CEPS WORKING DOCUMENT
Thinking ahead for Europe

# Measuring ageing and the need for longer working lives in the EU

Mikkel Barslund and Marten von Werder

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## Abstract

This study considers different ways of measuring the ageing of societies and their implications for public policy. The first part characterises the ongoing ageing of the population in the EU28 by relating it to past and future longer-term demographic trends for broad groups of countries. It goes beyond traditional chronological measures, which are increasingly insufficient, such as the old-age dependency ratio, and includes recently suggested prospective measures of ageing. The second part of the study is concerned with economic dependency ratios; a more relevant measure for summarising the economic challenges related to ageing. Three main findings emerge: first, prospective indicators of ageing reveal the challenge of population ageing to be less onerous than traditional chronological measures would suggest. Their relevance, however, will depend on the degree to which policy changes can respond to the changing age structure of the population. Second, substantial increases in the length of working lives are necessary to maintain current economic dependency ratios. Taking a year-2000 perspective view of the economic challenges of ageing shows that substantial progress has been made. Third, looking towards 2050, education will have limited *direct* impact on the scale of the ageing challenge.

*Keywords: measuring ageing, demographic dependency, prospective ageing, population projection, longer working lives*

MoPAct
Mobilising the Potential of Active Ageing in Europe

SEVENTH FRAMEWORK PROGRAMME

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# Measuring ageing and the need for longer working lives in the EU


## Mikkel Barslund and Marten von Werder*



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## 1. Introduction

The average and median ages of people living in Europe are increasing. This has been the case for more than a century and is well recognised. The two major factors behind this phenomenon have been secular declines in fertility rates and mortality at older ages. Without changes to policies and behaviour this development will place enormous strain on European welfare states, as was indicated in the early 1990s (World Bank, 1994). The phenomenon is reflected in increasing old-age dependency ratios across Europe. While not a novel insight, it is still worth noting since much debate about the consequences of ageing still takes as its starting point the old-age dependency ratio. Moreover, until recently public policies related to pensions and the labour market were firmly fixed at the age of 65, or 60 in most European countries (in some cases even lower) and, importantly, had been so for half a century.

However, as noted by several authors (Sanderson and Scherbov, 2007, 2010, 2013; Lutz, 2009; Shoven, 2009; Spijker and MacInnes, 2013; Spijker, 2015; Barslund and Werder, 2015), only considering the conventional old-age dependency ratio is a static view of ageing, which by definition is bound to see increasing longevity as a challenge to public finances. Instead, they argue that ageing and associated challenges should be seen dynamically and linked to mortality developments.

This study provides a comprehensive overview of different measures of ageing societies available to quantify the challenges stemming from population ageing. In particular focus is on prospective measures of ageing, which are designed to take increases in longevity into account. We apply these metrics to broad country groupings of the EU28 countries. While the challenges to welfare states do not disappear by measuring them differently, they do appear to be more manageable if one links the definition of 'old' that is embedded in pensions and labour policies to longevity increases at older ages.

We conclude by looking at the changes to the length of working lives that will be needed to keep economic dependency rates constant at current levels towards 2050. As an analogue to the prospective measures to quantify the challenges of ageing societies, we envisage the increase in working lives to take place between the ages of 60 to 75.

The remainder of the study is organised as follows. After describing the Eurostat population forecast (our main data source) and the assumptions behind it, we look at conventional measures of ageing (such as the demographic dependency ratio) across different broad regions in Europe. This is followed by an analysis of prospective measures on ageing. Finally, we look at economic dependency ratios, the role of education and the need for extending working lives to maintain current economic dependency ratios.


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## 2. Data sources

The main data source for this study is the EUROPOP2013 population projection prepared by Eurostat in 2013.[1] This is supplemented by historical data points from Eurostat. The EUROPOP2013 set of projections provide population projections for all 28 EU countries for, respectively, a base scenario, and low and high fertility scenarios. We use the base scenario, but detailed assumptions on age-specific fertility, mortality and net migration are available to facilitate alternative projections. The projection horizon is 2080, with 2013 being the base year. Results in this study are presented up to 2050. The country-specific projections are based on a convergence scenario where the key demographic contributors – fertility and mortality – are assumed to converge towards the same value for all 28 countries in the very long run. Central features are a general increase in fertility for most countries (exceptions are Ireland, Sweden and France) and a further increase in life expectancy for all countries with convergence towards the value of low mortality countries. Migration projections are country-specific based on historical values. Figures 1-3, below, illustrate the underlying assumptions.

In order to keep the exposition tractable, the 28 EU countries are divided into six broad regional groups:

- NC – Nordic countries (Denmark, Finland and Sweden),
- WE – Western Europe (Ireland, UK, France, Belgium, Netherlands, Luxembourg),
- CE – Central-Eastern Europe (Lithuania, Latvia, Estonia, Poland, Czech Republic, Slovakia, Hungary, Slovenia and Croatia),
- SEE – South Eastern Europe (Bulgaria and Romania),
- GS – German-speaking countries (Austria and Germany) and
- SE – Southern Europe (Italy, Spain, Greece, Portugal, Malta, Cyprus).

While there is variation within these groups, this grouping nevertheless allows for a consistent presentation of differences. Where relevant, individual country results are presented in the annex.

### 2.1 Drivers of demographic change and ageing populations

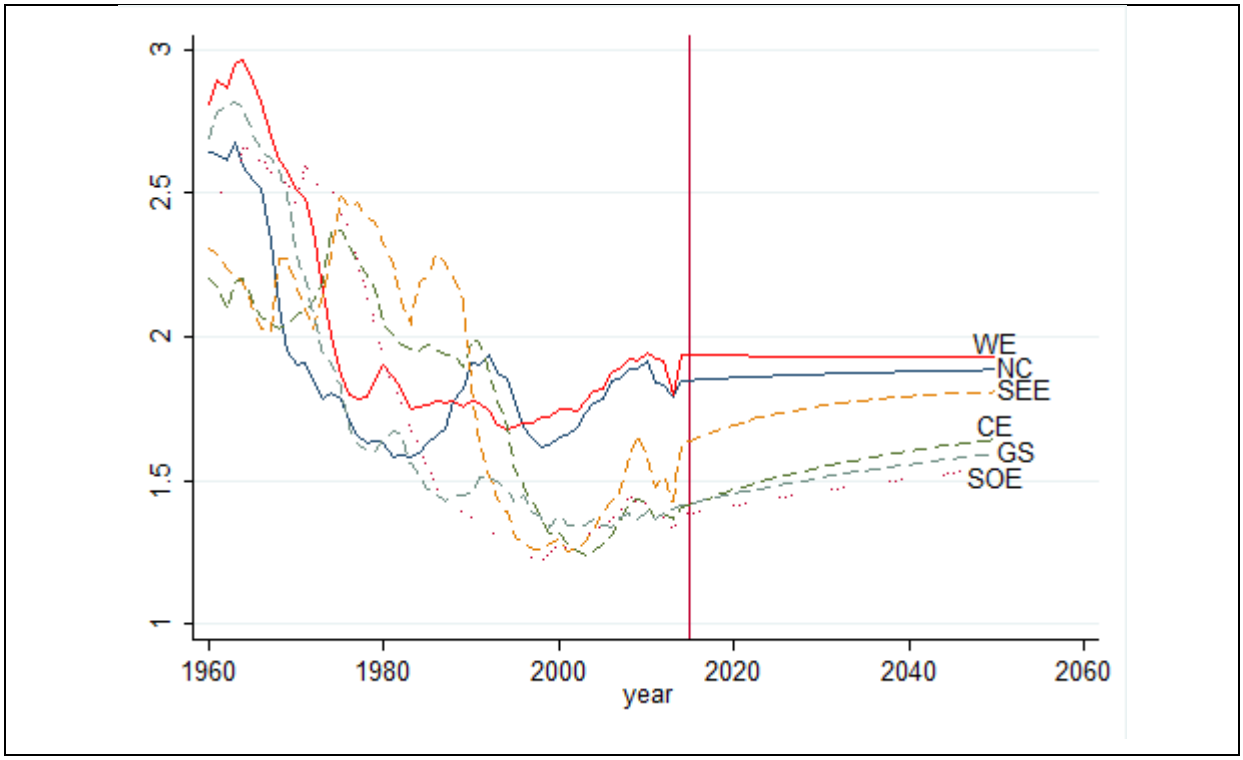
There are three fundamental drivers of demographic development: mortality, fertility and net migration. Assumptions based on these quantities are central to the outcome of the projections. It is well documented that the combination of ageing post-WWII baby boomers, the consistent fall in mortality rates at older ages and the secular fall in fertility rates, explain the nature of population ageing today (European Commission, 2014; World Bank, 1994).

#### *2.1.1 Fertility*

Developments in the total fertility rate are of importance to the structure of the adult population in the medium to long run. Changes in fertility today will start to affect the size of the labour force two decades from now.

[1] A detailed description of the EUROPOP2013 projections is forthcoming. A short description is available from Eurostat (2015) and the European Commission (2014).

*Figure 1. Total fertility rates for broad EU regions, 1960-2050*




*Note*: The total fertility rate in a given year is the average number of children a woman would have had at the end of her reproductive period if she was subject during her whole live to the fertility rates of the given year and if she was not subject to mortality risk.

*Source*: Own calculations based on EUROPOP2013 (see Eurostat, 2015).

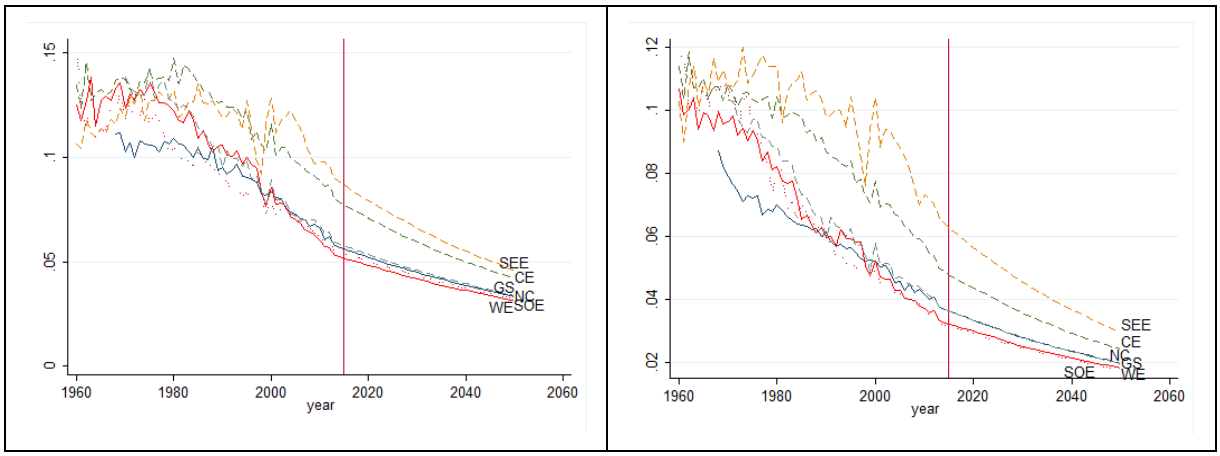
Figure 1 documents this declining trend since 1960 and illustrates the fertility assumptions behind the base scenario in EUROPOP2013.[2] For western European countries fertility rates are projected to remain unchanged. For all other countries an increase in the total fertility rate is built into the projections. However, for central and southern European as well as German-speaking countries the total fertility rate is projected to stay well below replacement rates.

### 2.1.2 *Mortality at older ages*

Since the 1970s all EU countries have seen substantial declines in mortality rates at older ages (Figure 2). The decline has been faster in the EU15 compared to EU10 countries (World Bank, 2015), which has manifested itself as a substantial divergence between EU10 and EU15 countries in mortality.

[2] The total fertility rate is sensitive to changes in the age when women choose to have children. Particularly in periods where the average age of first-time mothers is increasing the total fertility rate will underestimate the total number of children that women will have on average during their lifetime (Myrskylä et al., 2013).

*Figure 2. Mortality at age 80 for men (left panel) and women (right panel)*

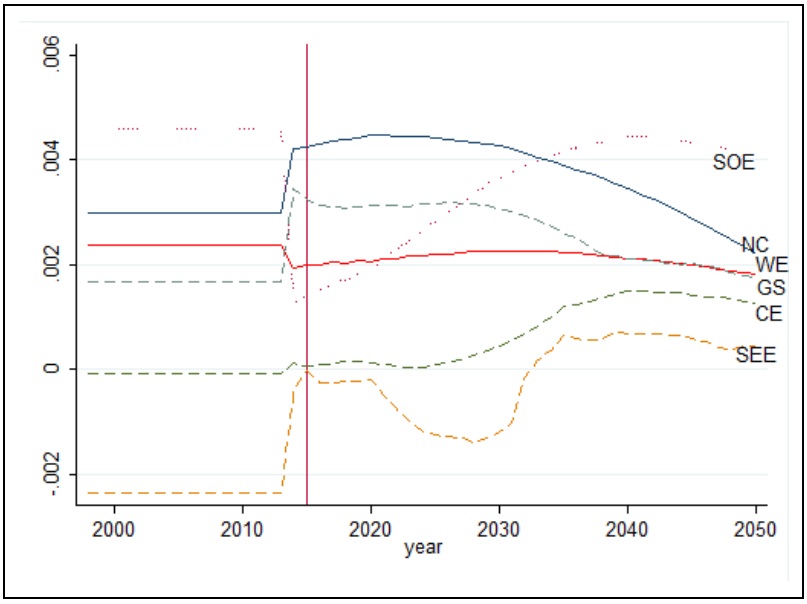



*Note*: Own calculations based on EUROPOP2013 (see Eurostat, 2015).

### 2.1.3 *Net migration*

Net migration is the most uncertain item in any population projection (Bongaarts & Bulatao, 2000; Lee, 2011). Not only are projections highly uncertain they are also subject to large discrete changes that can affect the working age population substantially in the short run. While projections of mortality and fertility are also uncertain they are unlikely to show large discrete changes, implying that over shorter horizons (i.e. a 10-year horizon) they will not deviate markedly from projections. With some deviations, the EUROPOP2013 build upon historical rates of net migration in the projections (Figure 3)

*Figure 3. Net migration assumptions in EUROPOP2013 for broad EU regions, 1998-2050*




*Source*: Own calculations based on EUROPOP2013 (see Eurostat, 2015).

# 3. Measuring ageing

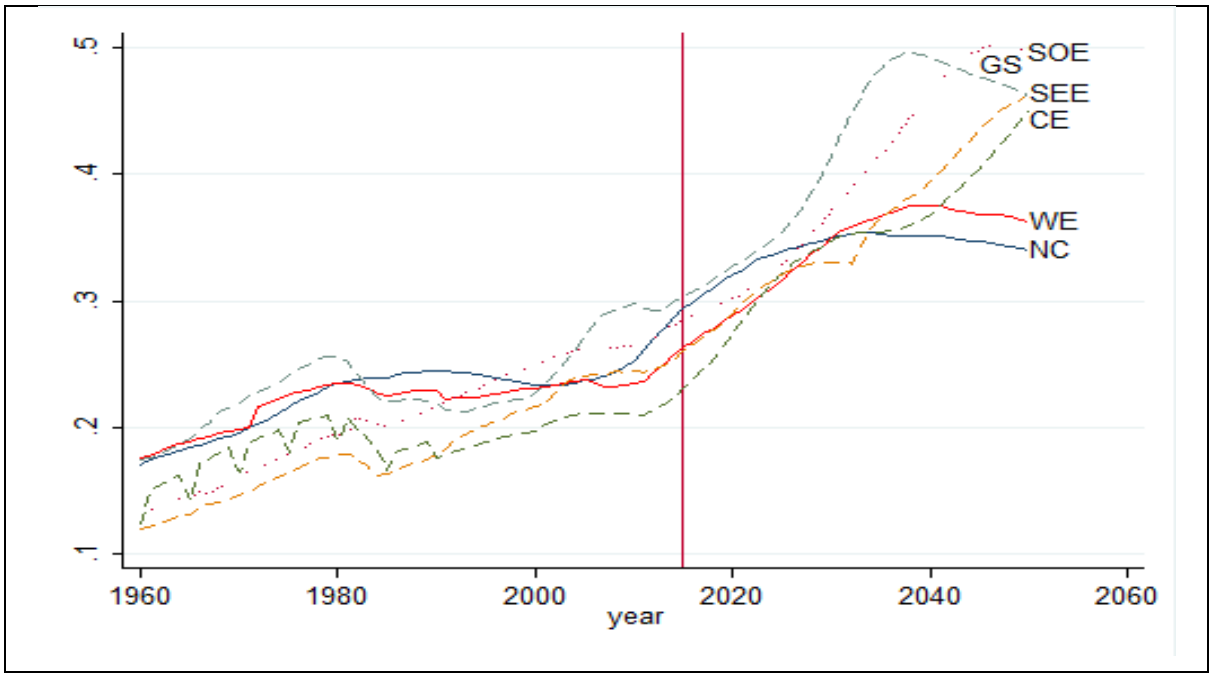
## 3.1 Demographic dependency ratios

The ageing of the European population is traditionally measured by the so-called Old-Age Dependency Ratio (OADR) that relates the number of people aged 65 years and over to the number of people of working age (20-64 years old) (WB, 1994). This ratio measures the number of older individuals that each working age individual will have to support. While recent developments in the OADR have been amply documented elsewhere (European Commission, 2015a, 2015; World Bank 2015), a few points are worth emphasising.

Population ageing, as measured by the OADR, is no new phenomenon. It has been ongoing in all EU countries for a long time. Since 1960 the OADR has on average doubled for the EU28 countries. From a low of 0.16 – one person aged 65 and over for every 6 persons of working age – in 1960 to 0.3 in 2013 (Figure 4). The OADR is projected to rise to around 0.54 in 2050. Thus, population ageing is set to increase in coming years but the extent to which it affects different European countries varies substantially. This is not only the case when we look at the outcome in 2050 but also at the trajectories.

The Nordic countries have been experiencing an acceleration in the OADR in recent years but this will level off and the absolute increase in the OADR for the period 2013 to 2040 will in fact only be marginally higher than for the 25-year period 1960 to 1985.

*Figure 4. Old-age dependency ratio (OADR), 1960-2040*




*Notes*: Data since 1960 are not available for all countries. The figure shows OADR for countries with available data in a given year.

NC – Nordic countries (Denmark, Finland and Sweden), WE – Western Europe (Ireland, UK, France, Belgium, Netherlands, Luxembourg), CE – Central-Eastern Europe and the Baltics (Lithuania, Latvia, Estonia, Poland, Czech Republic, Slovakia, Hungary, Slovenia and Croatia), SEE – South Eastern Europe (Bulgaria and Romania), GS – German-speaking countries (Austria and Germany) and SE – Southern Europe (Italy, Spain, Greece, Portugal, Malta, Cyprus).

*Source*: Own calculations based on EUROPOP2013 (see Eurostat, 2015).

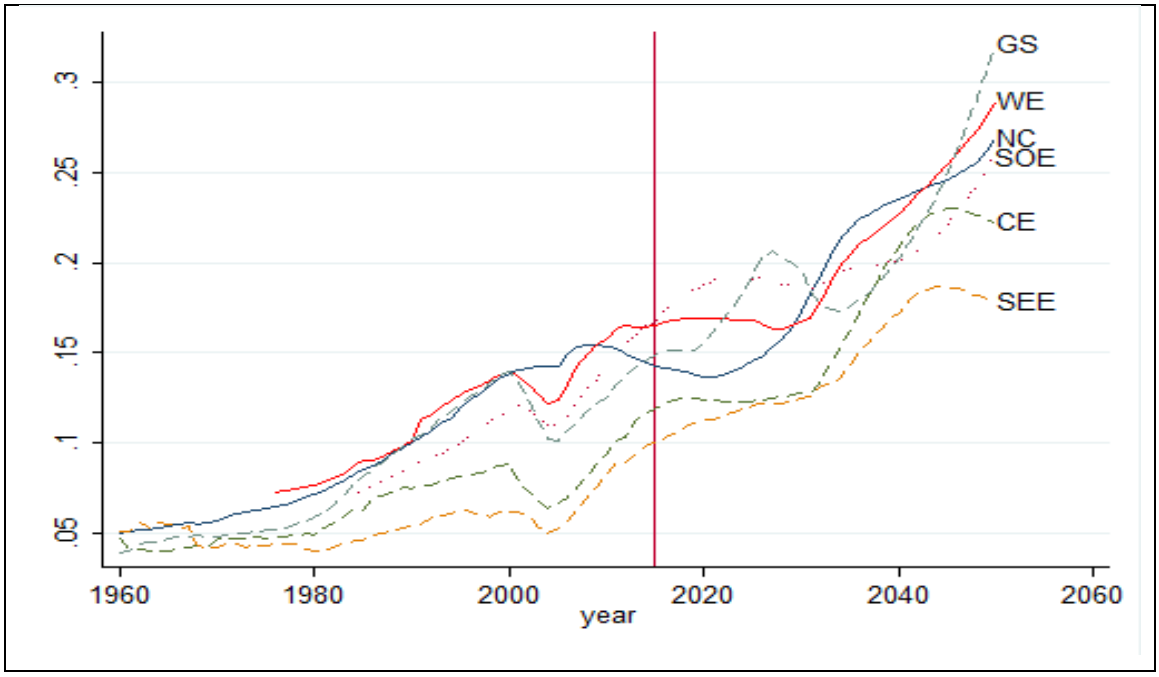
For western Europe the acceleration will be sharper and last for longer, particularly when compared with the 1960 to 2013 period. However, the difference in the absolute OADR between western Europe and the Nordic countries is not large. The German-speaking countries face the steepest ageing curve over the next two decades. The average yearly increase in the number of people aged 65+ for each 20 to 64 year old will increase more than three times as fast in the next 20 years as it did in the period from 1960 to today. This, combined with an already large number of older people for each working age individual, means that the OADR for Austria and Germany will be much higher than for the Nordic countries and western Europe. The prospective trajectories of countries in south-eastern Europe (SSE) and central Europe and the Baltics (CE) are similar to those of German-speaking countries, although they start from a lower OADR today. The development for central Europe and the Baltics is much steeper. Southern Europe is projected to have the highest OADR in 2050. The increase is less steep than for the German-speaking countries towards 2030, but the OADR will continue to increase in southern Europe, while it will level off for the German-speaking countries.

The broad grouping of countries employed here is useful to cover broad trends of broadly similar countries, but there are differences among individual countries within these groups (see Annex, Table A1). Notable exemptions among the larger countries from the common trends are Italy and Spain in the group of southern European countries. The projected increase in the old-age dependency ratio for Spain is substantially larger than for Italy (with Portugal and Greece in between), which is reflected in a much steeper trajectory for the OADR in Spain.

### *3.1.1 Age composition of the very old*

The group of people aged 65 or over is heterogeneous, in particular with respect to the health and long-term care needed. The age composition of this group is therefore of separate interest, and it will change towards 2050 (Figure 5). While the fact that the share of very old as a percentage of the old will increase is well known (European Commission, 2015b; World Bank, 1994), it is interesting to note that for the next 5 to 10 years all countries will see a levelling off, if not actually a decrease, in the percentage of very old people. The only exception to this is the southern Europe region. The main reason is that the post-WWII baby boomers started to reach the age of 65 in 2010. This bulge of people tend to make the population aged 65 and over younger by comparison. Intra-EU differences are sizeable but will not increase further in the next two decades.

*Figure 5. Share of people older than 85 in 65+ year olds*




*Note*: See Figure 4.

*Source*: Own calculations based on EUROPOP2013 (see Eurostat, 2015).

These differences among European major regions visible in Figures 4 and 5 are further spelt out when looking at the average and median ages of the population in the 100-year period from 1960 to 2060 (Table 1). Median and average ages will continue to increase, but at a slower pace in the coming 50 years compared with the preceding 50 years.

*Table 1. Average and median ages for different regions (selected years)*

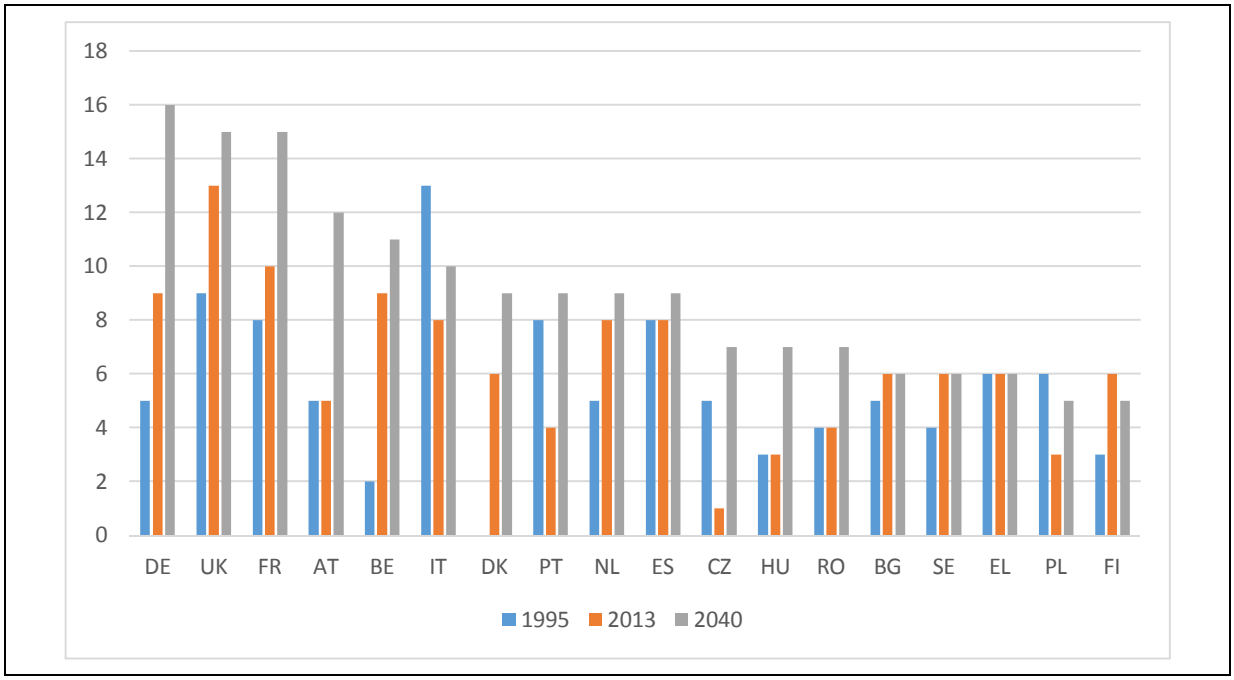
| | | **Average age** | | | | |
|---|---|---|---|---|---|---|
| **Country** | | **1960** | **1980** | **2010** | **2040** | **2060** |
| Nordic countries | NC | 33.9 | 36.6 | 40.4 | 42.5 | 43.2 |
| WE | WE | 33.2 | 35.6 | 39.3 | 42.7 | 43.2 |
| CE | CE | 30.6 | 33.6 | 39.5 | 45.7 | 47.1 |
| SEE | SEE | 31.7 | 33.5 | 40.6 | 44.9 | 46.0 |
| GS | GS | 35.4 | 37.3 | 42.8 | 47.5 | 48.1 |
| SOE | SOE | 31.9 | 33.9 | 41.7 | 47.1 | 47.6 |
| | | **Median age** | | | | |
| **Country** | | **1960** | **1980** | **2010** | **2040** | **2060** |
| NC | NC | 33 | 34 | 40 | 42 | 42 |
| WE | WE | 31 | 33 | 39 | 42 | 42 |
| CE | CE | 28 | 30 | 38 | 48 | 48 |
| SEE | SEE | 30 | 31 | 40 | 47 | 46 |
| GS | GS | 34 | 36 | 43 | 49 | 49 |
| SOE | SOE | 30 | 32 | 41 | 49 | 48 |

*Source*: Own calculations based on EUROPOP2013 (Eurostat, 2015).

### 3.1.2 Regional (NUTS2) differences

While countries will differ in their rate of ageing so will, to an even greater extent, the different (NUTS2) regions within and among countries (Figure 6). The figure shows the difference in the median age between the NUTS2 region with the lowest and largest median ages within EU countries. All but a few countries, except Finland, Portugal, Greece, Sweden and Bulgaria, will see a widening age dispersion among regions. Relatively old countries today will see large increases in regional median age differences, most notably Germany. The main reason for this is that large metropolitan areas will not age much, whereas in more rural areas the ageing of the population will be more rapid.

*Figure 6. Country differences in lowest and highest median age among NUTS2 regions, 1995, 2013 and 2040*




*Notes*: Only countries with four or more NUTS2 regions are shown. Excludes the regions of: Ciudad Autónoma de Melilla (NUTS2 code ES64), Ciudad Autónoma de Ceuta (ES63), French Guyana (FR93), Réunion (FR94).

*Source*: Eurostat regional population projections (2015).

### 3.1.3 Total dependency ratio

Traditionally the focus has been on the OADR's measure of pensioners per working age adult. This measure leaves out the large group of young people aged up to 20 years old. The main reason for this distinction is that pensioners affect public finances to a much larger extent than young people due to pension benefits and much larger health care costs (Barslund & Werder, 2015). However, falling fertility rates has been the other major driver of population ageing in most European countries (Figure 1). This implies that focusing only on the OADR may underestimate the challenges facing many countries, because the adjustment process in the last two decades has been aided by a falling number of young people.

The total dependency ratio relates the number of people in inactive ages – the young, 0-19 year olds plus the old above 65 – to the 20 to 64 years old. This gives the ratio of inactive to potentially labour market active individuals. Panel A of Figure 7 shows the differences in the

TDR among broad regions. The projection part resembles the OADR shown in Figure 4 because fertility is assumed to stay roughly constant in the projection period (Figure 1), thus the young dependency ratio – number of people under 20 years old and over 20 to 64 year olds – will be relatively flat. The main point to note is the difference vis-à-vis the historical part of Figure 4. Whereas the OADR has been rising in the period shown, this has been more than offset by a decrease in the number of young people, leading to a fall in the TDR.

*Figure 7. Panel A. Total dependency ratio (TDR), 1960-2040*

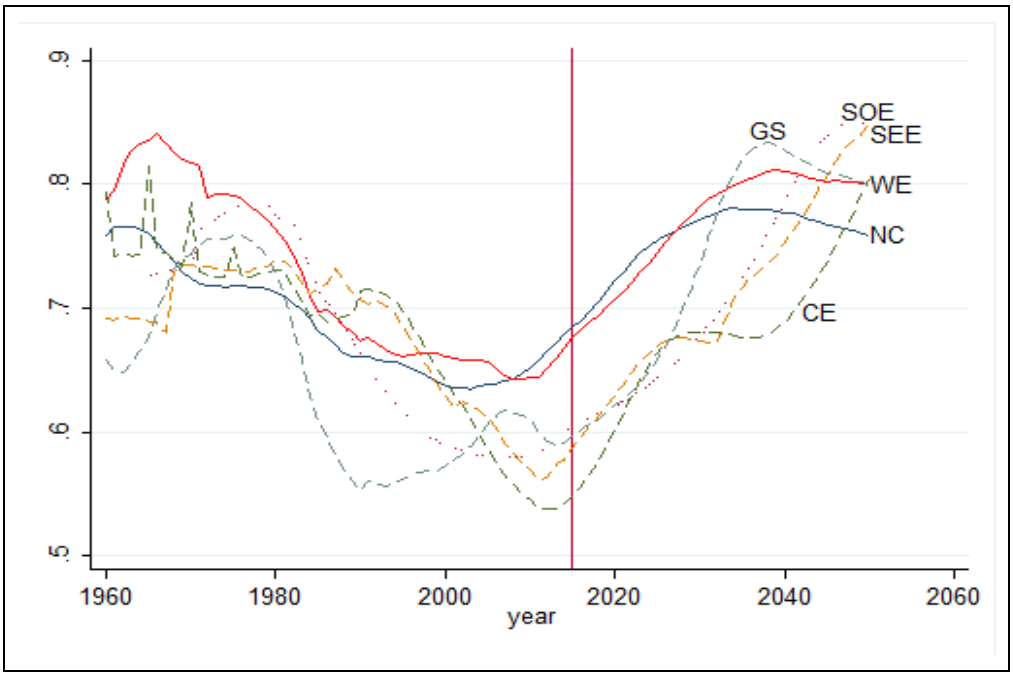



*Figure 7. Panel B. Normalised Total dependency ratio (TDR, 2013=1), 1960-2040*


*Note*: See Figure 4.

*Source*: Own calculations based on EUROPOP2013 (see Eurostat, 2015).

Figure 7 panel B presents the total dependency ratio normalised to 1 in 2013. It serves two main purposes. First, it is clear that most countries are now at the trough of the TDR. Increases in the number of older individuals are no longer offset by a decrease in the number of children and young people. Second, there are significant differences among country groupings in relation to the scale of the future challenges faced. The percentage increase in the TDR ranges from 16% (Nordic countries) to 50% (Central European countries). This is also reflected in differences in the rate of increases in the TDR expected in the next 10 years.

## 3.2 Adjusting for increasing longevity: prospective measures of ageing

A central feature of the increase in life expectancy in the last 40 to 50 years has been a decrease in mortality at older ages (see Figure 2, above). In such an environment, measures of ageing that build on fixed chronological cut-offs (i.e. 65 years old) may not be the best or most accurate method to measure the age of a society (Sanderson and Scherbov, 2007, 2010, 2013; Lutz, 2009; Shoven, 2009; Spijker and MacInnes, 2013; Spijker, 2015). Even a stable population, i.e. a population with longer-term constant fertility and mortality rates, with a replacement fertility rate would experience an increase in the old age and total dependency ratios if mortality at older ages were to increase. Thus, chronological measures of ageing – by definition – depict increases in longevity as a societal challenge. To illustrate this Table 2 shows the difference between the OADR as presented in Figure 4 and the OADR of the same country groupings but where the population projection is arrived at by holding mortality constant at 2013 level. The difference in OADR between the two projections shows the part of the ageing challenge that is directly due to increased longevity, and therefore at least seems desirable from a societal point of view.

*Table 2. Changes in old-age dependency ratios due to mortality changes*

| Country region | Projected mortality changes Change in OADR 2013 2050 | Mortality fixed at 2013 level Change in OADR 2013 -2050 | Difference in change |
|---|---|---|---|
| NC | 0.06 | 0.03 | 0.03 |
| WE | 0.11 | 0.08 | 0.03 |
| CE | 0.23 | 0.17 | 0.06 |
| SEE | 0.21 | 0.13 | 0.08 |
| GS | 0.17 | 0.12 | 0.05 |
| SOE | 0.22 | 0.18 | 0.04 |

*Source*: Own calculations based on EUROPOP2013 (Eurostat, 2015). The population projection with constant mortality is made following Barslund and Werder (2015b).

The share of the total predicted change in the OADR that is due to longevity differs among countries and to some extent is negatively related to the fall in the fertility rate in the decades preceding 2013. However, it is clear that for all regions a non-negligible part of the increase in the projected OADR is due (as one would expect) to the change in mortality.

A number of authors have proposed so-called prospective measures of ageing, which in various ways account for increasing longevity (Sanderson and Scherbov, 2005, 2007, 2010, 2013; Lutz, 2009; Shoven, 2009; Spijker and MacInnes, 2013). From a policy perspective the

most promising prospective indicator is the prospective old-age dependency ratio.[3] The prospective old age dependency ratio (POADR) adjusts the age limit for being 'old' by the development in life expectancy. Specifically, the POADR is defined as

$$POADR_t = \frac{Population\ \{age>aged|_{\{\ RLE\leq Z\}}\}}{Population_t\ \{20\leq age_t\leq aged|_{\{\ RLE\leq Z\}}},$$

where the nominator counts the number of people with remaining life expectancy (RLE) less than $Z$ years, and the denominator counts the population in the age group 20 years old to the age at which RLE is less than $Z$ years. Z is often set at 15 years, however, in our application, $Z$ is calibrated to correspond approximately to the median retirement age in Europe (65, with Z being 19 years of remaining life expectancy). With this calibration the definition of the POADR corresponds to the OADR where the cut-off point (and hence the statutory pension age is adjusted with gains in life expectancy).[4]

The POADR expands the age bracket of non-dependents in line with life expectancy at older ages. Similarly, one can define the total prospective old age dependency ratio (TPOADR) as

$$POADR_t = \frac{Population\ \{age_t<20\} + Population\ \{age>aged|_{\{\ RLE\leq Z\}}\}}{Population_t\ \{20\leq age_t\leq aged|_{\{\ RLE\leq Z\}}}.$$

Here, young people are added to the nominator. Even with prospective measures the age composition of the group of 'old' people can be of policy significance. An analogous prospective indicator to the measure of the share of 85+ year olds in the group of 65+ year olds (Figure 5), a prospective very old age ratio, can be defined as

$$PVOAR_t = \frac{Population\ \{age>aged|_{\{\ RLE\leq Y\}}\}}{Population\ \{age>aged|_{\{\ RLE\leq Z\}}\}}.$$

The prospective very old age ratio calculates the share of those people with RLE less than $Y$ in the population of people with RLE less than $Z$ (with $Y < Z$). Setting $Z$ equal to 19 and $Y$ equal to 6 in 2013 yields approximately for EU28 the 85+ to 65+ ratio depicted in Figure 5 for the year 2013.

Informally, looking at prospective measures adjusts for the part of the increase in the old age dependency ratio that is due to increasing longevity. This is useful in assessing to what extent adjustment of public finances should come from working longer (Andersen, 2014).

Figure 8, panel A, depicts POADRs for the six country groups where the cut-off point for being old is set at a remaining life expectancy of 19 years. At a European average this was

[3] See Spijker (2015) for a recent survey of indicators of ageing. Related to the POADR is what Spijker denotes as the proportion of the population with remaining life expectancy of $X$ years or less to the total population. The choice of $X$ is arbitrary (often set at 15 years) but can be calibrated so that the cut-off is equal to e.g. the official retirement age in a given year. Another measure is the population average remaining years of life. This measure is equal to the population-weighted sum over remaining life expectancy in different age groups. A third demographically interesting measure is the prospective median age. This measure starts from a reference population, e.g. the population in 2013. The prospective median age in a given future year is the age of the person in the 2013 population that has the same life expectancy as the median aged person in the given year in the future. For an application of these measures to European countries, see Mamolo and Scherbov (2009).

[4] Such designs are becoming more common in the EU. See Shoven and Goda (2010) for a more general discussion of adjusting government policies to developments in mortality.

roughly reached at the age of 65 in 2013.[5] Compared to Figure 4, the POADR curves are substantially flatter. The large fall in fertility (Figure 1) in German-speaking, central and southern European countries is also apparent in Figure 8. These regions face a steeper ageing of the population compared to the Nordic countries and western Europe where fertility has held up.

Looking at the TPOADR – young and old for each active individual, where the threshold for being active is postponed with increases in life expectancy at older ages – the implied societal challenges of an ageing population seem to diminish. The difference between Panel A and B in Figure 8 is the continued fall in the number of young due to the below replacement rate fertility assumptions.

*Figure 8. Panel A. Prospective old age dependency ratio (POADR), 1960-2050*

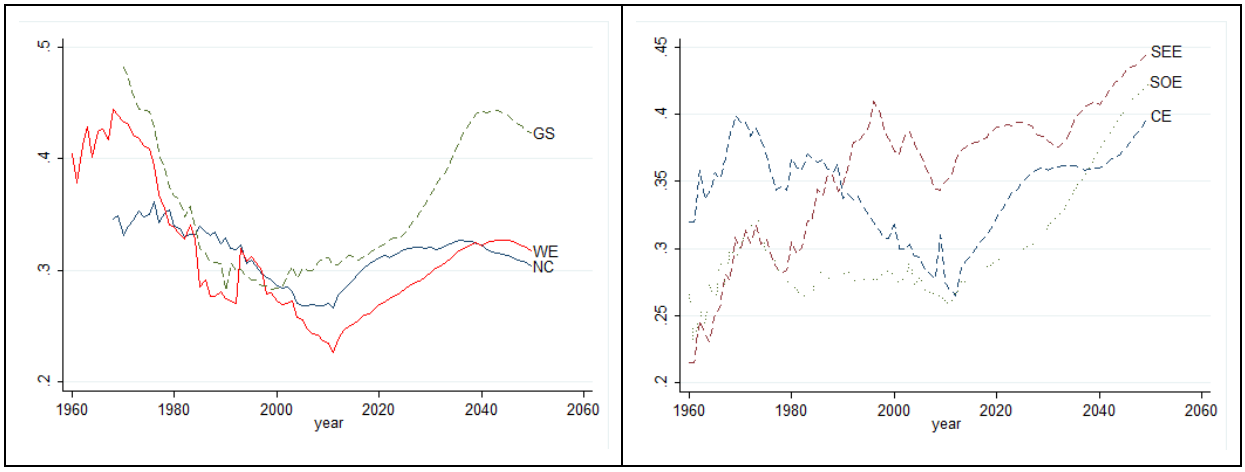
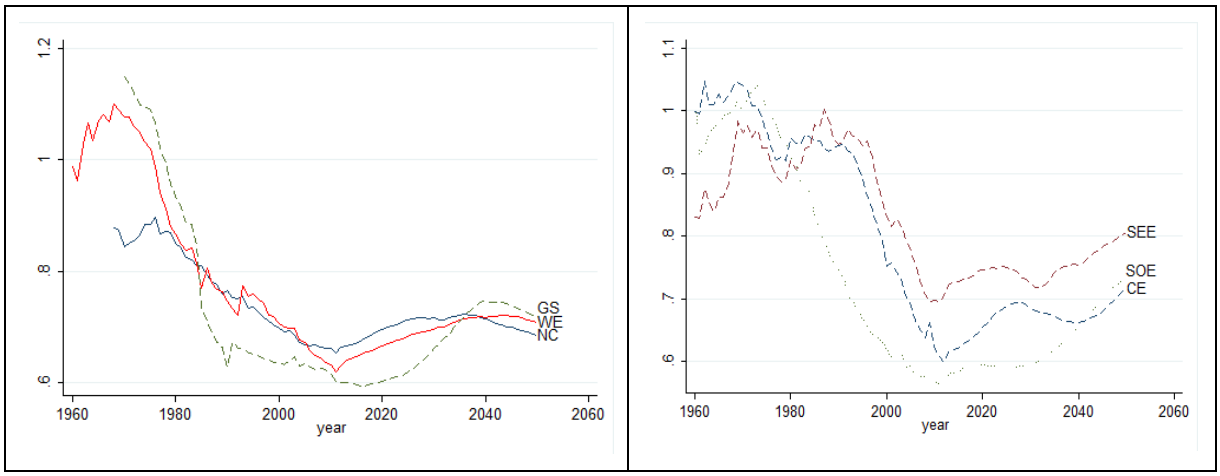



*Figure 8. Panel B: Total prospective old age dependency ratio (TPOADR), 1960-2050*



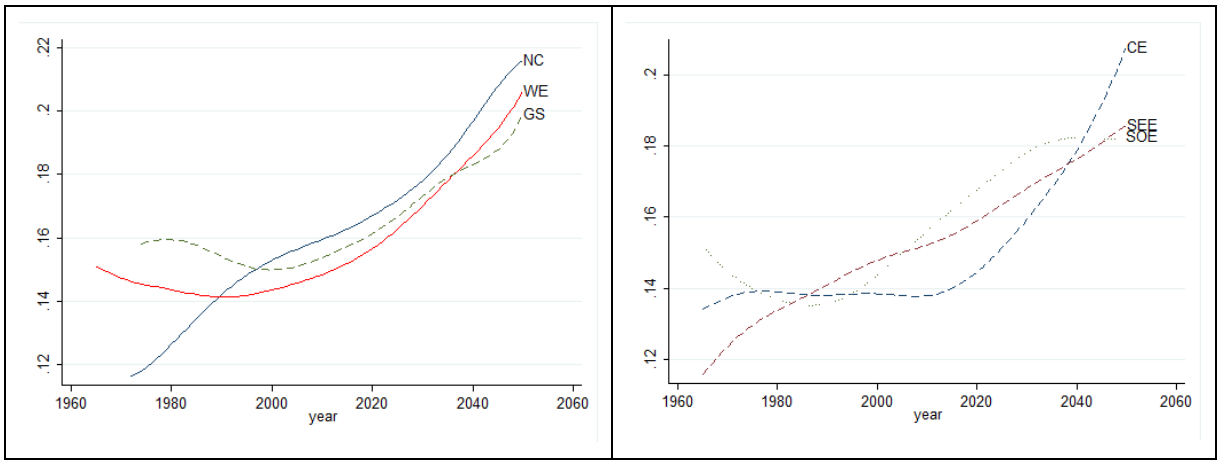

*Note*: The value for 2013 differs from the one in Figure 4 due to differences in remaining life expectancy at age 65.

*Source*: Own calculations based on EUROPOP2013 (see Eurostat, 2015).

[5] The population-weighted life expectancy at 65 years of age was 19.4 years for the EU28 in 2013. At 67 life expectancy is just below 18.

Returning to the age composition of the very old in Europe, Figure 9 depicts the PVOADR. While the prospective share of very old people will increase, the difference in comparison to Figure 5 is stark. Take as an example the German-speaking countries; their prospective very old share increases by one-third when measured prospectively, whereas it more than doubles when measured conventionally (see Figure 5).

*Figure 9. Prospective measure of the very old age dependency ratio (RLE<7 / RLE<19), 1960-2050*




*Source*: Own calculations based on EUROPOP2013 (see Eurostat, 2015).

## 4. Economic dependency ratios and longer working lives

The old-age dependency and the prospective old-age dependency ratios are indicative of society's potential to sustain its dependent population. They differ in how to distinguish between dependent and non-dependent people. There are, however, many dependent or non-labour market active people among the 20 to 64 year olds, as evidenced by labour market participation rates being well below one, in particular in older age groups in this age bracket. The economic dependency ratio (EDR) measures the number of labour market inactive individuals (irrespective of age) relative to the number of labour market active persons (irrespective of age). It gives a summary measure of how many extra people a working individual has to support. Formally, the EDR is defined as

$$EDR_t = \frac{Total\ Population - \sum_{agegroup} \#person\ agegroup * LMPR\ agegroup_t}{\sum_{agegroup} \#person\ agegroup * LMPR\ agegroup}.$$

Where LMPR is the labour market participation rate for the given age group.

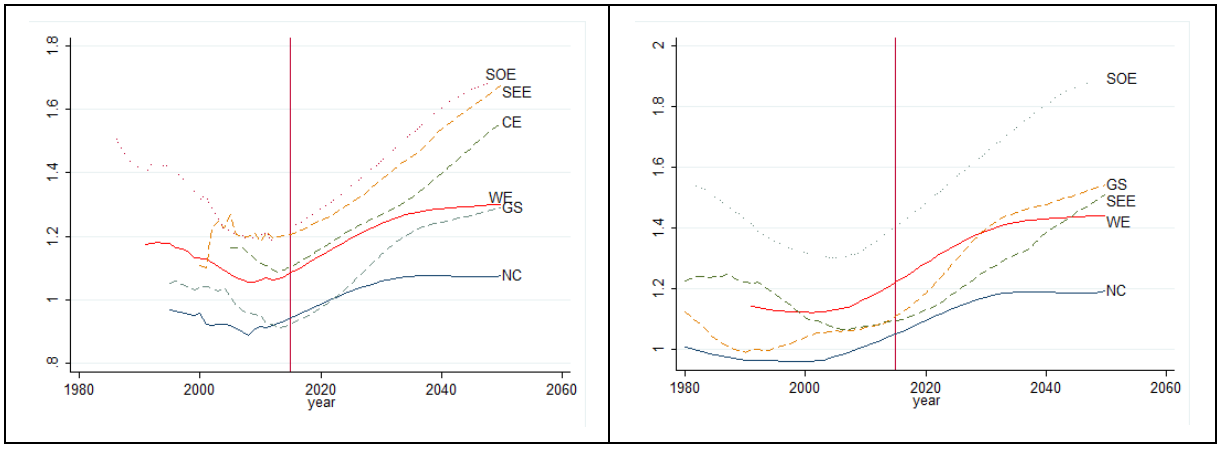
For most countries labour market participation rates are only available from the mid-1990s, which makes long historical comparisons infeasible.[6] The development in the EDRs to some extent resembles the OADR in Figure 4 for the projection period (left hand side, Figure 10). However, in the last two decades most countries have seen a decline in the EDR. In fact, for none of the six country regions will the EDR in 2020 be above its recent historical maximum. With unchanged labour market participation, however, EDRs will continue their recent increase and will in 2040-50 be substantially above any value observed since the mid-1990s. This also implies that although European societies have been ageing in the conventional old-

[6] Longer time series are available for some (western) European countries via the International Social Security project (see Milligan and Wise, 2015).

age dependency ratio sense for decades, the number of people supported by each person employed has actually gone down in the last 20 years. Figure 10 also reveals the differences within the EU28 in the level of economic dependency ratios. The EDR for the GS countries will not reach the current level of western European countries until after 2025.

Given the focus on extending working lives over the last two decades, it is also of interest to see how much of the recent fall in the EDR is due to favourable demographics and how much is due to increasing labour market participation rates. We do this by looking at the future EDRs from the viewpoint of labour force participation rates in the year 2000 (Figure 10, right hand side). Looking at the pre-projection period, the interesting thing to note is that most EDR curves are upward sloping from the year 2000. However, increases in labour force participation, in particular among 50 to 74 year olds, from 2000 and onwards changed the trajectory of the curves. The second main issue of interest is the level of the EDRs in 2050. Comparing the projected EDRs in 2050 between the LHS and RHS of Figure 10 tells us how far we have come since the year 2000 in addressing the challenge towards 2050. This suggests that even if the challenge to EDRs from population ageing looks impressive (Figure 10 LHS), in the last 15 years there has been much progress in addressing this by extending working lives.

*Figure 10. Economic dependency ratio, 1980-2050*




*Note*: The LHS graph shows the economic dependency ratios (EDRs) using historical labour force participation rates before 2013 and 2013 rates for the projection. The RHS graphs presents synthetic historical EDRs constructed with labour force participation rates from the year 2000. Data for Central Europe (CE) are not available for this. Excludes Luxembourg, Lithuania, Malta and Cyprus due to incomplete information on labour force participation for different age groups. For Bulgaria and Romania labour market participation rates are not available for the 70-74 years age group.

*Source*: Own calculations based on EUROPOP2013.

## 4.1 Education as a driver of future labour market participation rates

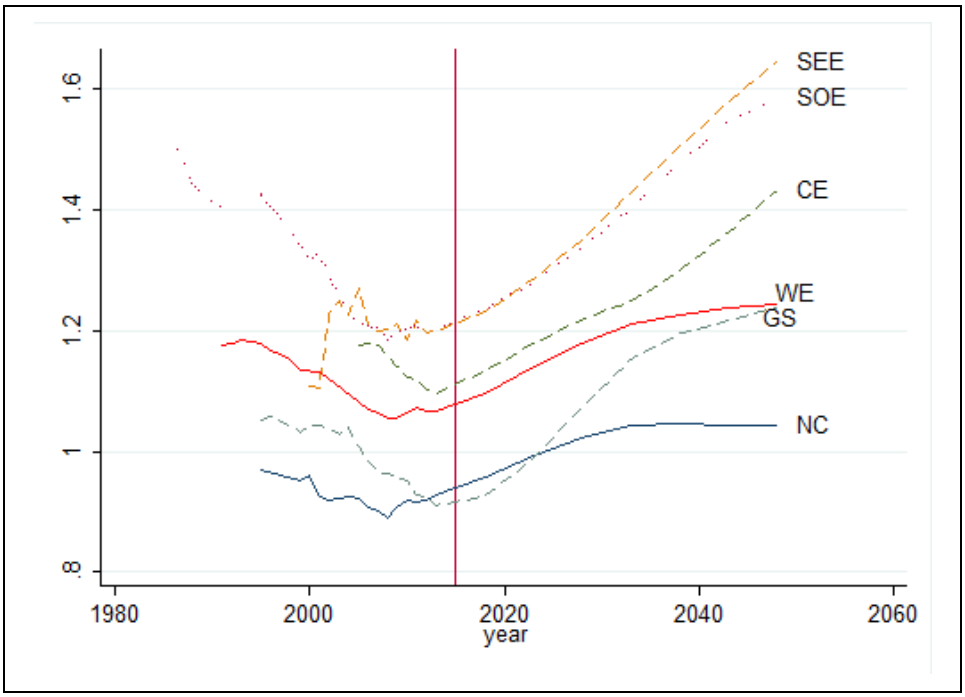
As populations age across Europe, extending working lives is one necessary policy prescription. An important question is therefore: to what extent can working lives be projected to increase in the future? Projecting labour market participation rates is beyond the scope of this study, however.[7] One important determinant of future labour market participation is the level of education of the future older cohorts. Better educated persons

[7] For more elaborate attempts to estimate future labour market participation, see Loichinger (2015) or Dolls et al. (2014).

tend to work longer. Older cohorts with higher levels of educational attainment should thus 'mechanically' extend working lives without additional changes to policies. Education has been an important driver of labour force participation of older age groups in the last two decades (Gros, 2015; Maestas and Zissimopoulos, 2010). Education can to some extent be forecasted by the current level of educational attainment in the younger population (see Annex A3). Since younger cohorts are better educated than older cohorts the future working age population will be better educated. The change in EDRs driven by this increase in labour market participation rates can be informally interpreted as a projection of future EDRs in the absence of institutional changes (e.g. changes in pension age and benefits systems). A straightforward way to make a simple projection of future education levels is to keep each cohort's level of educational attainment fixed at the present (2013) level. New cohorts enter with the same amount of education as today's young cohorts.[8] This procedure gives a conservative estimate for the future education level of new cohorts entering the labour market.

The important message arising from this simple model is that while better education in itself is likely to dampen the increase in the economic dependency ratio, it does not fundamentally change the problem faced by many countries (Figure 11 and Table 3). This is in line with the findings from more advanced modelling as in Loichinger (2015).

*Figure 11. Economic dependency ratio adjusting for increasing education levels, 1980-2050*




*Note*: Excludes Luxembourg, Lithuania, Malta, and Slovakia due to incomplete information on labour force participation for different age groups. For Bulgaria and Romania labour market participation rates are not available for the 70-74 year old age group.

Only for the Nordic countries (where the scale of the challenge is comparatively small) does accounting for educational change of the population make a relatively large difference (Table

[8] Specifically, we let labour market participation rates unchanged for the 15-29 year olds and update every new 30-34 year old cohort with the current level of educational attainment of 30-34 year olds.

3). For western European and German-speaking countries it reduces the increase in the EDR by around one-sixth, and this is approximately the same for central and southern European countries. In order to stabilise economic dependency ratios at the 2013 level there would be a need to extend working lives beyond what an educational upgrade of the labour force can deliver.

*Table 3. Increase in economic dependency ratios (EDRs) 2013-2050*

| Broad regions | Percentage change in the EDR from 2013 to 2050 with | | |
|---|---|---|---|
| | Constant age-specific 2013 labour market participation rates | Simple model of increasing education and labour market participation rates | Difference Pct.points |
| NC | 7 | 4 | 3 |
| WE | 30 | 24 | 6 |
| GS | 28 | 24 | 4 |
| SEE | 65 | 64 | 1 |
| SOE | 68 | 58 | 10 |
| CE | 53 | 43 | 10 |

*Note*: The results from south-east Europe (SEE) are influenced by a lack of data on labour market participation for different educational levels for 70-74 year olds and unusually high labour market participation at older ages for low levels of educational attainment.

*Source*: Own calculations based on EUROPOP2013 and Eurostat LFS Statistics.

## 4.2 Working for how much longer?

Solving the public finance challenges arising from population ageing will likely involve many remedies from different policy areas. In addition, uncertainties regarding the projection of many quantities – relating foremost to health and long-term care expenditures make precise long-term policy prescription difficult. The reason behind the focus on the economic dependency ratio is that, in a stylised world, keeping it constant would eliminate the need for further redistribution from workers to non-workers and at the same time allow the same relative consumption between workers and non-workers in place today.

We therefore turn to the estimated length of working life necessary to keep the economic dependency ratio constant for each of the six broad country groupings. This is done by increasing labour force participation for the age group of 60-74 year olds in 2050 so as to keep the EDR at the same level as in 2013. Naturally, effective longer working lives can be attained by each person working on average more in the early years of the working life; this includes getting more women into the labour force; something for which there is scope in the southern and central parts of Europe.

Table 4 presents the results. For all country groupings a substantial extension of working lives is necessary to keep the EDR constant. The labour force participation rate has to increase by a factor between 2 and 4, depending on the country. What is most striking about Table 4, however, is how similar the need for extending working lives is across country groups. The Nordic countries and western Europe require the smallest increase in the 60-74 year old labour market participation rate, but here the average length of a working life is already long. The German-speaking countries stand out with an already long working life but still have a substantial need to extend it, whereas the required remedy in the south,

south-east and central Europe does not differ much among these countries. These required changes are in line with (although at the upper end of) what was found in Barslund and Werder (2015) using National Transfer Accounts for a limited set of countries.

*Table 4. Necessary change in length of working lives to keep EDRs constant*

| Broad regions | Labour force participation rate | | | Average length of working life | |
|---|---|---|---|---|---|
| | 2013 | | 2050 | 2013 | Change to 2050 |
| | 55-59 Years | 60-74 year | 60-74 years | | |
| NC | 83.4 | 28.6 | 52.6 | 40.3 | 3.6 |
| WE | 73.5 | 19.4 | 52.3 | 37.3 | 4.9 |
| GS | 78.4 | 23.8 | 71.0 | 38.7 | 7.1 |
| SEE | 59.9 | 22.0 | 60.2 | 33.5 | 5.7 |
| SOE | 64.0 | 13.6 | 54.5 | 33.2 | 6.1 |
| CE | 64.8 | 13.1 | 52.5 | 33.9 | 5.9 |

*Source*: Own calculations based on EUROPOP2013 and Eurostat LFS Statistics.

We can get a feeling of the size of the required increases in the labour force participation rate by looking at changes from 2000 to 2013 (Table 5).

*Table 5. Changes in length for working lives for 50-74 and 60-74 year olds, 2000-14*

| Broad regions | Change in working life length | | |
|---|---|---|---|
| | 2000-2013 | | Additionally required, 2013-2050 |
| | 50-74 years | 60-74 years | 60-74 years |
| NC | 1.8 | 1.3 | 3.6 |
| WE | 2.3 | 1.1 | 4.9 |
| GS | 3.1 | 2.0 | 7.1 |
| SEE | -1.2 | -1.8 | 5.7 |
| SOE | 2.0 | 0.4 | 6.1 |
| CE | 1.6 | 0.2 | 5.9 |

*Source*: Own calculations based on EUROPOP2013 and Eurostat LFS Statistics.

## 5. Conclusion

We have employed a number of concepts and indicators to measure the ageing of European societies. To our knowledge, it is the first application of prospective measures to all 28 EU countries. Clearly measuring ageing prospectively does not change the basic facts of population ageing; those of falling fertility and decreasing mortality at older ages. Ageing and how to organise important societal institutions (most notably the labour market) to adjust to it, is a challenge for policy-makers, and this is clear from all indicators. The development in the total old-age dependency ratio, a conventional measure of ageing, also makes it clear that for most countries ageing only now really starts to bite if policies remain unchanged.

Prospective measures do emphasise that with the right adjustments of policies and institutions underpinning them, the process of ageing in European societies − even if it is a permanent feature for the foreseeable future − does not need to spell relative decline. Our stylised analysis of the economic dependency ratio shows that over the next 35 years (and probably for even longer) a significant extension of working lives will be necessary to sustain current relative per capita consumption. But it also reveals that demography is not destiny in terms of sustaining economic dependency ratios at current levels. Looking back at the historical development from 2000 to 2013 shows that, viewed from the year 2000, economic dependency ratios were set to increase. However, due to higher labour force participation rates among the 50-74 year olds especially, the economic dependency ratio actually declined in that period. The process of extending working lives will have to speed up towards 2050 in order to keep economic dependency ratios at current levels. Is that possible? Results from studies of current working capacity among 50-74 year olds suggests that it is, in particular if the horizon is 2050 and beyond (Barslund, 2015; Jousten and Lefèbvre, 2015; Milligan and Wise, 2015; Cutler et al., 2013). In fact, the discussion should not be so much about *if* but rather *how*. Putting the right policies in place to provide the right incentives for all people to work longer *and* at the same time ensure an acceptable standard of living for those who cannot will be the crucial social policy questions for the coming decades.

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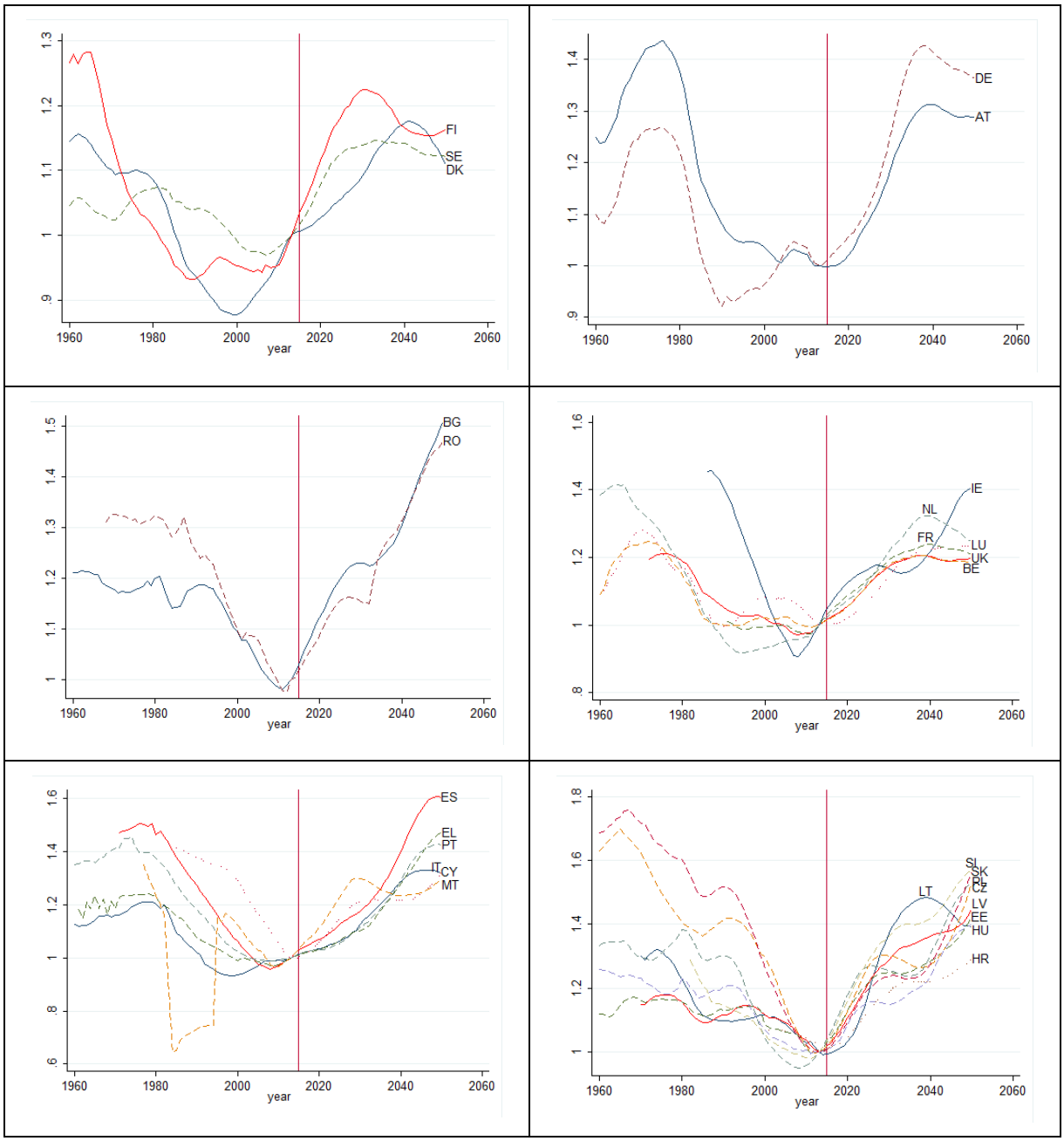
# Annex A

*Table A1. Old-age dependency rates for EU28 countries (1960-2050)*

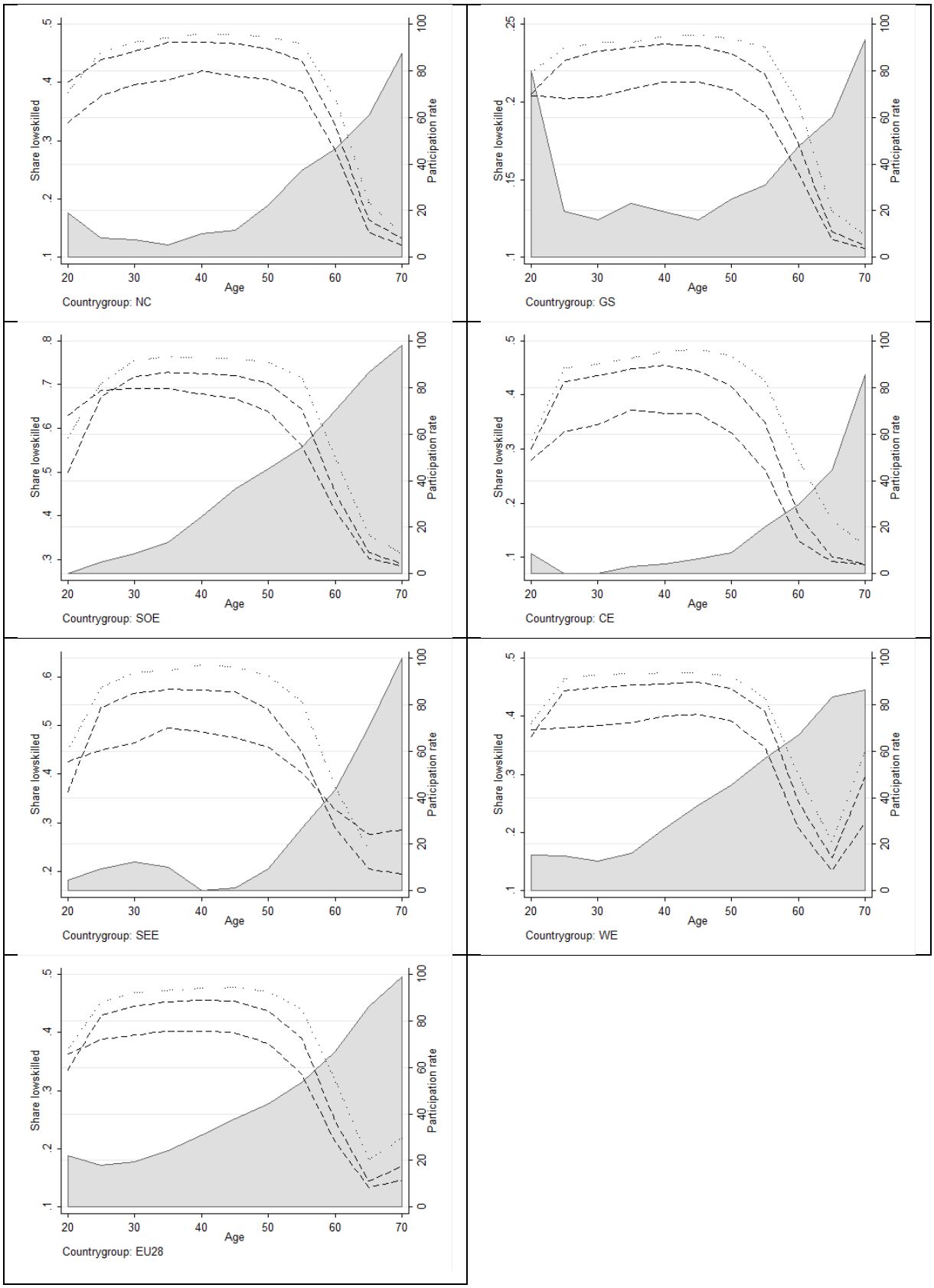

*Source*: Own calculations based on EUROPOP2013.

*Table A2. Normalised total dependency rates for EU28 countries (1960-2050) (2013=1)*




*Source*: Own calculations based on EUROPOP2013.

*Table A3. Labour force participation of educational achievement classes and net government transfers, % of 30-49 y/o transfers (LHS) for EU-28 countries*



**MOPACT is a four year project funded by the European Commission under the Seventh Framework Programme to provide the research and practical evidence upon which Europe can begin to make longevity an asset for social and economic development.**

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MOPACT starts from the conviction that Europe requires a new paradigm of ageing if it is to respond successfully to the challenges of demographic change. Ageing is currently understood as a time of decline, frailty and dependence and policy responses to it still reflect the historical era when retirement took place for a majority at state pension ages and post-retirement years were relatively short. Changes in the labour market and social behaviour coupled with a remarkable extension in longevity have transformed the experience of later life. The boundaries of frailty are being pushed back and, for a growing number of older Europeans, 70 is the new 50.

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- To conduct the most comprehensive review to date of the social and economic challenges of ageing
- To collect and analyse social innovations and policy initiatives
- To map the steps required to realise active ageing in Europe and to propose innovative ways of doing so
- To involve key end-users and stakeholders, such as policy-makers, practitioners, product producers, designers and older people in all project activities
- To undertake the wide and effective knowledge transfer and dissemination of the work of MOPACT

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- **Extending working lives**: Raising the employment of older workers, aided by lifelong learning
- **Pension systems, savings and financial education**: Ensuring pension adequacy and pension system sustainability
- **Health and well-being**: Driving healthy life expectancy and the social engagement of older people
- **Biogerontology**: Delaying the onset of frailty, dependence and age related diseases
- **Built and technological environment**: Shaping housing, mobility, transport and ICT to support an ageing population
- **Social support and long term care**: Matching supply and demand for long-term care and social support
- **Enhancing active citizenship**: Enhancing the political participation of senior citizens and improving the capacity for adapting to societal change

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