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The Impact of Future Demographic Trends in Europe, 2005–2050

MAREK KUPISZEWSKI[1], Director
JAKUB BIJAK[1], Senior Researcher
BEATA NOWOK[1,2], Associate, Ph.D. Student

[1]Central European Forum for Migration and Population Research (CEFMR), International Organization for Migration
[2] Netherlands Interdisciplinary Demographic Institute (NIDI)

Abstract

The objective of the paper is to examine the future of populations within the Council of Europe member states, identify the main trends and discuss their policy implications. The analysis focuses on the impact that future demographic trends will have on the following social domains: education, the labour market, health care and care of the elderly and social protection. The study aims to be policy-oriented and to provide an overview of future demographic trends for 2005–2050 in the Council of Europe member states, as well as presenting an analysis related to selected policies and an interpretation of these trends. The analysis of population dynamics in the coming 45 years is based on the United Nations population projection of 2005.

Keywords: Demographic trends, policy implications, Europe

Introduction and background

Demographic change is contemporarily a key policy issue, as it influences many areas of social and economic life. Of a special relevance are the problems related to population ageing, i.e., an increase in the proportion elderly people in the population. Being an immanent feature of developed societies in the contemporary world, including Europe, the ageing of the population is a process that will no doubt continue in the future. Another demographic issue of a growing importance and relevance to policymaking is that of international migration. Both these population processes have a significant impact on many aspects of life and in particular on labor markets, economic growth and social cohesion, primarily with regard to social inequalities.

For these reasons, it is of key importance to assess the most likely future development paths of demographic processes, together with a plausible 'error margin', for the purpose of policymaking and planning. This information is provided in a variety of

population projections and forecasts produced either by official statistical authorities and international organizations or by individual researchers. The outcomes of these projections and forecasts can provide an important input for the design of future policies, as well as for the resulting political decisions.

The purpose of this research is to contribute to the analysis and development of links between demographic projections on one hand, and socio-economic decision making in the member states of the Council of Europe on the other. The focus of the study is the impact of projected future population changes on various aspects of social and economic life, and the derivation of implications regarding relevant policies. Taking into account the advances in knowledge of demographic processes which have been made since the previous publication concerning this topic, prepared under the auspices of the Council of Europe (Cliquet 1993), there is a need for such a study.

The direction and magnitude of the impact of population change on labor markets, economic growth and social cohesion is, in many cases, unclear. There are, however, indications that population ageing in particular may have negative side effects on social, economic and political life, including most importantly (United Nations 2002):

- increasing public expenditure on pensions, social security and health services;
- a decreasing number of people of a working age (in the labor force) and an increase in the overall economic burden on the working population (intergenerational transfers);
- an increasing risk of a collapse of the pay-as-you-go components of pension systems;
- changing public health patterns and medical care requirements, due to the increasing number of elderly people, including those in the oldest-old age bracket (85 years or more);
- an increasing risk of intergenerational conflicts, due to changes in resource distribution and a growing pressure on providing ever more means for the elderly.

Although these issues have not yet become critical, certain policy measures need to be implemented as soon as possible, in order to prevent serious problems related to future population ageing. This is therefore an important policy challenge, touching many areas of life such as health care, the economy, social security systems and education and requiring changes in attitudes and practices towards the elderly and their role in the society (National Research Council 2001). With respect to the economy in particular, the relevant research is already ongoing in various fields, including such issues as labor markets (Johnson and Zimmermann 1992; Snel and Cremer 1994), productivity and innovativeness (Council… 1996), economic growth (Lindh and Malmberg 1999) and fiscal sustainability (Aaberge et al. 2004). In the case of Australia, a thorough overview of the problems related to ageing in various aspects of economic and social life, as

well as the possible policy implications, has been recently presented in a Productivity Commission publication (2005).

From the policy point of view, it is crucial to make reference to the outcome of the Expert Group Meeting on Policy Responses to Population Ageing and Population Decline, held by the United Nations Population Division in New York in 2000. The meeting followed directly upon the publication of the controversial United Nations (2000) report on 'replacement migration' as a hypothetical remedy to offset the negative effects of ageing. With respect to Europe, major contributions have been made from both a demographic (Lesthaeghe 2000) and a policy point of view (Fotakis 2000). Currently, it seems that there is no shortcut to policy, as there is no solely demographic 'solution' to population ageing which is feasible and the remedies for its negative outcomes need, primarily, to be sought elsewhere, among non-demographic policies (Coleman 2002). On the other hand, policy measures aimed at reducing the side effects of demographic change should, wherever possible, be considered as part of a wider set of policies aimed at dealing with the consequences of population ageing. Special attention should be paid to migration policies, which contemporarily constitute a very sensitive issue.

The current study therefore has the following aims:

- to provide an overview of future demographic trends in the Council of Europe member states for 2005–2050;
- to provide a policy-relevant analysis and interpretation of these trends.

The analysis focuses on the impact of future demographic trends on the following social domains: education, labor market, health care and care of the elderly and social protection. The entire study aims to be policy-oriented and to provide recommendations of feasible policy responses to the demographic changes on which it focuses. A thorough analysis of the possible policy outcomes is also offered, allowing for a detailed evaluation of the proposed solutions. In geographic terms, the analysis covers 42 of the Council of Europe's member states. Andorra, Liechtenstein, Monaco and San Marino have been not considered, due to the absence of statistical information in the United Nations (2005) report and related database.

In terms of structure, the next section of the study contains information on the source of the data. The third section presents an assessment of the projection assumptions, with a focus on their possible impact on the results of the study. The fourth section contains a quantitative analysis of trends in population size and sex and age structures, with a description and illustration of the main tendencies. The fifth section is devoted to a discussion of the possible impact of demographic change on various aspects of social development: education, labor market, health care and care of the

elderly and social protection. It also includes a qualitative analysis of possible policy outcomes, as well as an evaluation of feasible responses to the demographic change from a policy-oriented perspective. Final section contains a summary of the results and the main conclusions with respect to policy challenges and recommendations for the future, as well as suggestions for further studies in this field. Details on country-specific results are presented in a working paper by Kupiszewski, Bijak and Nowok (2006), constituting an unabridged version of the current paper and available on-line at www.cefmr.pan.pl.

Data issues

The entire study is based exclusively on the recently released medium variant of the United Nations (2005) population projections provided in the report *World Population Prospects: 2004 Revision*. The analysis, which is set out in 5-year intervals, covers the period 2005–2050. Unlike the recent Eurostat (2005) population projections, which encompass the 27 member and accession countries of the European Union, the UN source provides full geographic coverage of the Council of Europe member states. The advantages of using a single source are that the projections follow a common methodology which is used simultaneously for all the countries under study, thus ensuring both greater international comparability and consistency of the data used than there would be when using various sources for different countries.

The main disadvantages of relying solely on the United Nations (2005) projections are that: (1) the assumptions on which they are based are more general than in the case of the Eurostat projections; (2) they do not allow for a regional sub-division; and, (3) they are set out in 5-year age groups. The first issue is discussed more thoroughly in the next section, which is devoted to the projection assumptions. The second problem would pertain even if the Eurostat (2005) regional projections were used for the 27 EU member and accession countries for which they are available. For the majority of the remaining 15 countries no reliable sub-national projections exist, which would be a serious drawback to the analysis for the Russian Federation, Ukraine or Turkey, where a significant regional variation of the processes under study can be expected. Therefore, in this study we decided to carry out the analysis at the country level, despite the fact that we are perfectly well aware of the existence of large intra-national differences in the pace and shape of population ageing processes, especially in large countries.

The problem of disaggregating the 5-year age groups in order to estimate the size of the functional groups has been overcome by using the Karup-King interpolation of the 5-year groups into 1-year age groups (the methodology discussed, for example, in Shryock and Siegel 1971, 681–701). The functional age groups for which the future demographic trends are analyzed are as follows:

- the pre-school age group: 0–5 years;
- the school-age group: 6–18 years, distinguishing three levels: elementary (6–11), lower secondary (12–15), and upper secondary (16–18);
- the tertiary-education age group: 19–23 years;
- the working-age group: 24–64 years, distinguishing younger (24–34), middle-aged (35–44), and older (45–64) groups;
- the elderly population: 65 or more years, distinguishing the 65–79 year-old age group and the oldest-old population group (80+).

The division into functional age groups is more or less standard and follows general research practice; however, the brackets assumed do not fit the educational system and retirement legislation of every country. The creation of the *Tertiary-education age group* possibly requires some justification. Traditionally, this group belongs to the young working age population. However, the proliferation of tertiary education and the university sector's need to know the size of their potential clientele justifies the creation of a separate group.

To produce a greater transparency of results, the countries under study have been grouped into six larger clusters, taking into account their geographical, historical and cultural proximity. These clusters have been defined as follows:

- *Central Europe* (8 countries): the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic, and Slovenia.
- *The European and Trans-Caucasian part of the former Soviet Union* (FSU): 6 countries (excluding the three Baltic EU members included in the Central European cluster) – Armenia, Azerbaijan, Georgia, Moldova, the Russian Federation, and Ukraine.
- *Northern Europe* (7 countries): Denmark, Finland, Iceland, Ireland, Norway, Sweden, and the United Kingdom.
- *Southern Europe* (6 countries): Cyprus, Greece, Italy, Malta, Portugal, and Spain.
- *South-Eastern Europe* (8 countries): Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Former Yugoslav Republic of Macedonia (FYROM), Romania, Serbia and Montenegro, and Turkey.
- *Western Europe* (7 countries): Austria, Belgium, France, Germany, Luxembourg, the Netherlands, and Switzerland.

The Central Europe and FSU clusters, as well as the majority of the countries in the South-Eastern cluster (apart from Turkey), share a common political and economic history of communism or 'real socialism', at least for the period between World War II and the late 1980s. Conversely, the Northern, Western and Southern clusters comprise countries from the other side of the 'iron curtain'. The rationale of grouping Turkey together with the remaining, post-socialist South-Eastern countries is to obtain a cluster encompassing the newest EU Member States (since 2007), as well as all the current and (likely) future EU accession and candidate countries.

Discussion and criticism of the assumptions of the United Nations 2004 projections

In this section of the study we will examine and critically assess the assumptions made by the United Nations in their 2004 round of population projections. We used the documentation of the UN projections contained in *World Population Prospects. The 2004 Revision. Highlights* (United Nations, 2005) and data from the on-line database at www.unpopulation.org.

It is very difficult to assess the assumptions made by the UN demographers. Among the reasons for this is the lack of clarity as to what product it is that they offer. Conventionally, we classify the results of a run of population dynamics models into forecasts, projections and simulations. Projections extrapolate the trends observed in the past and tell us what the consequences are of keeping observed population trends intact for a certain period of time (Rogers 1975; Willekens and Rogers 1978). Ahlburg and Lutz (1998) have noted that unless there are arithmetical errors in the projection model, projection is always correct by definition. Forecasts tell us what the forecasters believe will happen with the population, in other words, what the most likely population change will be. Simulation is based on any assumptions regarding the evolution of components of population change which are fed into the population dynamics model, be they feasible or not (Kupiszewski 2002). If we adhere to this nomenclature, it becomes quite a challenge to establish what the UN actually offers. Given the function of the UN *World Population Prospects* in the international community and the frequent references which are made to it as a forecast (cf., for example, Keilman 1998 and Bongaarts 1997) and bearing in mind the fact that many forecasts are termed 'projections' in the literature, we have treated what the UN terms a 'prospect' or 'projection' as if it were a forecast. This assumption is justified by the title, "World Population Prospects", despite the fact that the word 'forecast' is not used once in the entire text of *World Population Prospects. The 2004 Revision. Highlights* (United Nations 2005). It is therefore justified to assess the plausibility of assumptions made by the UN demographers as if they were forecast assumptions.

In this study, the UN assumptions are examined from the point of view of their feasibility and compared with existing projections and forecasts prepared by national statistical institutions, and with two predictions for at least 25 countries: the official Eurostat projection from 2004 (epp.eurostat.cec.eu.int) and the recent Central European Forum for Migration Research forecast (Bijak 2004; Saczuk 2004; Bijak et al. 2004; 2005).

Assumptions on fertility change in the UN 2004 population projection

The key assumption adopted in the United Nations (2005) projection is that the total fertility rate will eventually converge at 1.85 in all countries. The UN demographers consider two cases, one for countries with an observed TFR in 2000–2005 of higher than 1.85 (in the case of the Council of Europe member states it refers to Albania, France, Iceland, Ireland and Turkey) and the second for those with a TFR of below this value. In the former case, based on the generalized historical experience of all countries, they assume a decrease in fertility until the TFR reaches the target value. If such a derived trajectory of change departs significantly from the observed patterns, it is modified for a period of several years, in order to avoid sharp discontinuities in trends. For countries which experienced a TFR of below 1.85, for the first 5–10 years, the trajectory of change would follow the trend; following this period, an increase by 0.07 child every 5 years is assumed, until the target level is reached. This means that some countries will not reach the target level within the 50 years covered by projection.

The assumptions made may be analyzed by two approaches. The first is as to how they compare with the assumptions made in other projections and, if there are any significant differences, how these are justified. The other approach is to examine the justification of assumptions.

Let us start with the latter, that is, with an insight into the justification of assumptions made. The key question which has not been really answered by the UN is as to why the world-wide convergence of the TFR should occur at all. In fact, it is difficult to offer any rationale behind such changes. There is no doubt that a reduction in fertility encompassing the entire world and, in consequence, a certain reduction of the span between highest and lowest observed levels of fertility can be observed, but nothing can really justify a hypothesis based on full convergence, especially given that the countries with higher levels of fertility are experiencing a relatively modest decrease. Much more reasonable would be an assumption of convergence of fertility in clusters of countries, constructed according to certain criteria, as practiced in the population projections and forecasts of the European Union and CEFMR. In consequence we may expect that the UN projection overestimates fertility in low fertility countries, mostly the southern and eastern member states of the European Union and Slavonic post-Soviet states. At the same time, the UN projection underestimates fertility in Northern Europe and in southern post-Soviet countries and Turkey, which have so far experienced relatively high fertility. This suggestion is in line with the comparison of assumptions made by other forecasters, namely national statistical institutes, Eurostat and CEFMR.

The UN projections on the target total fertility rate are higher by 46%, 42% and 36% for Poland, Cyprus and Romania and Germany respectively than are assumed by national forecasters. For Iceland and Turkey, they represent 90% and 88% respectively

of the levels assumed by the national forecasters. Furthermore, assumptions made by Eurostat for the EuroPop 2004-based projections for countries such as Italy or Spain are lower by 1/3 in comparison to those of the UN projection. The reader should be therefore aware of the fact that the UN projection uses somewhat simplified and aggregated assumptions concerning fertility, in many cases elevated in comparison to the assumptions made in other projections and forecasts.

It should, however, be noted that the low variant of the UN (2005) forecast assumes a convergence of the TFR to 1.35, which seems to be a more realistic value, although the notion of a pan-European convergence of fertility patterns is still questionable.

Assumptions on mortality change in the UN 2004 population projection

Future changes in mortality are expressed by the UN forecasters in terms of life expectancy at birth for males and females. The methodology used is described very briefly as follows: "Mortality is projected on the basis of models of change of life expectancy produced by the United Nations Population Division. These models produce smaller gains the higher the life expectancy already reached. The selection of a model for each country is based on recent trends in life expectancy by sex." (United Nations 2005, 22). Importantly, the impact of the HIV/AIDS pandemics in the 60 most affected countries is explicitly taken into account. This is a major and much appreciated development in population forecasting.

Among the Council of Europe member states, the target life expectancy at birth in 2050 has been reduced by 3.2 and 2.6 years in the Russian Federation and Ukraine respectively as a result of AIDS-related deaths. It should be noted here that the UN have assumed that both the rate of recruitment of individuals to high risk groups and the infection rate will decrease substantially. Simultaneously, the increased use of antiretroviral drugs will increase the life expectancy of those infected with HIV.

The differences between the values assumed by the UN and those assumed by national forecasters and other institutes are not large. In most cases, they do not exceed 5%, the exceptions being Turkey and Greece for males and Turkey and Slovenia for females, both of which have a difference of between 5 and 6%. The UN assumptions are generally less optimistic than those made by other forecasters, which may prove detrimental to the quality of the results, given that in most ex-post assessment of forecasts, the forecasters were shown to have underestimated the mortality change. However, the stipulation that gains in life expectancy are dependant on the expectancy level can be questioned. There is no evidence of a correlation between levels of mortality and rates of mortality improvement (see e.g. Vaupel et al. 1998).

Assumptions on international migration in the UN 2004 population projection

The assumptions on international migration given in the UN projection are very short: "The future path of international migration is set on the basis of past international migration estimates and an assessment of the policy stance of countries with regard to future international migration flows." (United Nations 2005, 22). However, based on the data published on assumed migration gains and losses, it is surprising to see that, in the majority of cases, from 2005–2010 international migration is set to be constant. Even more surprising are the dramatic changes shown for 2000–2005 and 2005–2010: for example migration in Spain will supposedly drop from 405 thousand to 120 thousand. The permanent negative net migration for Poland may also be questioned. The net migration gain for Europe in the decade 1990–2000 is estimated to be 1139 thousand, dropping in the decade 2000–2010 to 937 thousand and in the decade 2040–2050 to 699 thousand (United Nations 2005, 19). These changes are small in terms of the scale of the continent.

Moreover, if constant absolute numbers of net migration smaller than zero are assumed, as, for example in the South-Eastern Europe and FSU countries, this leads to an artificial acceleration of the depopulation process, given negative population growth. In our view, in such cases it would be better to specify the assumptions in terms of migration rates (intensities) rather than crude numbers. Of course, we are perfectly well aware that the UN projections are made on a global scale and that the zero migration balance world-wide needs to hold, which is much more straightforward if assumptions are made in terms of numbers, rather than rates.

Concluding remarks

Users of the results of the UN population projection should be aware of the simplification and unrealistically high assumptions regarding fertility, leading, in general, to an overestimation of birth numbers, in comparison with other projections and forecasts. Mortality is slightly higher than assumed in other studies. The fixed net international migration is rather unrealistic and the defining of assumptions in absolute numbers may generate high errors for small countries with a high net migration. It may be suggested that the UN projections will generate more numerous and younger populations in comparison with what may realistically be expected and is predicted by other specialists. However, population forecasting is an uncertain business and, as Keilman (1998) concludes, the ex-post errors of earlier revisions of UN projections fall within a reasonable range and are often generated by discontinuities in trends, for which demographers have yet to find a satisfactory solution.

Trends in the future population size by sex and functional age groups

In the concluding remarks of the previous section we noted that the UN projection is over-optimistic regarding the numbers and structure of future European populations. We believe that the actual population will be less numerous and older which should be taken into account when considering the analysis in the remaining part of the paper. This section contains a quantitative analysis of trends in population size and structure in the 42 Council of Europe member states under study. The analysis describes and illustrates the main tendencies in terms of various dependency ratios, as well as proportions of the functional age groups in total populations. The discussion covers the clusters of countries defined in the previous section and is followed by the identification of countries displaying certain specific characteristics (e.g., extreme or outlying values within regard to some of the parameters). The latter information provides insights into the identification of certain problems related to demographic change which may be especially visible in some countries or regions.

The dependency ratios used in this study are defined in the following way:

- *Old-Age Dependency Ratio* (ODR): the ratio of the size of population aged 65 years or more to the size of population in the broadly-understood 'productive age' range (15–64 years), multiplied by 100% for the transparency of presentation;
- *Oldest-Old-Age Dependency Ratio* (OODR): the size of population aged 80 or more, divided by the 'productive age' population size, multiplied by 100%.
- *Young-Age Dependency Ratio* (YDR): the ratio of the size of the youngest population (under 15 years) to the size of population in the 'productive age' group, multiplied by 100%;
- *Total Dependency Ratio* (TDR): the sum of the Old-Age Dependency Ratio and the Young-Age Dependency Ratio, TDR = ODR + YDR.

The definitions of dependency rates are not linked directly to the functional age groups, in order to maintain comparability with other studies.

Future population changes in Europe – a global picture

In all of the 42 countries under study, the total population size is envisaged as declining from 808 million in 2005 to 763 million in 2050, i.e., by 6% over the 45-year period covered by the study. The short-term increase expected for 2005–2014 is a result of the previous positive population momentum. However, during the first half of the 21st century, this will come to an end throughout Europe and not only in the most developed countries of the former EU-15 (cf. Lutz et al. 2003). The sex ratio is expected to remain relatively stable, with the proportion of males in the total population maintaining a level of approximately 48.3%.

Despite the fact that the overall population decline is far from dramatic, the expected depopulation in some countries will be staggering and substantial changes are envisaged in the population age structure, reflecting the further advancement of the population ageing process as indicated by the dynamics of the three dependency ratios. Although the YDR is expected to stabilize at around 25 percent, the ODR is envisaged as more than doubling, from 22% in 2005 to 45% in 2050. In particular, the OODR with regard to population aged over 80 years will treble, rising from 5% to 15% in the same period. These changes will result in an increase of the total dependency ratio from 47% to 71%, meaning that the overall demographic burden of the population outside the productive age which will be placed on the population aged between 15–64 years will increase by a factor of 1.5.

With respect to the absolute sizes of population within the different functional age groups, the most notable decline, averaging 27%, is to be observed for all age groups between 12 and 44 years, encompassing secondary and tertiary level students, as well as younger and middle-aged workers. A slightly smaller decline, averaging 13%, is envisaged for children aged 0–11. The absolute size of the population of older workers, aged 45–64 years, will scarcely change in the coming 45 years, showing a slight decline of 3%. In contrast, the population of older age groups will increase: by 41% for the population within the 65–79 age group , and by 155% (thus, by a factor of 2.5) in the case of the oldest-old. Changes in absolute sizes and the relative proportion of particular functional groups of the total population are presented in Table 1.

Table 1. Changes in the size of the functional age groups, 2005–2050 in all 42 countries according to medium variant of the UN population projection, 2004 revision.

Age Group	2005		2020		2035		2050		Change
	thousands	share %	thousands	share %	thousands	share %	thousands	share %	2005 = 100
0–5	53 300	6.6	50 795	6.3	47 212	6.0	46 574	6.1	87.4
6–11	55 318	6.8	52 677	6.5	48 129	6.1	47 518	6.2	85.9
12–15	41 398	5.1	35 796	4.4	33 193	4.2	31 806	4.2	76.8
16–18	34 594	4.3	26 941	3.3	25 677	3.2	23 948	3.1	69.2
19–23	58 744	7.3	45 487	5.6	44 155	5.6	40 586	5.3	69.1
24–34	128 872	15.9	117 356	14.5	100 252	12.6	94 073	12.3	73.0
35–44	119 989	14.8	115 157	14.2	96 056	12.1	90 211	11.8	75.2
45–64	195 955	24.2	222 383	27.5	217 714	27.4	189 672	24.8	96.8
65–79	93 834	11.6	105 842	13.1	131 326	16.6	132 269	17.3	141.0
80+	26 093	3.2	37 259	4.6	49 580	6.2	66 643	8.7	255.4

Source: Own computations based on the United Nations (2005) projections

Future population changes in particular clusters of countries

In the *Central European* cluster, a sharp decline in the population size, from the initial 73 million in 2005 to 60 million in 2050, is expected, representing a decrease of 18% in the period analyzed. Notably, this decrease is envisaged for the entire period under study. The sex ratio will fluctuate slightly, with the share of males oscillating around the level of 48.1%.

An additional feature of this substantial decline is the rapid advancement of the population ageing process. The YDR will fluctuate between 20 and 23 percent, as a result of the varying proliferation of generations which was the legacy of the two World Wars and the post-war baby booms of the 20th century. Within the 2005–2050 period, the ODR will almost treble, increasing from 19% to 53%. Even faster growth dynamics will be demonstrated by the OODR, which, starting from the initial 4%, will have reached 15% by the end of the period under study, The overall demographic burden of the population outside the productive age which will be placed on the population aged between 15–64 years, as measured by the TDR, will increase by a factor of 1.8, from 42% to 76%.

The absolute sizes of almost all but the two oldest functional age groups (i.e., 65–79 and 80+ years of age) will decrease over the period under study. The expected decline is most dramatic in secondary and tertiary level students, as well as in younger workers, having an average of almost a half. The 65–79 year age group will display an increase of 62% on its size in 2005, while the increase in the oldest-old will be 147%.

In the projections for the *FSU* members of the Council of Europe, even more dramatic population changes can be observed. Over the period of 2005–2050, the overall population size is expected to decline continuously, from 210 million to 157 million people, over one quarter in total. This is partly due to permanent negative net migration which will be experienced in all countries within the region except Russia. The share of males is expected to oscillate in the range of 45.7–46.4%, which is much lower than in the remaining clusters and Europe in its entirety. This is a consequence of the current sex structure, as well as of the assumption of a pertaining mortality disadvantage in males. It is worth noting that, similar to the South-Eastern Europe the FSU region is dominated by a single country, in this case the Russian Federation, which contains 68% of the cluster's total population.

The aggregate indicators reveal that the overall demographic burden on the productive-age population (TDR) in the FSU cluster is expected to increase by more than a half, from 42 to 66 percent over the period under study. This is mainly a result of the doubling of the ODR, from 20% to 40% (and a more than trebled OODR, from 3 to 10 percent). At the same time, for the YDR a slight fluctuation is envisaged, resulting

in a slight increase from 23% in 2005 to 26% in 2050. Again, this can be attributed to the demographic consequences of the history of the post-Soviet region and, especially, to World War II, which dramatically distorted the population pyramids of countries in this part of Europe. With respect to the functional age groups, the only increase envisaged is in the elderly population (by 13% for people aged 65–79 and by 109% for the oldest-old), and the most dramatic decline, of almost one half on average, will be with regard to secondary and tertiary level students and younger workers.

The *Northern European* cluster is an example of a projected steady population increase, from 88 million people in 2005 to 100 million in 2050, representing a total of 13% across the period under study. The sex ratio is expected to be relatively stable, with the share of males oscillating around the average European level of slightly over 49%.

Due to relatively high levels of fertility, not only in the initial stages, but also throughout the projection period, with an assumed total fertility rate (TFR) of over 1.7, changes in population structures in the Northern cluster are expected to be less dramatic than elsewhere in Europe. In this case, population ageing will be driven more by an increasing life expectancy than by a rapidly shrinking base to the population pyramid due to very low fertility. This is reflected by the dynamics of the dependency ratios, which demonstrate a stable YDR of about 27% throughout the projection period, with the ODR increasing from 24% to 40% (within which, the OODR more than doubles from 7% to 15%). Together, these will result in the growth of the TDR from 51% in 2005 to 67% in 2050.

It is worth noting that the increase of the overall demographic burden on the productive-age population is not all that rapid in comparison to other clusters, due to the aforementioned reasons, as well as to the fact that population ageing in Northern Europe was already relatively advanced already in 2005. Moreover, the dynamics of the ODR and TDR are expected to decrease over time, with a stabilization of the values of both indicators envisaged 2035 onwards. This is most likely a result of constant fertility and a constant immigration volume. It supports the findings of Pollard (1973) and Espenshade et al. (1982), who showed that in a population with below-replacement fertility, constant immigration leads to a stationary population with a stable age structure.

Interestingly, for almost all functional groups under the age of 64, with the exception of middle-aged workers aged 35–44 years, the changes, both positive and negative, are not expected to be substantial, falling within the ±10% band in relation to their values in 2005. Only in the case of population groups aged 65–79 and 80 or more, the increase is expected to be substantial; 48% in the former case and 129% in the latter. Apart from the these exceptions, the relative proportions of functional age groups within the total population will not change significantly.

The *Southern European* cluster is an example of the very high dynamics in the population ageing process expected for the period 2005–2050, despite rather moderate changes in the overall population size (a decline of 6% from 124 to 117 million people and a stable sex structure (with around 48.8% of males)). Concerning the aggregate measures of the demographic burden, Southern Europe can be considered as the 'leader of ageing' from among the clusters of Council of Europe member states. Between 2005 and 2050, all dependency ratios are expected to increase, the YDR from 21 to 24 percent, and the ODR from 27 to 65 percent and including an unprecedented OODR growth from 7% to 25%. This dynamic will result in an increase of the total dependency ratio from 48% in 2005 to 91% in 2005 and thus from a situation in which each person outside the working age 'depends' on two people aged 15–64, to one where the ratio is very close to 1:1. In Southern Europe, the average ODR, OODR and TDR values at the end of the projection period are the highest among all the clusters under study, and significantly higher than the respective all-European averages.

With respect to the absolute sizes of population in particular functional age groups, the most notable decline, of 43%, is observed in younger workers (24–34 years, for middle-aged workers (35–44 years) the decline will be one of 35% and for students at tertiary education age (19–24 years), 27%. In general, an absolute decline will, to a greater or lesser extent, affect all age groups, apart from the two oldest, consisting of people aged 65 years or more. In the latter case, the population size is expected to increase, by 42% for the 65–79 age group, and by 171% for the oldest-old.

In *South-Eastern Europe*, the projected total population size is expected to increase by 14%, from 127 to 147 million in the period 2005–2050, with a slight decline only being marked from 2043. The percentage of males will decrease from 49.8% to 49.2%, thus shifting towards the all-European average. The population growth, however, does not imply a slowing down of the ageing process. The tendencies observed for the dependency ratios are clear; despite the decline of the YDR from 36% to 27% in the period under study, the ODR is expected to more than double, from 14% to 32%. At the same time the dependency ratio of the oldest-old is going to increase from 2% to 7%. The dynamics of the total dependency ratio, showing a decline from 50% in 2005 to about 46% in the period 2015–2020 and a subsequent increase to 58% by the end of the period under study, indicate strong changes in the age structure of the South-Eastern European population, the majority of which (58%) in 2005 is comprised of the population of Turkey.

The figures given above indicate that the South-Eastern population is presently still very young (with high initial YDR values), and that the ageing process, although also inevitable, is expected to progress towards the Western European pattern but with a time delay. This conclusion is supported by an analysis of the population change within

particular functional age groups. The population aged between 0 and 23 years, comprised of children and students at all levels of education, will shrink by around 20% in the period 2005–2050. A slightly smaller decline is envisaged for younger workers (by 14%), while the remaining groups will grow in terms of both absolute values and proportions of the total population; the middle-aged workers' group by 7%, the older workers by 51%, those aged 65–79 by 121%, and the oldest-old by almost 300%.

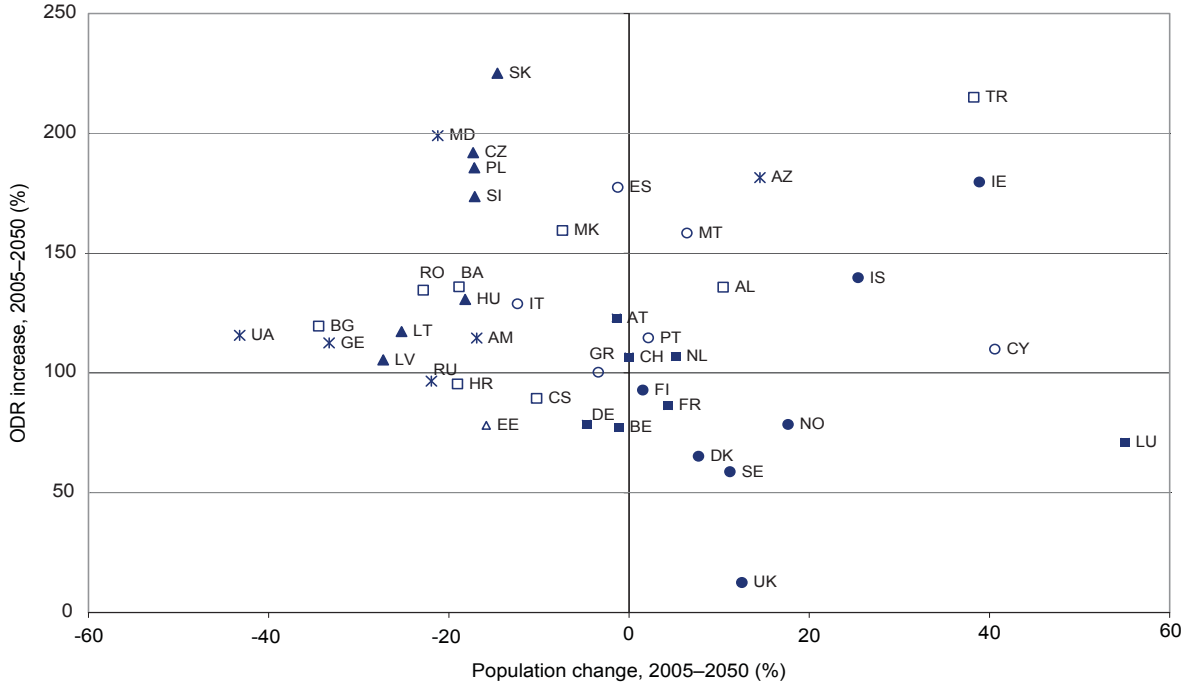
In *Western Europe*, the total population size will barely change over the projection period; following a slight increase from 186 million in 2005 to 190 million in 2028, a further decline to the level of 185 million in 2050 is envisaged. The proportion of males in the total population is expected to decline slightly, from 48.9% to 48.6%.

Despite the minimal changes in the overall population size, substantial shifts are envisaged in the population structure by age, reflecting further advancement of the population ageing process, as shown by the dynamics of the three dependency ratios. Although the YDR is expected to increase only slightly, from 24 to 27 percent, the ODR is envisaged as almost doubling, from 26% in 2005 to 48% in 2050. At the same time, the OODR regarding population aged 80 years or more will grow from 7 to 20 percent. These changes will result in an increase of the total dependency ratio by a factor of almost 1.5, from 51% to 75%. It is worth noting that, similar to the case of the Northern Europe cluster, a stabilisation of the ODR and TDR values is envisaged from the year 2035 onwards, after a period of increase at a declining pace.

Again, absolute population sizes of the functional age groups below the age of 64 years are expected to decline in the period 2005–2050, most significantly (by 30%) in the case of middle-aged workers (35–44 years). As in all the other clusters, the population of the older age groups will increase; in this cluster, by 25% for the 65–79 year-old age group, and by 158% for the oldest-old.

Future population changes: some specific issues

The cluster-based overview presented in the previous subsection does not provide an insight into the within-group heterogeneity of particular clusters. It appears that, although the clusters to some extent follow common patterns of population change, there are some country-level outliers. The illustration presented in Figure 1, shows countries on a two-dimensional chart, with the overall dynamics of population change in the period 2005–2050 shown on the horizontal axis, and the dynamics of population ageing, as approximated by the ODR increase, on the vertical one. Countries are marked with their 2-letter ISO codes.



Clusters: □ - South-Eastern, x - FSU, ▲ - Central, ● - Northern, ○ - Southern, ■ - Western.
Source: Own computations based on the United Nations (2005) projections

Figure 1. Population change and ODR growth (%), 2005–2050 in the member states of the Council of Europe according to medium variant of the UN population projection, 2004 revision.

From Figure 1, it can be seen that, in terms of expected population growth, Luxembourg is a clear outlier in relation to the rest of Western Europe , which is otherwise relatively homogenous. The same applies to Azerbaijan, Ireland and Turkey with regard to both indicators shown. The former is the only country in the FSU cluster with a projected positive population growth. In Central Europe, despite high homogeneity in relation to the overall (negative) population change, the dispersion of the dynamics of ageing is quite high; the same dispersion applies to Northern Europe, but in relation to positive population growth. In general, the very high values of the ODR dynamics indices concern countries with relatively young population structures at the beginning of the projection period (e.g., in the Slovak and Czech Republics, Turkey, Moldova, Poland, Azerbaijan, Ireland, Spain and Slovenia). On the other hand, the ODR for the United Kingdom is expected to increase only slightly, which is unique among the countries under study.

Changes to the various dependency ratios in all 42 countries are illustrated in Figures 2(a) and (b), with the former giving the initial situation in 2005 and the latter showing the outcome of the population ageing process in 2050. With respect to the overall demographic burden on the section of the population at the productive age, as measured by the TDR, in 2005 the dispersion of this indicator is very low, with the values varying from 40% for Moldova to 54% for Albania. The latter country, however, together with Turkey and Azerbaijan, are examples of very young populations, with extremely low (for European standards) ODR and OODR

values. For this reason, these countries are at the lowest end on the TDR scale projected for 2050, with values for this indicator of less than 60%. On the highest end, there are two 'leaders' of population ageing in Europe; Italy and Spain, both of which are characterized by TDR values of over 90%, and also by very high ODR and OODR indicators.

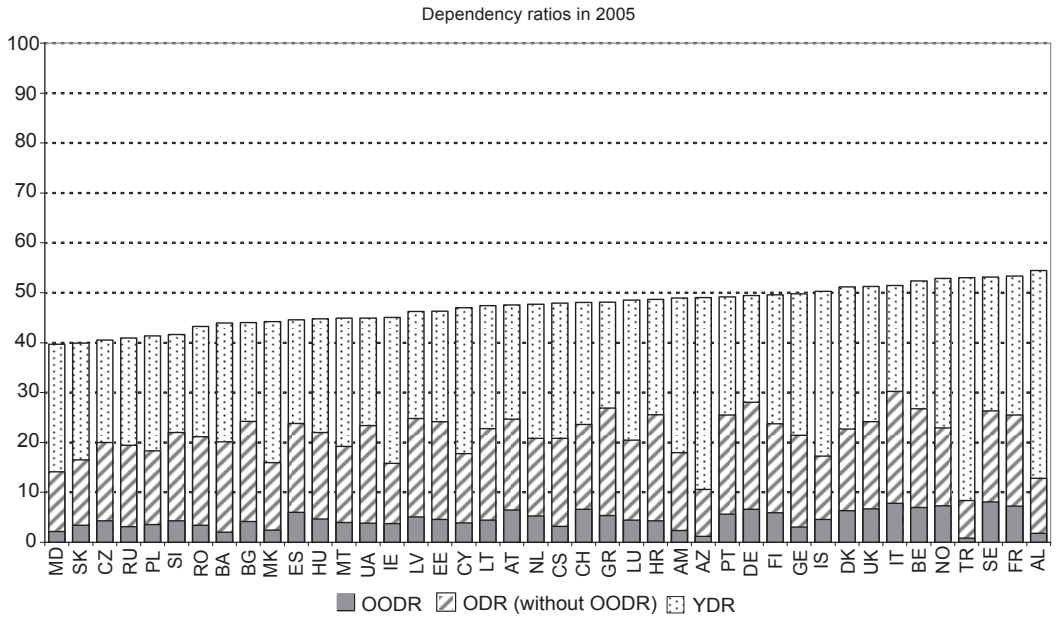


Figure 2(a). Proportions of particular dependency ratios in country-specific TDRs, 2005 according to medium variant of the UN population projection, 2004 revision.

Note: Countries are ranked by increasing total dependency ratios (TDR = total height of the bars).
Source: Own computations based on the United Nations (2005) projections.

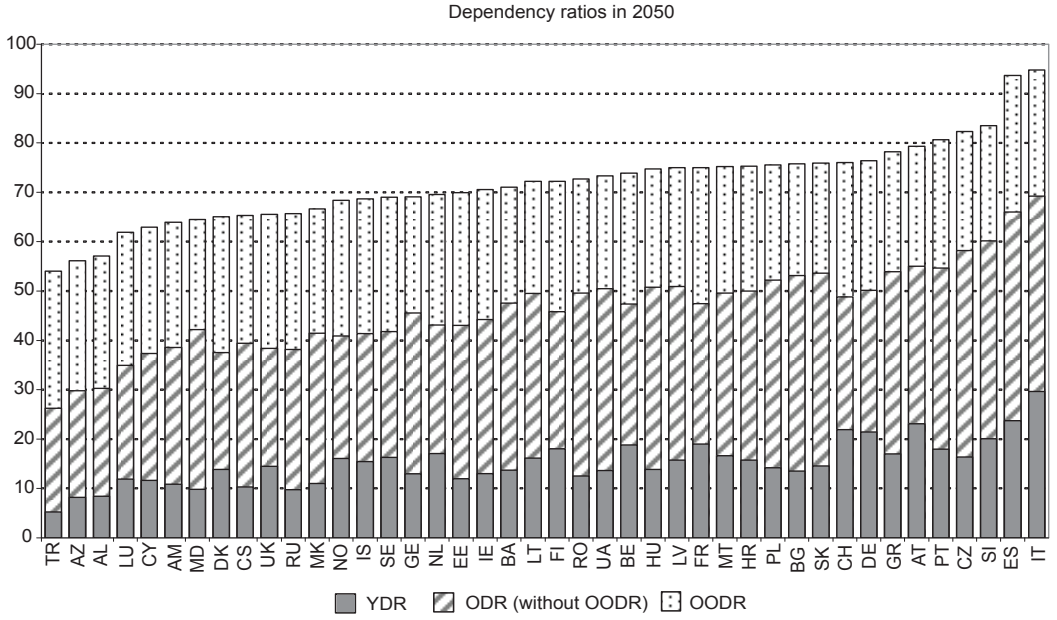


Figure 2(b). Proportions of particular dependency ratios in country-specific TDRs, 2050 according to medium variant of the UN population projection, 2004 revision.

Note: Countries are ranked by increasing total dependency ratios (TDR = total height of the bars).
Source: Own computations based on the United Nations (2005) projections

The oldest-old dependency ratio projected for 2050 for Italy is close to 30%, which is much higher than for any of the other countries and, in particular than those from the lower end of the scale, such as Turkey, with an OODR of about 5%. From Figures 2(a) and (b) it can be seen that, according to the United Nations (2005) projections, not only will the dependency ratios (the TDR, the ODR and the OODR) increase all over Europe, but also that the differences between particular countries with respect to these indicators will be greater in 2050 than they were in 2005.

High heterogeneity also concerns the dynamics of particular functional age groups, which are crucial for long-term public policy planning in such areas as care for children and the elderly, or for education, as well as from the point of view of labor markets and so forth. The country-specific indices of change for the whole period are shown in Table 2, with both secondary-school age groups (12–18 years) shown together, as are the three working age groups (24–64 years). With respect to children aged 0–5 years, an increase in their numbers between 2005 and 2050 is expected only for Luxembourg, Cyprus, Sweden, the United Kingdom, Denmark, Switzerland, Malta and Norway.

In general, only in Luxembourg, the UK, Ireland and some of the Scandinavian countries is an increase in the population at the school age expected for almost all levels of education (primary, secondary and tertiary). In all the other countries, a decline in the pre-working age population is envisaged, most significantly within some of the FSU and South-Eastern European countries, particularly Ukraine, Georgia, Moldova, Bulgaria and Romania, followed by the countries of Central Europe. This indicates that, across most of the continent, the demand for child-care and education facilities will be shrinking.

With respect to the working age population (24–64 years), which can be viewed as the potential labor force, apart from the aforementioned Western and Northern European countries, an increase over the coming 45 years is also projected for the three countries with initially young population structures, i.e. Turkey, Azerbaijan and Albania. In contrast, a steep decline in the working-age population is envisaged for the remaining post-socialist countries. The 65–79 year-old age group is expected to increase almost universally, with the exception of Ukraine, where a decline of 10.5% is predicted. All over Europe, an increase in the numbers of the oldest-old is expected; this will occur most slowly (by under 100% over the period under study) in Ukraine, Bulgaria, Latvia and Estonia, and most quickly in the youngest countries of Albania (by 411%), Azerbaijan (by 679%) and Turkey (by 736%). These figures demonstrate what the increase in the demand for care for the elderly will be up to 2050.

Table 2. Changes in the absolute sizes of particular functional groups, 2005–2050 (%) according to medium variant of the UN population projection, 2004 revision.

Country	Pre-school (0–5)	Primary education (6–11)	Secondary education (12–18)	Tertiary education (19–23)	Productive age (24–64)	Elderly (65–79)	Oldest-old (80+)
Albania	–25.1	–30.7	–37.1	–29.7	23.8	115.2	411.1
Armenia	–23.6	–38.9	–59.4	–59.5	–11.0	33.5	245.8
Austria	–5.2	–15.1	–23.5	–21.7	–18.4	42.2	190.3
Azerbaijan	–11.0	–26.2	–43.2	–34.3	28.0	150.5	678.5
Belgium	–7.4	–10.7	–13.7	–11.0	–13.7	25.2	134.1
Bosnia and Herzegovina	–23.9	–36.6	–43.2	–44.9	–28.6	27.2	377.4
Bulgaria	–36.1	–35.8	–53.3	–58.3	–43.8	6.4	70.6
Croatia	–15.7	–27.1	–35.5	–41.5	–29.7	10.9	148.1
Cyprus	25.7	10.0	–4.0	–2.6	34.4	134.2	269.6
Czech Republic	–17.2	–23.7	–41.8	–44.8	–34.7	70.4	142.0
Denmark	–2.4	–7.0	4.5	24.5	–4.9	42.7	117.3
Estonia	–8.0	–5.6	–39.6	–46.2	–22.3	14.6	88.1
Finland	–2.7	–11.8	–14.5	–11.1	–11.8	37.3	169.6
France	–12.9	–8.1	–8.7	–11.7	–8.0	42.6	140.0
Georgia	–43.9	–50.9	–62.5	–60.2	–34.9	5.1	150.0
Germany	10.2	–4.7	–16.0	–15.2	–19.8	7.7	162.9
Greece	–4.8	–8.5	–16.2	–31.8	–18.4	37.5	153.7
Hungary	–21.6	–29.4	–38.4	–38.6	–30.9	44.2	101.5
Iceland	–5.2	–10.6	–11.3	–1.3	16.6	128.0	277.8
Ireland	–2.8	14.5	4.6	–14.8	24.5	205.2	313.1
Italy	–18.9	–16.8	–18.2	–23.7	–33.5	20.0	159.8
Latvia	–23.6	–27.6	–56.2	–58.8	–34.1	8.0	86.4
Lithuania	–24.5	–43.1	–60.0	–56.6	–29.9	16.4	131.7
Luxembourg	37.5	34.5	44.0	57.2	39.7	106.0	271.4
Malta	2.9	–16.0	–26.1	–24.0	–7.8	97.6	241.7
Moldova	–29.5	–43.1	–60.9	–62.5	–23.5	80.4	204.7
The Netherlands	–10.3	–9.9	–5.9	3.3	–10.0	53.2	197.4
Norway	2.3	–5.1	0.8	17.2	5.7	69.2	137.6
Poland	–22.6	–33.7	–49.1	–56.7	–27.8	72.6	164.7
Portugal	–11.1	–6.3	–4.5	–20.7	–15.8	56.4	166.9
Romania	–30.5	–31.9	–49.9	–52.6	–31.5	33.8	134.6
Russian Federation	–16.5	–7.1	–40.8	–52.1	–28.9	15.8	108.2
Serbia and Montenegro	–20.7	–23.0	–30.9	–34.9	–16.2	32.9	156.3
Slovakia	–25.0	–36.8	–49.6	–53.5	–27.0	103.6	188.5
Slovenia	–21.1	–24.9	–39.1	–48.0	–33.8	45.7	196.7
Spain	–10.4	5.5	–4.9	–32.3	–26.7	74.9	192.5
Sweden	12.0	3.8	–11.7	6.1	1.0	40.6	103.8
Switzerland	5.2	–10.4	–13.3	–5.8	–17.3	32.9	178.4
The FYROM	–20.2	–29.5	–39.2	–40.0	–14.5	81.2	267.6
Turkey	–16.7	–14.5	–6.9	–4.8	51.6	286.3	736.0
Ukraine	–41.7	–48.6	–65.6	–68.0	–48.5	–10.5	68.1
UK	10.3	0.3	–5.5	5.5	3.4	40.7	122.3

Source: Own computations based on the United Nations (2005) projections.

Demographic change and development: results and policy implications

The projected population changes in the Council of Europe countries, as shown in Table 3. are very far from homogenous. Some countries are expected to experience a substantial increase in their population; in Luxembourg by 55%, in Cyprus by 41%, in Ireland by 40%, and in Turkey by 38%, in Albania, Azerbaijan and in Northern Europe the increases will be between 10 and 25%. The countries in which a population decrease is expected are all Slavonic countries and almost all of them are former so-called socialist countries (the two categories partially overlap). Some of these countries will experience staggering changes, with Ukraine dropping to 57% of its original population, Bulgaria to 66%, Georgia to 67%, and Latvia, Lithuania, Moldova, Romania and Russia to between 70 and 80%. It is very difficult to generalize with regard to the patterns observed. One may speak of the post-Soviet area of decreasing population, of the Northern European area of population growth, of a mixed picture in the South, with affluent South-European countries experiencing population loss, Turkey and Albania gaining, and a generally stable population size in Western Europe. In terms of policy implications, the curbing of population decline may be a priority for some countries, especially those with a very high projected depopulation, such as Ukraine and Bulgaria, or characterized by such specifics as unusual overmortality in males, as in Russia. In response to the changing situation, the majority of governments in Central, South-Eastern and Eastern Europe have concluded that the population growth, as recorded at the turn of the century, was not satisfactory and have thus decided to pursue population policies aiming at the increase of population growth rates; in other European states the aim has been to maintain the status quo and not to intervene (Zoubanov, 2000). On the other hand, there are numerous non-governmental organizations, such as World Population Awareness and World Overpopulation Awareness (www.overpopulation.org), World Population Balance (www.worldpopulationbalance.org) or the German Foundation for World Population (DSW) (www.dsw-online.de) to name but a few, all of whom are advocating the need for population reduction on environmental grounds.

It is necessary to be aware of the fact that the Medium variant of the UN (2005) forecast is very optimistic as far as European countries are concerned, due to the unrealistically high assumptions on future fertility. In the low variant, with a target TFR level equalling 1.35, depopulation would be much more widespread in Europe. In this variant, only the populations of Cyprus, Iceland, Ireland, Luxembourg, Norway and Turkey would increase; those of the remaining countries would all decline. It should be also noted that among the countries with growing populations, only Turkey is considered to be a large country. As all the other countries would experience depopulation, the European population would decrease by 30% between 2005 and 2050.

Table 3. Population change over the period 2005–2050 according to medium variant of the UN population projection, 2004 revision.

Country	Population change (2005=100)	Country	Population change (2005=100)
Albania	110.5	Latvia	72.7
Armenia	83.1	Lithuania	74.8
Austria	98.6	Luxembourg	155.1
Azerbaijan	114.5	Malta	106.5
Belgium	98.9	Moldova	78.7
Bosnia and Herzegovina	81.1	Netherlands	105.2
Bulgaria	65.6	Norway	117.6
Croatia	81.0	Poland	82.8
Cyprus	140.6	Portugal	102.2
Czech Republic	82.7	Romania	77.2
Denmark	107.7	Russia	78.0
Estonia	84.1	Serbia and Montenegro	89.7
Finland	101.5	Slovakia	85.4
France	104.3	Slovenia	82.9
Georgia	66.7	Spain	98.8
Germany	95.3	Sweden	111.2
Greece	96.6	Switzerland	100.0
Hungary	81.8	The FYROM	92.6
Iceland	125.4	Turkey	138.3
Ireland	138.9	Ukraine	56.8
Italy	87.6	United Kingdom	112.5

Source: Own computations based on the United Nations (2005) projections

However, as projected by the UN, the most important feature of the dynamics of population in the coming half century will be the process of ageing. Commonly, ageing is defined as the increase in the proportion of the elderly population within the total population. Either because of this definition, or due to much more significant changes occurring at the top of age pyramid, or both, researchers usually focus on the process of the increase in the elderly population, quite often ignoring the consequences of declining young populations, which frequently represents another aspect of ageing.

It is expected that over time we will face a profound decline in the population size of all young functional groups: pre-school, primary education, secondary education and tertiary education. Even a very superficial inspection of Table 2 shows clearly that, given the UN projection becomes a fact, these changes will be very significant and almost universal.

The only country in which the UN expects there to be an increase in the number of the young in all relevant functional age groups, between the period 2005 and 2050 is Luxembourg. In addition the projected gains are astonishingly high, between 34% for the primary education age group and 57% in the tertiary education age group. This unique pattern of population development in Europe is mostly generated by assumed high net migration gains and an overall projected increase in population size from 465 thousand in 2005 to 721 thousand in 2050. Some other countries, namely Norway, Sweden and the UK will experience moderate increases in three out of four younger functional age groups, and Cyprus, Denmark and Ireland in two. In terms of social and economical consequences these increases should be fairly easily accommodated as, with the exception of Luxembourg and, to lesser extent, Cyprus, they are moderate and occur relatively slowly. There is no doubt that Luxembourg will have to adjust to the increase in its young population by building nurseries, kindergartens and schools of all types and by expanding its tertiary education capacity; however, the more general problem presented is that of coping with a 55% increase in the population over 45 years.

At the other end of the spectrum of changes in young populations are countries in which the numbers are expected to fall. The vast majority of countries, 31 out of 42, fall into this category; however, in some cases, the predicted changes are alarming. By 2050, the young population in Georgia will have decreased to less than half of its size in 2005. A far-reaching decrease is also expected in other countries of the former Soviet Union, namely, Armenia, Latvia, Lithuania, Moldova and Ukraine. In all these countries at least two out of four functional age groups will decrease by more than half. Bulgaria also belongs to this group. In general, the largest reduction will affect the secondary and tertiary education age groups.

Changes in the two oldest age groups, that is, the elderly (65–79) and the oldest-old (80+) are even more dramatic. The only country in which a decrease in the elderly population and a no more than moderate increase in oldest old population is envisaged is Ukraine. This is due to a dramatic decline in the total population, arising from an assumed annual population loss of 100 thousand due to migration and a very high mortality rate in the working age population, which prevents substantial ageing (Kupiszewski and Kupiszewska 1999). Bulgaria, Estonia and Latvia may also expect a relatively modest increase in the number of elderly people. At the other end of the spectrum are Turkey, Azerbaijan, Albania, Bosnia and Herzegovina and Ireland, with an expected increase in the oldest old age group ranging from 736% to 313%. Turkey and Ireland are the only two countries in which the elderly population is expected to rise by more than 200%. This age group will also more than double in Albania, Azerbaijan, Cyprus, Iceland, Luxembourg and Slovakia.

The demographic consequences of these changes are quite obvious. On the one hand, a rapid shrinking of the cohorts entering the procreative age in the second half of the

21st century will result in a further decline and ageing of the population after 2050. On the other hand, we will face ageing, both in terms of the proportion of elderly to the total population and in the absolute numbers of elderly, at the scale unprecedented in human history. The list of ageing-related policy issues which must be addressed is long indeed: the restructuring of health and social services, an increasing demand for labor in certain service sectors and a decrease in demand in others, a decrease in fiscal income and changes to its structure, coupled with increasing budget expenditure, the restructuring and possible decline of savings, changes to and a possible drop in productivity, reduction in the educational sector, changes in the demand for goods and the consequent restructuring of production, a decrease in the pool of potential soldiers and the attendant need to reformulate defence strategies, the increasing role of immigrants in ageing societies and the potential problems relating to their integration, the depopulation of certain regions, particularly those which are rural and remote, and the need to reshape the delivery of services and distribution systems. The list is endless. Below, we offer a more detailed discussion of selected issues and problems.

There is no doubt whatsoever that the coming decades will test the efficiency of population policies to the limit. These policies may be roughly divided into two groups; policies aiming at the reversal or, more probably, the slowing down of unwanted changes and reactive policies, aimed at cushioning the consequences of unavoidable changes. Both types of policy have been disputed widely (United Nations 2002; Grant et al. 2004; Macura et al. 2005), below we therefore attempt not only to reiterate the main issues and arguments, but also to venture into less thoroughly debated areas. We begin with a discussion of the policies aimed at slowing down those changes which are considered unfavorable.

From the demographic point of view, the ageing process can be slowed down in two ways: by increasing immigration and by increasing fertility. It has been clearly shown by the United Nations (2000) in terms of the world, and Bijak et al. (2005), in terms of Europe, that the increase in immigration needed to maintain certain population parameters (for example ODR or the parameters characterizing the labor force), referred to as 'replacement migration'[1], is an infeasible option, due to the immense numbers of immigrants needed and as a result of the fact that immigrants quickly adopt the demographic patterns of the host societies, thus soon giving rise to the need for additional migrants to counter the ageing of both the indigenous population and the previous wave of immigrants. Bijak et al. (2005) have estimated that, in order to maintain the unchanged ODR in each of the 27 European Union countries, the total number of migrants needed in these countries from the outside would be 827.8 million by 2052, well above any reasonable absorption capacity of Europe in the coming fifty years. The issue of 'replacement migration' has been widely debated. *Population and*

[1] A term "compensatory migration" proposed by Korcelli (2003) seems to better picture the nature of the measure of demographic imbalance.

Environment: A Journal of Interdisciplinary Studies (2001) devoted a special issue to the problem. Coleman (2000, 2002) has been one of its most vocal critics, noting, among other points, that the cultural changes induced by migration of such a magnitude as that stipulated in the UN report would completely change both the social fabric and the cultural and ethnic composition of the receiving societies, leading to true replacement migration. Saczuk (2003) provided a multidimensional critical analysis of the concept of 'replacement migration', summarizing the debate.

One of the important points raised by many of the discussants was that, from the social and political points of view, it would be more feasible to increase fertility. However, we are not aware of any attempt to estimate what level would be needed in order to avert ageing in a reasonably short period of time. It might be expected that it would need to be much higher than the replacement level, which gives rise to the question as to what policy measures could stimulate such increase, when even replacement-level fertility is out of reach of all but a very few European countries.

Initially, attempts at the explanation of the decline in fertility originated predominantly in economic factors. The decline in fertility in developed countries has been explained in many ways. Easterlin's hypothesis (1968, 1975) suggested that fertility is explained by the relation of a cohort's income compared to the income of the cohort's parents, and, in consequence, to the relative size of the cohorts, which determines the relative change in living standards. Another theoretical approach, developed by a pioneer in family economics, Becker (1991), stems from the neo-classical economic theory approach in family studies, which perceives the demand for children being treated as akin to the demand for goods and services. Becker explains the drop in fertility in developed countries by the increasing 'opportunity costs' of having children. The socio-demographic explanation of fertility decrease, referred to as the second demographic transition, was proposed by Lesthaeghe and van de Kaa (Lesthaeghe, van de Kaa 1986, van de Kaa 1987). This theoretical framework stresses the role played in the changes to the demographic patterns, in particular to that of fertility-related behavior, by changes to the values and norms in modern society, such as increasing individualism, rejection of institutional control and the need for self-fulfillment. Okólski (2004) suggested that the crisis in the institution of the traditional family that followed the modernization processes in developed countries can be seen as one of the major factors underlying the decline in fertility.

The key question is as to what policies should be implemented to increase fertility in the European Union countries. Common wisdom says that an increase in the protection of family and, in particular, of females, increased social transfers to families with children, various family and child benefits, tax breaks, the development of various family- and child-orientated social services and so forth should suffice to solve the problem. However, it is common knowledge that pronatalist policies are inefficient

(Caldwell et al. 2002). Economic theory suggests alternative answers. If we expand maternity-related benefits, which should have a clear pronatalist effect, the cost of taxation and therefore of labor would increase, resulting in a worsening of a country's economic situation, which is usually considered to be an antinatalist phenomenon. Increased protection of pregnant women and young mothers on the labor market, which, in theory should have a strong pronatalist effect, results in a declining willingness on the part of entrepreneurs to employ women, thus proving to be a strong antinatalist factor. The measurement of the actual effectiveness of social transfers with regard to fertility is difficult. In their review paper, Caldwell et al. (2002) refer to a number of attempts at such measurement, but they noted that it is rather difficult to arrive at decisive conclusions; massive social transfers, amounting to around 10% of the government budget, resulted in a significant increase in fertility in Central Europe in the 1960s and 1970s, as did massive transfers in Sweden in the 1980s. However, smaller transfers and less coherent policies have usually generated dubious effects.

Palomba (2003) and Hantrais (2005) indicate the importance of reconciling employment and family life as a significant factor influencing fertility. Gornick et al. (1996) noted that in highly developed countries, such as Belgium, Denmark, Finland, France and Sweden, the pursuit of pronatalist policies through a variety of benefits and the protection of women on the labor market has lead to positive results, whilst retaining mothers on the labor market at the same time. The ability to retain a job or to be able to transfer to another job removes a major factor in the reduction of fertility; the fear of poverty or relative poverty which prevails among young couples. On the other hand, in the Anglo-Saxon countries, which, in comparison to continental Europe, are not particularly generous as far as protection of mothers on the labor market is concerned, the fertility level has been reasonably high.

If we take the theory of second demographic transition, which links fertility decrease to changes in social values and beliefs seriously, an attractive direction for state policy to take would be to work towards a modification of attitudes and values in young generations. A return to previous values does not seem to be feasible, but the development of more equal parental responsibilities, as has occurred in the Scandinavian countries, may be an efficient tool for the increase of fertility.

To summarize this very brief consideration of the issue, it is difficult to decide if pronatalist policies are effective and which policies should be pursued. It is quite likely that large-scale, expensive and long-lasting social transfers will be difficult to maintain in the future, as competing needs, especially those of the oldest generations, will limit such transfers. Availability of family support services, such as kindergartens, as well as a transformation of attitudes might be another option, less expensive and offering good value for money. The advocating and support of maternity-friendly employers

and a reduction in the burden maternity places on employers, increasing the chances for mothers to either retain their jobs or be re-employed after pregnancy may result in an increased readiness among couples to have children. However, no radical change in fertility should be expected; a return to replacement level fertility in Europe does not seem to be likely. Therefore the shrinking and ageing of the population and ageing will be the dominant demographic feature of the coming half of a century.

Some of the numerous issues linked to, and policies aimed at cushioning the consequences of unavoidable demographic changes are discussed below. An important and much debated question is the sustainability of pay-as-you-go retirement systems. A simple model describes the relation between the inflow of cash to the pool and the outflow to the retired:

$$r \cdot P_{ea} \cdot LF_{ea} \cdot W_{ea} = P_r \cdot (1 - LF_r) \cdot P,$$

where:

P_{ea} – population at the age of economic activity;
LF_{ea} – labor force participation rate for the population at the age of economic activity;
W_{ea} – average wage for the population at the age of economic activity;
r – contribution rate;
P_r – retirement age population;
LF_r – labor force participation rate for the retirement age population;
P – average pension.

Rewriting the above equation we obtain:

$$r = P_r/P_{ea} \cdot (1 - LF_r)/LF_{ea} \cdot P/W_{ea}.$$

This simple relationship shows clearly that ageing (the increase to the P_r/P_{ea} term) may be compensated for in three ways: by increasing the contribution rate r, by decreasing the pension-to-wage rate P/W_{ea} or by increasing labor force participation $LF_{ea}/(1 - LF_r)$. An increase in the contribution rate and a decrease in the substitution (pension-to-wage) rate are political decisions. In general, the former is not an option as it means an increase in the cost of labor, leading to a rise in unemployment and to enterprises being priced out of the market, which, in many cases, then leads to bankruptcies. Schnapp and Kostorz (2002) indicate that in Germany there will be a need to increase the contribution paid to maintain retirement benefits from the current 19.1% to 30.0% of the gross income by 2040. Decreasing the substitution rate bears important social implications, such as the worsening of the situation in many households, possibly leading to poverty. Moreover, it would be very difficult to win acceptance for this solution in those countries which cherish the idea of the state being responsible

for the well-being of its citizens, known as the European social model. A thorough overview of retirement policies has been offered by Kotowska (2003).

Bijak et al. (2005) have shown that from the point of view of labor market sustainability, a promising solution would be to increase the level of labor force participation. Based on Saczuk's (2004) assumptions of a universal increase in labor force participation rates, especially in the youngest and the oldest age groups, Bijak et al. (2005) estimated that the number of 'replacement migrants' needed to maintain certain demographic and labor market parameters would decrease very substantially and, in some countries studied, to socially acceptable levels. This suggests that policies aimed at an increase in labor force participation rates may be effective in curbing the consequences of demographic imbalances. They would also help, though not necessarily save, the pay-as-you-go retirement systems. Kotowska (2003) presents a wide spectrum of policies which should be implemented to improve the existing situation and minimize future threats through an increase in labor force participation on the part of the elderly population, ranging from anti-discrimination policies, through removing economic incentives for earlier retirement, to incentives for employers to retain older and possibly less efficient labor.

Demographic imbalances are not the only issue at stake. Various aspects of labor market imbalances are also important and maintaining the pay-as-you-go pension system is not the only reason to be interested in this aspect of population change. Imbalances on the labor market could have another important adverse effect, leading to the lack of labor needed to maintain the growth or, at the very least, the stability of economy. At least two issues should be taken into account here; the question as to whether an older labor force will maintain the productivity of a younger one and the matter of whether there will or will not be a lack of labor due to decreasing cohorts at the age of economic activity. The debate on the link between productivity and ageing has not proved conclusive. Skirbekk (2003, 19) states "An important cause of these age-related productivity declines is likely to be reductions in cognitive abilities across the life span. Some abilities, such as perceptual speed, show relatively large decrements from a young age, while others, like verbal abilities, show only small changes throughout the working life. Although older individuals have longer experience, they learn at a slower pace and have reductions in their memory and reasoning abilities. In particular are senior workers likely to have difficulties in adjusting to new ways of working." This short quotation encapsulates the complex debate, at the core of which is the assessment of whether, and to what degree, the speed with which cognitive abilities decrease in the ageing process may be offset by the higher level of human capital, experience or knowledge of procedures, the value of which is dependent on the occupation. The situation is further complicated by possible changes on the labor market in the future. Kryńska (2005) noted that it is very likely that future labor markets may have a very

different form; some jobs will disappear, atypical forms of employment, such as part time employment, job share or teleworking will proliferate. Given the massive ageing of the labor population, especially in some countries, it is almost inevitable that a certain drop in productivity will occur. The evolving age composition of the labor force will require a modification of attitudes towards elderly workers; companies need to start to value older employees and to adapt their mode of operations to the changing demographic environment. Balancing all these factors, especially over the long range perspective of half a century, is quite difficult; nevertheless the policy imperative is quite clear in that societies must adapt to an ageing labor force and to the strong likelihood of economic decline in the future. The importance of sustained economic growth for the financing of health care services will be demonstrated in the discussion which now follows.

The issue of the impact of ageing on the services sector, notably the health service, the social security services and education is also of great importance. Basically, there are two aspects to the change in demand. The first is the question of whether there will be a need for additional resources in order to provide more health and care for the ageing population. Schoenmaeckers (2005) noted that governments must prepare for massive investment in the construction and maintenance of retirement homes and in staff training. The second is the issue of whether there will be a growing discrepancy in the demand and supply of labor in the medical and care sectors, which, in all likelihood, will lead to a brain drain in these professions.

The first effect of the decreasing proportion of young people and the increasing proportion of old people will be the need to restructure hospital wards focusing on various specializations. Many wards will have to undergo a transition from paediatric to geriatric and other specializations dealing with the diseases prevalent in old age, such as Alzheimer's disease, cancer or osteoporosis. This will also require the re-training of personnel, the refurbishment of hospitals and, in some cases, the equipping of wards with new diagnostic and therapeutic equipment. As the ageing process will occur gradually, it is quite likely that there will be only a limited pressure on fiscal institutions to provide additional funds. In all probability, a more important factor will be a general sustained increase in the cost of medical procedures, linked to technological and pharmacological developments. Another question is whether there will be an increase in the demand for health services. The rising numbers of elderly people would suggest that this will happen. Much of the existing debate revolves around the question as to what extend the health and care cost of ageing may be offset by healthier elderly populations. A study by Manton and Gu (2001) has demonstrated that in the USA, age-standardized rates of disability fell by 0.56% per year between 1994 and 1999 and at a slower pace in preceding years. Lutz and Scherbov (2005) have shown that an increase in disability-free life of 2 years per decade will result, by 2050, in around

the same number of disabled in the EU-15 as was observed in 2000. This simulation suggests that investment in health prevention may be a very sensible option as it both reduces direct health care expenditure and improves the quality of life of the elderly.

Changes in the cost of health care are another enigma. Richardson and Robertson (1999) ran a set of simulations for Australia, trying to assess what, if any, the cost increase would be, and what other factors would either increase or offset the costs. The key finding of their study is that the evolution of the age structure is not the most important factor in the change of health service costs calculated as a percentage of the GDP. First, they tested the effect of a changing population age structure, given an unchanged population and GDP size, taking into account Fuchs' (1984) hypothesis stating that the number of years to death rather than a number of years from birth is the decisive factor in the cost of medical care. They found that, given a fixed cost of health services for a fixed number of population with a projected age distribution, the simulation resulted in an increase in the cost of health services from 8.4% of the GDP in 1995 to 11.8% in 2051. However, for a projected population increase (in terms of both size and age structure) and a reasonable increase in the GDP of 2.1% p.a., the costs would drop to 5.3% of the GDP. Removing the assumption of a fixed health service cost and replacing it with a cost increase in accordance with observed past trends results in a rise in health expenditure of 19.2%, given a 2.1% increase in the GDP. However, a rise in the GDP of 3.6% per annum would reduce the cost in 2051 to slightly below the level observed in 1995. The Australian researchers' simulations clearly show that it is not population ageing, but the cost of health care and the development of the economy which determine the significance of expenditure on health within the overall budget. Morgan and Hurley (2002) indicate the cost of pharmaceuticals and diagnostics as two main factors which may push the cost of medical care up. This view is seconded by Schoenmaeckers (2005), who noted that the cost of medicines is an important factor impacting on the cost of health services. Höhn (2000) noted that in Germany the attitudes of patients and doctors constitute a significant factor in the increase of the cost of health care. The evidence suggest that the effect of population ageing itself can be compensated by a moderate economic growth and therefore would not bankrupt the health care budget, but economic stagnation and rising costs of health care per illness may well do it. Schoenmaeckers (2005), who run simulations of GDP growth in ageing societies, assess that the some, usually most affluent, European countries should enjoy reasonable increase in the GDP per capita, however he is not that sure what the situation might be in other countries.

The picture presented by the Australian scientists calls for responsible labor and economic policies, but to what extend is it applicable to Europe? The answer is, not directly, as the pattern of population dynamics differ (Australia's population will increase substantially, from 20 to 28 million between 2005 and 2050); however, the structural changes are expected to be of similar nature to those in Europe.

There is an interesting discussion on the impact of ageing on the demand for the health and social services needed to take care of larger cohorts of old people. It was argued that the increase in a disability-free life expectancy may curb the demand for care services in the future and that a decline in disability levels has been already observed. However, there is also anecdotal evidence that the demand for care services is growing and will continue to grow. These two findings may, in fact, be consistent; the incidence of disability may be decreasing, but the need for everyday help, related strictly to ageing and not to disability, may be increasing. It is enough to browse through the classified advertisements in newspapers and professional medical journals in Central Europe, to see that a large scale, organized recruitment of medical staff is being run in order to fill the labor shortages in health service and social security systems in the old EU member states. There is a high demand for nursing home nurses, dentists and specialized doctors. On the other hand, research by Kaczmarczyk (2005) showed that the scale of emigration of medical personnel from Poland is within reasonable limits, with 2.2% of doctors and 1.2% of nurses applying for certificates confirming their qualifications. No doubt, the actual migration is lower than this. However, this should not give the governments of the sending countries cause for complacency. Firstly, affluent countries have a long history of brain drain from poorer countries, which is excellently documented in the literature. For example, Dovlo and Nyonator (undated) noted that 75% of graduates from the University of Ghana Medical School emigrated within ten years of the date of their graduation. Similarly Stilwell et al. (2004) showed that among doctors trained in Cape Verde, more than ¾ work in Portugal. The situation is similar with regard to other Portuguese-speaking African countries. If the emigration of doctors and nurses continues, the human resource problems in developing countries will spread to developed countries which are not amongst the wealthiest. One possible by-product of ageing, and, in particular, of the increase in numbers of people aged 80+, may be a massive drain of health care personnel from poorer countries.

There is one final, and important, aspect of the changes in age structure which is overlooked in demography; the declining school age populations will impact seriously on the educational sector, resulting in a decrease in the number of teachers and, above all, the need to close down schools in sparsely populated areas. In consequence, the density of the school network will be reduced, making access to education for those children living in depopulating areas more and more difficult. According to the projection, in 2051, Armenia, Bulgaria, Georgia, Lithuania, Moldova and Ukraine will have less than 50% of the children of secondary education age currently observed. Given a strong regional dimension to depopulation (for evidence with regard to Europe, see Rees and Kupiszewski 1999), the regional losses in the most disadvantaged regions might be much higher, leading to a far-reaching reshaping of the school network and an increase in catchment areas. UNDP (2004) noted that in Bulgaria there were also positive effects to the concentration of schools in larger localities, namely a rise in attendance.

There are a number of other issues, such as the evolution of production patterns and products, the modification of the retail and services networks, the possible modification of the financial sector, due to shrinking assets and an increased aversion to risk on the part of the elderly, or the demise of some professions and the creation of others. These will all have a profound impact on the societies in which they occur; however, they are not discussed here in depth.

Conclusions

This study clearly shows that depopulation will affect some of European countries, whereas ageing will be an universal phenomenon. In consequence, the societies concerned must adjust to the new, grey demography.

Two questions arise. Firstly, are the demographic changes, and, in particular, is ageing unavoidable? Here the answer is simple; yes, at this stage of demographic development, they are. This has been confirmed not only by the United Nations (2005) projection, but also by the Eurostat projection from 2004 and by the CEFMR forecasts (Bijak et al. 2005). Secondly, will the consequences of these changes be detrimental to the societies concerned? Here the answer is more complex; it depends. The consequences are very difficult to predict, as they will, to a large extent, depend on the policies adopted by governments and the societies' own readiness to accept the necessary changes.

In terms of policy measures, the increase in fertility and the increase in labor force participation should be the two main priorities, as they directly reduce the speed of population change.

One of the consequences of ageing will be problems with the maintaining of the social security systems and, in particular, of the retirement systems. Bismarck's system of social security, created in the 19th century, worked well for young, growing populations, with a significantly lower life expectancy than the retirement age. In ageing, shrinking populations with a life expectancy much higher than the retirement age, they may became dysfunctional and be threatened by bankruptcy. The World Bank (2005) warns that the social security systems in the new EU member states, despite recent reforms, are still vulnerable. Oksanen (2004) noted that the EU response to ageing must come from retirement systems, and recommends that the retirement age be increased. A similar opinion is presented by Schoenmaeckers (2005), who specifically noted that early retirement schemes should be abandoned. Turner's report (Pensions Commission 2005) suggests that the retirement age in the UK should have reached 69 years by 2050, whereas Caldwell, Caldwell and McDonald (2002) assess that retirement at 75 is needed in Germany in order to maintain a constant ratio of retired to working population fixed at 35%. Past experience in modifying social security systems shows how difficult the task is (Höhn 2000).

An increase in labor force participation has been identified by Bijak et al. (2005) as a very efficient tool for reducing ageing-related imbalances on labor markets, especially in the short- and middle-term (up to 50 years, depending on the country in question). To increase the labor force participation we have to bid farewell to the pan-European tendency to retiring in the late fifties and add several years to the effective retirement age. Some countries have already introduced the necessary legislative changes. We must also introduce incentives to place people in legal employment. This can most probably be done by reducing employment costs and liberalizing labor codes, so that the unemployed find employment quickly enough not to slip into poverty and companies can adjust the demand for labor to the flow of contracts without being financially penalized. The removal of unnecessary costs linked to the termination of employment would constitute an incentive for many of the employers and employed currently operating within the black economy to emerge and begin to contribute to the social security systems. Finally, development of atypical forms of employment, catering for those who cannot or do not want to work full time, is necessary.

Every effort should be made to reduce future demand for health care services. Lutz and Scherbov (2005) have shown that an increase in a disability-free life expectancy may allow for the maintenance of health and care service costs. Unlike the other measures suggested in this section, this one will directly increase people's well-being.

It has been argued that maintaining health care and social service costs at current levels in terms of the share of GDP spent on them will be conditional on economic growth and controlling the cost of medical care. In order to maintain economic prosperity, it is imperative to balance national budgets and to start accumulating surpluses so that the economy may be supported in the future, when such support will be indispensable to stimulation of flagging economies. In other words, the generations currently on labor market should not continue to live at the cost of future generations, but should rather start saving to help future generations support them in the long period of retirement. Provision should be made for the states to be able to compensate the potentially lower productivity of older working populations in the future.

An important ethical issue is the very probable brain drain of highly qualified personnel in health care from poorer to more affluent countries. Freedom of mobility for the work force and globalization result in the almost unrestricted mobility of the highly skilled and significant economic losses to poor countries.

Has this wish-list a chance of being realized? It requires governments to take unpopular steps, such as reducing budget deficits and making people work more and take more responsibility for their financial future. There are some signs that politicians realize what demography will bring down upon the nations that they govern; however, the most difficult problem remains that of convincing the societies themselves.

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