33,57	35,69	39,52	46	50,18	54,16	57,81
Malta	21,26	27,03	31,75	36,28	39,22	39,35	40,2	42,93	46,47	51,05	55,56
Netherlands	22,82	27,11	30,79	35,15	40,25	44,84	47,29	46,91	46,5	46,69	47,47
Austria	26,1	27,82	29,78	33,34	38,83	44,22	46,83	47,39	48,56	49,27	50,73
Poland	18,96	21,75	26,94	32,42	35,24	36,86	39,89	45,25	53	60,01	64,59
Portugal	26,7	28,98	31,32	34,04	37,85	41,79	46,72	52,04	55,62	56,66	57,2
Romania	21,37	22,59	25,68	29,04	30,23	35,28	40,65	47,61	53,81	62,31	64,77
Slovenia	23,8	25,83	30,41	34,82	38,84	42,73	46,14	50,81	55,05	57,81	57,61
Slovakia	16,93	19,14	23,59	27,98	31,36	33,88	37,99	44,63	51,38	57,58	61,8
Finland	25,63	31,41	36,18	39,82	42,74	44,25	43,46	43,79	44,86	45,74	47,43
Sweden	27,72	31,28	33,47	35,3	37,21	39,27	40,45	40,85	41,7	43,71	46,21
United Kingdom	24,86	27,76	29,63	31,74	34,83	37,7	38,86	38,58	39,41	40,9	42,07
Iceland	17,87	21,29	25,07	28,84	32,15	33,93	34,45	34,03	33,54	32,57	33,49
Liechenstein	19,29	24,19	29,68	36,19	43,61	50,61	54,36	54,57	54,08	53,53	52,87
Norway	22,46	24,96	27,39	30,27	33,02	36,13	38,49	39,36	40,29	41,54	42,97
Switzerland	24,71	26,97	29,48	33,11	38,04	42,77	45,71	47,95	50,53	52,76	54,36

Source: EUROSTAT

Figure 1: Trend of old-age dependency ratio (selected countries, 2010-2060) in %



Source: EUROSTAT

The Czech Republic has growing trend as well but with different progress. Level of ratio was 0.190 back in 1990 and grew up to 0.216 in 2010. Currently it is projected to reach 0.550 in 2060, which means that productive person is responsible for more than one half of other non-productive individual. Increment is 33.4 percentage points. Growth after 2035 is caused by large group of people born in 1970th who will reach age of 65 in this period and will be moved from productive part (15–64) to seniors (65+), i.e. old-age dependency ratio increases.

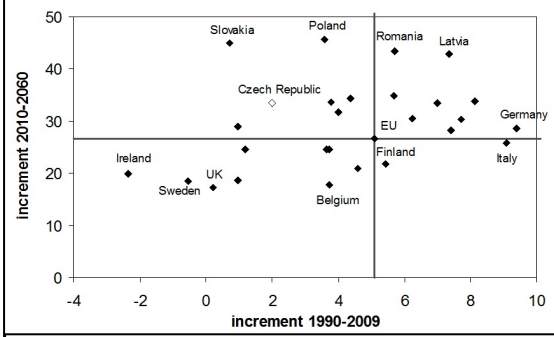
In case of the Slovak Republic it is clear that population structure is younger (old-age dependency ration was 0.160 in 1990) but ageing process is faster and no slowdown could be expected in the period of 2045–2060. Slovak population will reach old-age dependency ratio 0.33 in 2035, which is less than the Czech Republic or EU average. However, the ratio will be already above EU average (0.514) in 2050 and will grow constantly to the level of 0.618 in 2060. At that time, Slovakia is projected to be one of the “oldest” populations in EU, together with Latvia (0.680), Romania (0.648) and Poland (0.646).

Another example of EU country is presented in the figure: Germany. It belongs to countries with an old age structure but the trend of ageing slows down since 2035 and further grows by 1.14 percentage points each five years (on average). In 2060 there is the old-age dependency ratio on the level of 0.599. On the other hand, Ireland, reaches the lowest level from EU countries: 0.367 in 2060. In case of Ireland, Greece and Spain it is projected that trend decreases at the end of period.

Increment of Old-Age Dependency Ratio

Following figure presents increment of the old-age dependency ratio in the period of 1990–2009 versus the period of 2010–2060 for EU countries. EU average is denoted by lines: the old-age dependency ratio increased by 5.1 percentage points between the years 1990 and 2009 and is projected to increase by 26.6 percentage points from the year 2010 till 2060.

Figure 2: Increment of old-age dependency ratio (1990-2009 versus 2010-2060) in percentage points



Source: EUROSTAT

Countries in the lower left quadrant grew slowly and will continue in gradual growth, two of them should face improvement (i.e. decrease) of old-age dependency ratio – proportion of people aged 65 years and more to productive part of population aged 15–64 will even decrease (Ireland, Sweden). Upper right quadrant joins countries with fast ageing process so far and fast increase of old-age ratio in future. Whereas lower right and upper left quadrants present those countries

- lower right quadrant: where ageing was already fast and will continue with lower dynamics (Finland, Italy),
- upper left quadrant: where ageing process went slowly last 20 years but will speed up according to EUROSTAT projection (Poland, Slovakia, Czech Republic, Hungary, Cyprus and Spain).

Conclusion

Ageing is a process ongoing in all European countries. In some of them proportion of older people (defined by the age of 65 years and more) grows very quickly and is projected to grow further; in some countries rate of velocity will slow down. Proportion of people in the age of 80 years and more grows as well. It is projected to increase by 7.6 percentage points in the European Union.

Old-age dependency ratio shows how many individuals in the age of 65 years and more has to be supported by people in productive age (according to EUROSTAT methodology defined by the age of 15–64 years). It will grow by 33.4 percentage points in the Czech Republic and 26.6 percentage points in the EU between years 2010 and 2060. The fastest growth is projected for Poland (+45.6 percentage points).

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References

Arltová, Markéta, Langhamrová, Jitka. 2010. Migration and ageing of the population of the Czech Republic and the EU countries. Prague Economic Papers, Vol. 19, No. 1, p. 54–73.

Binstock, Robert H., George, Linda K. (ed.). 2011. Handbook of Aging and the Social Sciences. 7th ed. Elsevier. ISBN 978-0-12-380880-6.

Fiala, Tomáš, Langhamrová, Jitka, Langhamrová, Jana. 2009. Changes in the Age Structure of the Population in the Czech Republic and its Economics Consequences. Uherské Hradiště 27.08.2009 – 28.08.2009. In: AMSE 2009 Applications of Mathematics and Statistics in Economy. [online] Praha : Oeconomica, 2009, p. 137–148. ISBN 978-80-245-1600-4. URL: http://amse2009.vse.cz/proceedings.pdf.

Koschin, Felix. 2005. Kapitoly z ekonomické demografie. 1st ed. Prague : Oeconomica. ISBN 80-245-0959-8.

Langhamrová , Jitka, Fiala, Tomáš, Langhamrová, Jana. 2009. Ageing of the Population of the Czech Republic and its Economic Consequences in the Sphere of Pension Security and Financing of Health Care. Marrakech 27.09.2009 – 02.10.2009. In XXVI International Population Conference [CD-ROM]. [online] Paris : IUSSP, p. 1–12. URL: http://iussp2009. princeton.edu/ download .aspx?submissionId=90582.

Langhamrová, Jana, Langhamrová, Jitka, Miskolczi, Martina. 2011. Application of demographic Projections for Modelling of Economic and Social Dependency in the Czech Republic. Prague, 27.06.2011 – 29.06.2011. In: The 31st Annual International Symposium on Forecasting: Forecasting in a Disruptive World, pp. 182.

Langhamrová, Jitka, Fiala, Tomáš. 2007. The Ageing of the Population and its Consequences. Forum Statisticum Slovacum, Vol. III., No. 6, p. 79–83.

Martin, L. G., Preston, S. H. 1993. Demography of Aging. Committee on Population, National Research Council. ISBN-13: 978-0-309-05085-2.

Pour, Vojtěch Václav. 2011. Selected characteristics of labour market in connection with population ageing. University of Economics in Prague, prepared bachelor thesis.

Quality of Life in Old Age. National Programme of Preparation for Ageing for 2008–2012. 2008. Ministry of Labour and Social Affairs, Czech Republic. [online]. 2008-08-01 [cit. 2011-07-03]. URL: http://www.mpsv.cz/files/clanky/5607/starnuti_en_web.pdf

EUROSTAT. 2011. URL: http://epp.eurostat.ec.europa.eu/

Population Statistics. 2006. Detailed Tables. Eurostat, 2006. ISBN 92-79-01642-3. [online]. 2006 [cit. 2011-10-21]. URL: http://epp.eurostat.ec.europa.eu/ cache/ ITY_OFFPUB/KS-EH-06-001/EN/KS-EH-06-001-EN.PDF

Population structure and ageing. 2011. Eurostat. [online]. 2011 [cit. 2011-07-20]. URL: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Population_structure_and_ageing

World Population Ageing 1950-2050. 2002. Changing Balance Between Age Groups. Population Division, Department of Economic and Social Affairs, United Nations. [online]. 2002 [cit. 2011-10-20]. URL: http://www.un.org/ esa/ population/ publications/ worldageing 19502050/pdf/81chapteriii.pdf