Replacement Migration Revisited: Migratory Flows, Population and Labour Force in Europe, 2002–2052

Jakub Bijak[1*], Dorota Kupiszewska[1], Marek Kupiszewski[1]

[1] Central European Forum for Migration Research, ul. Twarda 51/55, 00-818 Warsaw, Poland. Tel. + 48 22 697 88 34, fax + 48 22 697 88 43, web: www.cefmr.pan.pl.

[*] Corresponding author, e-mail: j.bijak@cefmr.pan.pl.

1. Introduction

The study presents an analysis of interrelations between international migration, population ageing and labour force dynamics, followed by recommendations for future population and labour force policies in Europe. In geographic terms, the analysis covers 27 European countries: 23 countries of the EU without the smallest island states (Cyprus and Malta), two accession countries: Bulgaria and Romania, as well as Norway and Switzerland. The timeframe of the study covers fifty years, from 2002 to 2052. The mathematical model of population dynamics used in the analysis is the multiregional MULTIPOLES model developed by Kupiszewski and Kupiszewska (1998). The analysis presented in the paper is supported by extensive background material, with a comprehensive discussion of simulation assumptions, as well as detailed country-level results, provided in a number of papers (Bijak, 2004; Saczuk, 2004; Bijak et al., 2004, 2005) available on-line at www.cefmr.pan.pl.

Apart from the Introduction, the paper contains six sections. Section 2 presents selected background information on population ageing and its recent magnitude in the European countries under study. Section 3 offers brief information on the data used, the model of population dynamics and simulation assumptions. Section 4 presents the simulations of 'replacement migration' from outside the 27 countries, hypothetically needed to maintain the target sizes and structures of the analysed populations. Alternative targets are considered with preventing either the population size or various support ratios from declining. The results are compared with other similar studies in Section 5. Most importantly, the *Replacement Migration* report of the United Nations (2000) (hereafter also: 'the UN report'), is referred to.

In Section 6, on the basis of the results of the study, recommendations for European population and labour force policies are made, taking into account the main objectives of the EU, as well as the expected impact of migration flows on policy developments. On the basis

of the empirical results and available literature, proposals for alternative policy directions are drafted. The proposed solutions are evaluated according to their long-term plausibility, and only on that basis recommendations for the policy-makers are made. Finally, Section 7 briefly summarises the outcome and the most important conclusions of the study.

2. Background: Europe's ageing population and labour force

Population ageing recently became a very important policy challenge, having widespread consequences in various areas of social, economic and political life. Ageing, a "process, by which older individuals become a proportionally larger share of the total population" (United Nations, 2002: 1), is a direct consequence of low fertility and longer life expectancy observed recently in the developed countries. As it has been noted by Coleman (2002), this process is durable and irreversible. According to the report of the United Nations (2002), the key policy challenges posed by ageing include increasing public expenditures on pensions, social security and health services; shrinkage of the labour force and an increase in the overall burden on the working population in terms of intergenerational transfers; increasing risk of failure of the repartition (*pay-as-you-go*) pension systems; changing patterns of public health, and many other. Although the mentioned problems are not yet critical, the policy-makers need to realise that in order to prevent the negative consequences of ageing in the future, significant measures should be implemented as soon as possible.

Since Pollard (1973) and Espenshade et al. (1982) showed that in a population with a below-replacement fertility, constant immigration leads to a stationary population with a stable age structure, there have been many attempts to find out whether immigration can at least partially offset population ageing (see also: Wu and Li, 2003). From the recent examples, the issue of 'replacement migration' has been addressed by Feld (2000), as well as in the controversial United Nations (2000) report, the latter criticised by many authors (Lesthaeghe, 2000; Espenshade, 2001; Coleman, 2002, overview in Saczuk, 2003). All these studies indicated that the magnitude of 'replacement' population inflows would have to highly exceed any reasonable quantities.

The current study aims at contributing to the discussion on 'replacement migration', providing various simulations for 27 European countries for the period 2002–2052. The study presents simulations of demographic consequences of the additional inflow of people needed to maintain the population size or selected aggregate indicators of the age structures. In this way, the impact of international migration on population dynamics and labour force resources

in Europe is assessed and, on that basis, plausible population and labour market policies are evaluated and recommended, with the focus on migration issues.

With respect to changes in the age structures of the population, the current study focuses on the analysis of a commonly used aggregate measure of the phenomenon, the *Potential Support Ratio* (PSR). The PSR indicates how many people aged 15–64 in a given population correspond to (can potentially support) one person aged 65 years or more. The age limits of 15 and 65 years, dividing the population into three groups: pre-working, working and retired, have been chosen arbitrarily. Although the lower limit of working age (15 years) is disputable due to increasing participation in tertiary education, it has been kept for the sake of comparability of results with the other studies, as well as due to the expected increased elasticity of labour markets in future, allowing for various forms of employment of students and youth. The analysis of sensitivity of the results to the retirement age is also deliberately omitted in the current study, as it has been already covered by Roseveare et al. (1996), the United Nations (2000), and Coleman (2002).

In addition to the PSR, two additional aggregate measures are proposed, the *Economic Elderly Support Ratio* (EESR) and the *Labour Market Support Ratio* (LMSR), taking into account the size and structure of the labour force. The EESR is defined as the ratio of the economically active population aged 15 years or more to the inactive population in the retirement age (65+). Such a measure describes the economic burden of inactive pensioners on the working population, and is therefore an important indicator of the effects of ageing from the point of view of sustainability of the pension systems. The LMSR is defined as the ratio of the whole economically active population to the whole inactive population, both nominator and denominator considering people of 15 years or more. This indicator can be interpreted as the overall economic burden of the inactive population on the labour market.

A brief analysis of the proposed measures confirms that the process of population ageing in Europe has been progressing in the second half of the 20th century. According to our calculations based on the Eurostat data, the average PSR in 27 countries under study declined from about 6.5 in 1960 to 4.2 in 2002. The average EESR observed in 2002 indicated that each economically inactive person in the age group 65+ corresponded to 3.1 active persons. The mean LMSR of 1.3 for the same year denotes a heavy burden of the economically inactive population on the labour market.

Significant differences have been observed between the individual countries. In 2002, the PSR indicators ranged from 3.6 for Italy to 6.1 for the Slovak Republic, the EESR from

2.2 for Italy to 5.6 for Romania[1], and the LMSR from 0.9 for Italy to 2.1 for Switzerland. The values of the indicators for all countries under study, ranked from the highest to the lowest, are presented in Table 1.

Table 1. About here.

3. Data, model and simulation assumptions

The analysis is based on the data from the official statistical registration of population, births, deaths and migratory events in the countries under study, published by the Eurostat and the Council of Europe. Data on labour force participation come from the database of the International Labour Organisation (2003). Five-year age groups are used, with 85+ being the highest group for population stock and 75+ for economic activity. Migration flows have been estimated taking the higher of the figures available from the origin and destination countries. Details on the sources used, data quality control and preparation can be found in the background papers on demographic, migration and labour force scenarios (Bijak, 2004; Bijak et al., 2004; Saczuk, 2004).

The model of population dynamics used in this study, MULTIPOLES (**MULTI**state **PO**pulation model for multi**LE**vel **S**ystems) developed by Kupiszewski and Kupiszewska (1998), follows the ideas of Rees et al. (1992) and Rees (1996). The model is cohort-component, female-dominated, multilevel and multiregional. It follows the methodological foundations set by Rogers (1975) and is based on the movement type population accounts. The age-specific rates in the model equations are defined as numbers of events (births, deaths or migration) in a projection period divided by the population at risk. The assumptions on the future developments of fertility and mortality are prepared in terms of respectively total fertility rates (TFR) and life expectancy at birth (e_0). International migration is dealt with on two levels: (i) between the countries under study and (ii) between each of the countries and the remaining countries of the world, other than the 27 ones studies. The former is modelled in terms of emigration rates, while the latter – in terms of crude net migration numbers. A detailed description of the model is available in Kupiszewski and Kupiszewska (1998) and in Kupiszewski (2002). The model has been programmed as computer software, developed by

[1] It has to be noted that the exceptionally good position of Romania is due to the broad definition of the economically active population combined with strong income effects in this country (Saczuk 2004).

D. Kupiszewska since 1996 and recently re-designed for the purpose of the current study, in order to allow for the 'replacement migration' simulations.

Considering assumptions on future fertility it has to be noted that the changes in social values and norms (Lesthaeghe and van de Kaa, 1986), occurring in Europe for over four decades, brought fertility far below the replacement levels. The return to the replacement fertility in the future can not be feasibly assumed, as there is no evidence that policy measures can counterbalance the fertility decline significantly enough. In any case, some recuperation of period fertility levels in Europe is expected, primarily due to the realisation of the childbearing postponed in the past (Sobotka, 2004). Hence, the period total fertility rates (TFR) for 27 countries under study are expected to follow their past downward trends in the short run, but then recover and stabilise by 2052 at the levels reflecting the current diversity of childbearing patterns in Europe. The target TFR values for individual countries, ranging between 1.4 and 1.9 are shown in Table 2, and a detailed discussion of the assumptions is presented in Bijak (2004).

Table 2. About here

With respect to mortality improvements, it has been assumed that although one cannot exclude the emergence of new infectious diseases in the future, their impact on public health in the developed countries will likely be offset by technological, institutional and behavioural changes. As a result, the maximum life expectancy is envisaged to continue increasing, although at a declining pace (thus slightly less optimistically than suggested by Oeppen and Vaupel, 2002), reaching 85 years for males and 90 years for females by 2052. For Western Europe, a visible convergence of the trends to the maximum level is expected, much slower in the case of Central and Eastern Europe. Due to institutional, economic and social drawbacks it will undoubtedly take the post-socialist countries many more years to recover in terms of mortality improvements, although the recent trends already indicate the upturn from the post-transformation crisis (Meslé, 2004). The target values of life expectancy at birth (e_0) for 2052 for all 27 countries under study are presented in Table 2 and discussed in Bijak (2004).

Each of the two types of migratory flows (between the 27 countries under study, as well as the population exchange with the rest of the world) has been assigned separate assumptions, based on the qualitative analysis of migration factors. These scenarios of future migration developments are further referred to as the 'Base' ones, in order to distinguish them from the 'replacement migration' simulations.

With regard to the population exchange of the countries under study with the other regions ('external' migration), the Base scenario assumes a sustained improvement of economic, political and social situation worldwide. This is expected to result in a moderate overall population inflow to Europe and a gradual shift in places of origin from the neighbouring countries to the other developing regions. Policy measures are assumed not to be restrictive, due to a relatively good and stable socio-economic situation in Europe.

Similar assumptions are envisaged for population flows among the 27 countries under study, with alterations resulting from the gradual liberalisation of the labour markets of the old EU-15 for the citizens of the new member states. Hence, the Base scenario assumes a stable socio-economic situation and a long-term convergence of income levels in Europe. This is expected to result in an overall rise in mobility following the increase of job opportunities abroad, and to reduce the income-related push factors to emigrate from Central and Eastern Europe to the West. The positive effects of European integration are likely to occur in full in the longer term, which is going to increase the returns of the former emigrants. The gradual liberalisation of the Western European labour markets is expected to mark temporary deviations from these global trends. The timing of liberalisation of the labour markets of the old EU-15 for the citizens of the new member states is assumed as follows: *Ireland*, *Sweden* and *the United Kingdom* already did so in 2004, *Denmark*, *Finland*, *the Benelux countries* and *Norway* (country of the European Economic Area, guaranteed the same rights to restrict the access of foreign workers as the old EU-15) are assumed to follow in 2006, *Italy*, *France*, *Spain*, *Portugal* and *Greece* in 2009, while *Germany* and *Austria* in 2011. *Swiss* labour market is likely to be liberalised by 2007 for the EU-15 citizens and by 2011 for the new member states. *Bulgaria* and *Romania*, foreseen to join the EU in 2007, are assumed to follow the new member states who joined the EU in 2004 with a three-year delay.

Numerically, the scenarios of flows among the 27 countries multiply the initial emigration rates by factors consisting of two components: an overall trend (mobility increase by 0.5% yearly) and temporal deviations resulting from the labour market policies discussed above (for details, see Bijak et al., 2004). Their age schedules come mainly from the German sources depicting migration to / from a given country, except for migration to the Mediterranean (age distributions based on the data of the receiving countries), as well as within Central and Eastern Europe, where average age schedules of migration of all Europeans to / from Germany have been used. 'External' migration has been extrapolated exponentially from the recent (2002) values to the target ones, corresponding to the rates shown in Table 2. The age structures of net 'external' migration in Germany, Spain, Sweden,

and the Czech Republic from 2002 have been assumed respectively for the countries of Western, Southern, Northern, and Central-Eastern Europe.

Assumptions on labour force participation, discussed in details in Saczuk (2004), in general follow the argumentation presented in Palomba and Kotowska (2003), and include a further increase of the economic activity of women, primarily for the age groups of 25–54 years, particularly dynamic in the low-participation countries of Southern Europe. By 2052 all countries under study should reach an inverted U-shaped pattern of female economic activity, with small differences in activity levels between the countries, grouped for the purpose of this study in three clusters according to their current patterns of economic activity: low female participation countries (A), high female participation countries (B) and Central and Eastern Europe (C). The allocation of the countries to the clusters is summarised in Table 2.

According to Saczuk (2004), economic activity in the older age groups in most of the countries is expected to be much higher in 2052 than in 2002. However, the decade 2002–2012 will observe a continuation of the country-specific trends and only then the rates will converge to the assumed target values. Despite the age-specific labour force participation rates for women being lower than those of men, the scenarios for all countries assume that economic activity of older people of both sexes should stabilise on the same level in the long run. For the young workers (15–24 years), it is assumed that after a decade of continuation of the recent downward trends of economic activity, the development of flexible forms of employment will enable reconciling work with education. Hence, an increase of activity rates after 2015 and their stabilisation on higher levels in the long run are assumed. The only group, for which stagnation or a moderate decline in the economic activity are expected are the middle age men. The assumptions on the target age-specific labour force participation rates, by sex and group of countries, together with the 'maximum' pattern, showing for each age group the largest age-specific rates observed in 1985–2002, are summarised in Figure 1.

Figure 1. About here

4. 'Replacement migration' simulations for 27 European countries

In order to measure the size of the population deficit, and of demographic structural imbalances forecasted for 2002–2052, four 'replacement migration' simulations have been conducted. The first one aims at assessing how many immigrants would be needed to sustain the overall population size of the countries under study. Having adopted the Base

international migration scenario, the number of additional immigrants coming from the other countries of the world has been calculated. If the Base migration alone was enough to prevent the population decline for a given country and period, the 'replacement' immigration has been set to zero. Thus, in the simulation period (2002–2052), the population could grow or stay at the same level but could not decline.

Under these assumptions, the total population of 27 European countries under study would increase from 494 million in 2002 to 533 million in 2052, due to the inflow of 33 million immigrants more than under the Base migration assumptions. At the end of the simulation period, the group of post-2002 external immigrants and their descendants would comprise 118 million people, thus about 22% of the total population and the PSR would equal 2.0. This shows that maintaining the population size alone does not reverse, or even slow down the ageing processes (Figure 2).

Figure 2. About here

With respect to the country-level distribution of the additional 'replacement immigrants', the highest numbers were obtained in the simulation for Romania (8.8 million), Poland (6.6 million), Germany (4.7 million), Bulgaria (3.5 million) and Italy (3.2 million). In the case of Bulgaria the size of 'replacement immigration' would amount to 45% of the 2002 population, while for Romania – to over 40%. On the other hand, in ten countries the maintenance of the population size would not require the inflow of additional migrants from outside Europe, apart from the ones scheduled under the Base assumptions. These countries are: Belgium, Denmark, France, Ireland, Luxembourg, the Netherlands, Norway, Sweden, Switzerland and the United Kingdom. Meeting the same goal in Finland would require only 1.7 thousand additional immigrants in the period 2037–2042. It is worth noting that these are the countries, for which the target 2052 total fertility rates of 1.8 or 1.9 were assumed.

In the simulation with non-decreasing population volumes, the labour force resources would decline only by 0.6% (1.4 million people) over the period 2002–2052, and would account for 43% of the total population by the end of the projection horizon (a decline from 47% in 2002). The EESR and LMSR indicators estimated for 2052 for all 27 countries equal 1.6 and 1.0, respectively, significantly less than in 2002. The post-2002 immigrants and their descendants would account for 28% of the total labour force (63 million people).

The 'non-decreasing population' simulation has been prepared exclusively for the sake of comparison of the results with the United Nations (2000) report. Preventing population

decline can hardly be considered as a rational policy goal in itself. Some authors even suggest that the opposite could hold: population decline can to some extent be desirable for the society and the environment (Burke, 1997). However, this view is controversial, given the division and specialization of labour, that are beneficial for productivity and easier in large populations (Espenshade, 2001). Regardless of the relations between population and economic growth, population decline should not be considered as a policy 'problem' and evaluated from a normative point of view. Instead, it would rather be seen as characteristic for yet another phase of human history, especially concerning the developed countries (Bouvier, 2001).

Despite the lack of direct policy implications, the 'replacement migration' scenario with the non-decreasing population size target produces feasible numbers of potential immigrants for most of the countries. Only in Central and Eastern Europe, most notably Bulgaria and Romania, the assumed low fertility and low net migration lead to extremely high hypothetical numbers of 'replacement migrants' required to maintain the population size.

Three further simulations have been performed in order to calculate the number of 'replacement migrants' required to maintain non-decreasing support ratios: the PSR, the EESR or the LMSR. The first one is comparable with that presented in the United Nations (2000) report, while two latter take the account of the criticism the UN report was subject to. Maintaining the support ratios reflects the aim to preserve the current status quo, rather than to achieve 'optimal' population structures. For this reason, no subjective minimum thresholds of the PSR, the EESR and the LMSR have been set. Although this approach is purely judgemental, it has been deliberately chosen in order to show problems with maintaining current aggregate parameters of population and labour force structures.

In this group of simulations, the most extreme results have been obtained for the one assuming the non-decreasing PSR. In order not to let the country-specific PSR decrease below the previous periods' levels, the 27 European countries would have to accommodate 840 million immigrants by 2052, in addition to the ones that are forecasted to come under the regular conditions (Base assumptions). The whole population under study would have to treble between 2002 and 2052, eventually achieving the size of 1,481 million. By the end of the simulation horizon, the post-2002 newcomers and their descendants would amount to 1,066 million people, thus to 72% of the total population. From the point of view of the 'replacement migration' concept, that would be the price of reaching the PSR value of 4.3 half a century ahead, given the assumed patterns of demographic change. The age structure of the population of all 27 countries under study simulated for 2052 follows to a large extent the one of the immigrant population, with the exception of the oldest age groups (Figure 3).

Figure 3. About here

According to this simulation, also the labour force would more than treble, reaching 773 million people in 2052. Over 50 years, the post-2002 immigrants and their descendants would amount to 78% of the labour force in 27 European countries. The 2052 values of EESR and LMSR for all 27 countries under study would amount to 3.6 and 1.6, respectively, which is significantly more than observed for 2002.

The population age structure shown in Figure 3 is very far from the stationary one that would guarantee long-term population stability. In the simulated 2052 population, the base of the age pyramid is very thin (there are relatively few children). This directly implies that in the more distant future, the inflow of 'replacement migrants' would have to continuously increase in order not to allow for the PSR decline. This conclusion supports results of other research, for example McDonald and Kippen (1999), who proved that there are declining returns from immigration in terms of its impact on slowing down the population ageing (decreasing effects of scale). Hence, both the magnitude of the projected 'replacement migration' and the structural features of the hypothetical 2052 population simulated under these assumptions render the 'non-decreasing PSR' scenario nothing more but a theoretical exercise.

In order to partially address the critique the United Nations (2000) report has been subject to (Espenshade, 2001; Coleman, 2002, for overview see Saczuk, 2003), selected economic (labour market) aspects of ageing have been incorporated into the simulation. Alongside the overall population size and structure, the labour force resources have been analysed based on the assumptions on the future labour force participation. This has been done in two simulations assuming constant aggregate measures that take into account the economic activity: the EESR and the LMSR. In both cases a simplistic assumption has been made that the labour force activity patterns for the 'original' population, as well as those for the immigrants are identical.

The simulation assuming the non-decreasing EESR values resulted in a similar, yet slightly less drastic outcome, as compared with the 'non-decreasing PSR' one, due to assuming improvements in age-specific labour force participation rates. In order not to let the country-specific EESR fall below the previous periods' levels, in total 653 million people would have to immigrate into the all countries under study during the projection period, in addition to the number envisaged in the Base assumptions. The 2052 population would

amount to 1,276 million people, thus would be over 2.5 times larger than the initial one. Some 861 million people (67%) would be the post-2002 newcomers and their descendants, and this magnitude of inflow would suffice to achieve the EESR of 3.2 in 2052.

The simulation with the non-decreasing LMSR generates even less extreme results, yet still very far from feasible. Preventing the country-specific LMSR values from declining would require accommodating in total 471 million people by 2052, in addition to the immigrants that would come under the regular conditions. At the end of the simulation period, the population of all 27 countries under study would amount to 1,066 million people, nearly 2.2 times more than in 2002. Out of this figure, the contribution of the post-2002 newcomers and their descendants would be 652 million (61%), enabling to reach the LMSR value of 1.4 at the end of the simulation period. The age structures of all 27 European countries projected for 2052 in the two replacement migration simulations taking into account the expected labour market developments, are presented in Figures 4 and 5.

Figures 4 and 5. About here

From Figures 4 and 5 it can be seen that the age structures of the population of the 27 countries under study in the latter simulations are also far from stationary. However, taking into account the labour market participation resulted in a decrease in the number of 'replacement migrants' and in smoothened age structures of the simulated populations compared with the 'non-decreasing PSR' case. However, the simulations showed that setting target to the aggregate measures (either the PSR, the EESR or the LMSR) does not help to achieve population structures close to the optimal. Adversely, such an approach generates the demand for increasingly more immigrants, eventually leading to artificial age structures, not suiting the aim of counteracting the ageing processes. The same conclusions apply also to the labour force resources.

On the country level, the magnitude of 'replacement' inflows depend heavily on the initial values of the respective dependency ratios, as well as on the assumptions on the future demographic and labour force developments. An overview of country-specific results for all four 'replacement migration' simulations is presented in details in Table 3.

Table 3. About here

Judging solely by the aggregate numbers for the 27 countries under study, it is obvious that only the scenario aimed at preserving the current population size of particular countries generally fits within the reasonable range of international migration developments. Three scenarios aimed at sustaining the aggregate parameters depicting population and labour force structures (the PSR, the EESR and the LMSR) result in the significant dominance of the post-2002 newcomers and their descendants in the overall population. This may lead to social and political turbulences, especially in the short term, before the eventual ethnic and cultural 'melting' of the society can possibly take place, as suggested by Espenshade (2001).

Similar conclusions can be drawn with respect to the labour force resources. The forecasted improvements of the age-specific economic activity rates do not contribute much to a reduction of the economic burden on the active population. From the point of view of the labour force, this is the ageing process of the overall population that is the key factor shaping the future size and structure of labour supply.

In addition to the 'replacement migration' simulations, an additional experiment was performed regarding the impact of increased labour force participation on ageing. For all the countries under study we assumed that the labour force participation patterns would reach their historical cross-country maxima (shown in Figure 1) in the period 2002–2007 and remain constant thereafter. An analysis of the projected LMSR indicate that in order to prevent these indicators from declining below their 2002 values, no additional 'replacement' immigration would be needed in 21 countries out of 27 in the whole projection period. In four cases (the Czech and Slovak Republics, the Netherlands and Spain) the LMSR would become lower than its initial values in the period 2047–2052, and in one case (Portugal) – between 2042 and 2047. Only for Switzerland, the country with the highest initial LMSR and labour force participation, the LMSR would be smaller than its starting value already halfway the projection horizon, between 2022 and 2027. This improbable, yet illustrative example proves that increasing labour force participation an effective mean to reduce the ageing-related burden on the labour market, at least in the short- and, in most of the countries, middle term, and that especially in the low-participation countries, there is still much potential left in that respect.

5. Comparison of the results with other similar studies

More than a decade before the controversial United Nations (2000) report, several attempts have been made to simulate the number of 'replacement migrants' required to fill the

population shortages caused by the ageing process in various countries. The simulations of Lesthaeghe et al. (1988) made for the 12 countries of the then European Community showed that in order to balance the below-replacement fertility with population inflow by 2050, "record" numbers of immigrants would have to be admitted into Europe, at least a million persons a year. It is worth noting that in the light of the later migratory experience of Europe, these figures are not unrealistic any more. Blanchet (1988) developed a mathematical model for France, showing the size of projected 'replacement migration' with visible cycles, offering a theoretical possibility of successive waves of immigration and emigration. Such policy would, however, imply an increasingly high amplitude of migration flows required to keep the population structure constant, and is therefore totally unfeasible.

The simulations prepared by Wattelar and Roumans (1991) for Austria, Belgium, Canada and Spain proved that keeping the PSR at a constant level of 3.0 would require at least doubling the initial population through immigration. Moreover, the size of these population inflows would have to increase constantly, as the immigrants would also be subject to the ageing process. Further simulations by Gesano (1994) showed that maintaining the population size of Italy at its level from early 1990s would require between 300 and 500 thousand immigrants yearly, depending on the simulation assumptions. The immigration peak would be expected about the middle of the 21st century, followed by a slight decrease to the levels ultimately ensuring the stable population structure.

The outcome of the current study can be directly compared with the United Nations (2000) report for France, Germany, Italy and the United Kingdom, as well as for the 'old' European Union (15 countries). In the simulation assuming no decline of the total population, the required yearly net migration levels are expected to converge to similar values by 2050 for both studies, despite the visible initial differences. It has to be noted that the UN study underestimated the net migration values for most of the European countries except Germany already for the beginning of the 21st century, what could be ex-post verified by the data for 2000-2002. For these reasons, the PSR values obtained in the current study are smaller than the ones from the UN report.

With respect to the population size, the UN simulation practically keeps it constant, while the population of the 27 European countries analysed in the current paper is expected to increase by 8% between 2002 and 2052, due to a slightly different simulation methodology. The Base migration flows are assumed to occur anyway, and only on the top of them, the additional 'replacement' flows are added in order to prevent the population size from

declining. Hence, in the current study some non-zero migration is assumed independently from the development of the overall population size, being the source of the difference.

In the 'replacement migration' simulation preventing the PSR decline, the yearly net migration levels required to satisfy this assumption are expected to converge to similar values in both studies. Also the required population growth: for the EU-15 in both analyses, for the 27 countries in the current study, as well as for 47 countries in the United Nations (2000) report, would be roughly the same – about three times.

As it has been noted by Espenshade (2001: 388), "the current potential support ratio in [the European] countries is substantially higher than the potential support ratio one would observe in a long-run stationary population endangered by below-replacement fertility and constant immigration. […] The only way to maintain a permanently younger population than the population implied by constant immigration stream is to let the annual migration stream increase into the indefinite future." This additionally renders the replacement scenarios aimed at maintaining the non-decreasing PSR values for fifty years demographically implausible.

The UN report additionally showed the impact of increasing the retirement age, an important remedy against the PSR decline, which was not analysed in the current study. In the UN report, the average PSR value of 2.0 forecasted for 2050 for 15 countries of the 'old' EU in the Medium (most likely) variant, assuming retirement at the age of 65, would more than double to 4.1 with ten additional years in employment (United Nations, 2000: 143).

In terms of the crude demographic outcome, the current study is roughly comparable to the results presented in the report of the United Nations (2000). The key difference between the studies is the enhancement of the current one by the labour market aspects. Focus on the size and structure of the labour force is more appropriate in the analysis of the potential economic problems posed by the population ageing. Therefore, even an analysis of aggregate measures of social security burdens, like EESR and LMSR, is a step forward in comparison to the study of the crude PSR, that has been proposed by the United Nations (2000). While the latter indicators are purely demographic, the former take into account the assumed future developments of labour force participation and thus incorporate the economic factors of ageing in the analysis, for the lack of which the UN report was heavily criticised.

Almost at the same time as the United Nations study, an article has been published by Feld (2000), focusing on twelve European countries: Austria, Belgium, France, Germany, Greece, Italy, the Netherlands, Norway, Portugal, Spain, Sweden and the United Kingdom. Similarly to the current research, Feld (2000) projected the future population and economic activity developments for the period 1990–2020 in different variants. Two of them have been

found as the reasonable limits of possible changes in the labour force, combining either high fertility and immigration with low activity rates, or, adversely, low fertility and immigration with high participation in the labour force. The former one is associated with the average of 900 thousand immigrants a year for the period 1990–2020, while the latter one – with 300 thousand.

In the study of Feld (2000) the variant with lower immigration and higher labour force participation ultimately leads to a higher increase in the active population of the countries under study (by 3.8 million people over 30 years), in comparison with the opposite boundary variant (increase by 1.4 million). This increase is, however, most likely linked to the timeframe of the analysis. By 2020, the effects of ageing are not going to be as profound as they are expected to be in a longer run. Until 2010–2015 in most of the countries under study the high population momentum caused by the 'echo' of the baby boom from the 1950s is going to prevent the overall population size (and thus also the labour force) from declining. This finding is consistent with the results of the current study, which, however, projects the population and labour force resources until 2052, for a period long enough to observe the long-term consequences of assumed below-replacement fertility.

Also about the same time as the UN report, a study of McDonald and Kippen (2000) was published, containing future labour force development scenarios for various countries, including eight European ones. The remedies to maintain the absolute size of the labour force in the short run have been found in increasing either labour force participation (France, the United Kingdom), fertility (Germany, Sweden), or both factors together (Greece, Italy, the Netherlands, Spain). In the case of the latter group an alternative policy measure can be to allow for high immigration, at the level of 0.5% of the current population size a year. Although the authors found such numbers of immigrants as extremely high, in the light of the most recent migration developments this conclusion needs not hold any more. For example, according to the data of the Eurostat, the registered yearly net migration balance of Spain in 2002 was 447 thousand people, more than 1% of the total population of the country.

As a response to the UN report, Coleman (2002) presented alternative simulations prepared for the United Kingdom by the Government Actuary's Department (GAD). The immigration levels needed to preserve the currently observed PSR at the level of 4.1–4.2 over 50 years are similar in the study of the GAD, in the report of the United Nations (2000), and in the current study. The projected population size half a century ahead implied by the constant / non-decreasing PSR is visibly lower in the GAD study than both in the UN research

and in the current one, due to less optimism with respect to mortality decline in the former one, assuming target life expectancy shorter by 5 years for males and by 4 years for females.

With respect to the place of the current research in the discussion concerning the impact of migration on various population parameters, it can be noted that in comparison with the other similar studies, it focuses more on the structural issues concerning the labour markets. To a lesser extent is the current study dealing with the topics that have been already covered elsewhere, like the absolute size of the labour force in Feld (2000) or McDonald and Kippen (2000), leaving out macroeconomic problems concerning public pensions, health expenditures, fiscal balance or national savings, covered in Roseveare et al. (1996).

The authors of the mentioned studies were very careful in formulating the recommendations for the population policies on the basis of the obtained results. Lesthaeghe et al. (1988) concluded their simulations for 12 EC countries by stating that relevant demographic policy means should be sought not in 'replacement migration', but elsewhere, especially in increasing the fertility rates. The latter idea has been later re-iterated by Gesano (1994). The infeasibility of migration policies based on keeping the potential support ratios constant has been also repeated by the other authors (Wattelar and Roumans, 1991; Coleman, 1992; Gesano, 1994). Coleman (1992) additionally concluded that the increased influx of immigrants into Western Europe in order to fill the labour force shortages would not be required within the period of 10–20 years, i.e. until about 2010. Recently, Coleman (2002) stressed that the policy responses to population ageing should focus on the economic issues. As the most profound and feasible, yet still partial solutions, the increase in both labour force participation and retirement age were proposed.

From the literature overview, one can see that the Western countries have already been covered by numerous studies concerning the 'replacement migration' simulations. The current research is, however, the first one explicitly dealing with this issue for ten countries of Central and Eastern Europe, most notably for the new EU member states[2]. The selection of countries for the purpose of this study was aimed at treating the enlarging European Union and countries like Norway and Switzerland as one migratory system. In such a system, migration flows between the countries are taken for granted, as following the increasing freedom of movement of labour, it will be hardly possible to influence them with policy means. In this approach these are the inflows from the other parts of the world that may to some extent constitute the decision parameters of the policy process.

[2] The only Central European country that has been subject to a similar study up to date is Hungary (Hablicsek, Tóth 2002).

6. Recommendations for European population and labour market policies

During the Lisbon European Council summit held on 23–24 March 2000, the EU set itself a strategic goal "to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion", to be achieved by 2010 (European Commission, 2000). In particular, the realization of this goal would require co-existence of three elements: development of the R&D sector and the information society, modernisation of the European social model and achieving a sustainable economic growth by appropriate macro-economic policies.

In the context of population ageing, these goals require giving priority to two policy areas. Firstly, lifelong learning and flexible management of working time should be enabled. Secondly, career opportunities should be equalled for men and women, in order to facilitate the reconciliation of working and family life, focusing on creation of new standards in the area of childcare, and ultimately to increase the economic activity of women.

In the Lisbon Strategy it is clearly stated that the overall aim should be "to raise the employment rate from an average of 61% today [in 2000] to as close as possible to 70% by 2010 and to increase the number of women in employment from an average of 51% today to more than 60% by 2010. […] This, by enlarging the labour force, will reinforce the sustainability of social protection systems" (European Commission, 2000).

In response to the current demographic trends in Europe, a *Green Paper "Confronting demographic change: a new solidarity between the generations"* has been recently published by the European Commission (2005). The document summarises past achievements of the Community policies designed to counteract the anticipated demographic change, as well as lists the main future policy priorities in that respect. The latter include the promotion of "active ageing" (Avramov and Mašková, 2004; Schoenmaeckers, 2004), gradual increase of the retirement age, reforms of social security systems and ensuring gender equality using policy measures aimed at achieving a better balance of career and family life: development of child care structures, division of parental leave and part-time working (European Commission, 2005).

With respect to all these issues, the Commission openly admits that the EU is presently still very far from achieving the set objectives. At present, the priority areas related to the demographic change in Europe include return to demographic growth and ensuring an inter-generational balance (European Commission, 2005: 10–11). These objectives require a

wide range of policies, not limited to the demographic ones, but including a variety of economic and social measures: increasing labour force participation and the retirement age, as well as reforming pension systems. In the context of ageing, the issues of fertility and childbearing are clearly given priority among the possible population policies.

Considering possible migration policies, the European Commission already a year before issuing the Green Paper noted that "[…] while using immigration to fully compensate for the impact of demographic ageing on the labour market is not a realistic option, increased immigration flows are not only likely but necessary. The existing literature confirms that migration can contribute to mitigating the ageing process significantly if migration rates remain at their historical levels or increase further, without being a solution to ageing populations" (*First Annual Report on Migration and Integration*, European Commission 2004). This shows the doubts of the Commission with respect to the 'replacement migration' as a possible remedy for the problems related to population ageing. Its implausibility is thus already recognised among the European policy-makers and the need for alternative policy measures aimed at dealing with population ageing is explicitly acknowledged.

With respect to the foreseen labour force shortages, Fotakis (2000) stressed the necessity for combining migration and economic policy measures, aimed at an increase in labour force participation and productivity. Such solutions may include employment of the unused labour potential and further increase in productivity due to technological changes. Mass 'replacement migration' would be then no longer needed to sustain the economic parameters in the long run. In the short term, however, additional inflow of immigrants into Europe may be helpful in offsetting the labour market mismatches caused by the ageing populations. With respect to migration policies he noted that "the political momentum tends to be in favour of a managed increase in legal immigration. […] In addition, the EU intends to promote effective integration measures for the new immigrants ensuring them decent living and working conditions and the development of anti-discrimination policies which could in turn reinforce their socio-economic contribution to their host society" (Fotakis, 2000: 10).

Apart from policy-makers, the policy implications of demographic processes have been also addressed by many researchers, both in Europe and worldwide. A recent study of Grant et al. (2004) provides a detailed overview of possible policy measures aimed at dealing with the consequences of ageing, divided into three groups (Grant et al., 2004: 3–4):

- Indirect preventive policies (concerning economics, gender issues and education), aimed at creating long-term conditions for higher fertility in the post-modern society through affecting the macro-level socio-economic variables;

- Direct preventive policies (migration, family support, reproductive health, child benefits and family-friendly employment), aimed at interfering with micro-level decisions of the individuals and families with respect to fertility and migration;
- Ameliorative policies (social security, labour force, health care and support for the elderly), aimed at reducing the negative impact of ageing on the society and economy.

Grant et al. (2004) concluded that the long-term conditions for fertility increase should be created using indirect and direct preventive policy measures, influencing the underlying reasons of the recent fertility decline. As it has been also noted by Lesthaeghe (2000), although demographic policies aimed at increasing fertility are not the only remedies against the consequences of ageing, in the long run they have to be ultimately introduced in order to avoid problems in more distant future.

The efficiency in achieving the objectives set by the European Commission in the context of population ageing can be enhanced by ameliorative policy measures regarding other areas of socio-economic life. A comprehensive study prepared recently for Australia by the Productivity Commission (2005) includes a broad analysis of potential problems and areas for policy actions with respect to ageing, the demographic ones being just a tip of the iceberg.

From a different perspective, Lutz et al. (2004) developed a concept of 'population balance' as a possible policy goal, not limited to the issue of demographic growth alone. According to them, population policy should be aimed at finding such population structures by age, education and other factors that would maximise the welfare of the individuals and the intergenerational equity. Social welfare has been defined as a function of consumption, survival rates and environmental quality. Focusing on the issues of investment in human capital, the authors found that fertility and education levels are in an interplay with respect to welfare maximisation and that higher education can compensate for reduced fertility. An experiment with a stable population showed that given high percentage of educated people (>85%), welfare is maximised by TFR levels less than 1.5 (Lutz et al. 2004: 329).

The proposal of Lutz et al. (2004) is a courageous step in the direction of detaching population policies from the bare issues of population ageing and growth. The authors argue that the "population growth and ageing are not separated phenomena, but are really two aspects of unbalanced age distributions" (Lutz et al., 2004: 331). Therefore, the policy aim should not be limited to achieving a zero population growth, nor hindering the ageing process, but to maximise the human welfare, given the magnitude of the demographic change. It is very likely that taking into consideration the additional factors such as welfare and human capital increase will gain more attention from the population policy-makers in the future.

Future demographic processes in Europe will undoubtedly have an impact on further developments of migration policies, due to their relatively small inertia. Unlike the attempts to increase fertility or to raise the human capital, the effects of implementing either liberal or restrictive migration policies, in response to the changing pressure of the economic needs, public opinion, or other factors, are visible without long delay. Although the long-term migration policy path is unpredictable, there may exist an 'equilibrium' around which the actual numbers of immigrants would oscillate. In such a simplified model, if immigration would be too small to satisfy labour market needs in a given country, there would be a pressure to liberalise the inflow of foreigners. Adversely, should immigrant flows be too high, causing social tensions, there would certainly be pressure on introducing more restrictive policy measures. The adjusted policies would then have a direct and almost immediate impact on the real population inflows into particular countries and into the EU as a whole. The migration policies, however, work well with flows of migrants, but not with the stocks of foreigners already present in the host countries. From the latter point of view, the efficiency of such policies could be negligible, at least in the short run.

With respect to the management of immigration, the policy context set by the European Commission (2004) can be seen as realistic. It is important that the policy-makers do not perceive immigration as a direct remedy against population ageing, but only as a partial measure to reduce its consequences in the short term. This is clearly a significant outcome of the discussion that took place among demographers and policy-makers following the controversies marked by the United Nations (2000) report on 'replacement migration'. In this context, the interrelations between ageing and 'replacement migration' been nicely summarised by van Imhoff and van Nimwegen (2000: 10, own translation): the "absurd numbers [of 'replacement migrants'] make it clear that migration does not help against the population ageing. The ageing has namely its origin in two processes that have nothing to do with migration: firstly, with fertility changes (previously high, currently low), secondly, mortality changes (ever higher life expectancy). […] We should simply accept that the young [population] structure will never come back due to the modern mortality and childbearing patterns. Before these processes cause problems in the society, we should adjust the organisation of our social life to them, and not talk in panic about immigration".

In this context this is not surprising that the European Commission (2004) admitted that "even somewhat higher net immigration would not dispense policy-makers from implementing the EU's internal structural reform agenda to cope with the impact of ageing populations. In particular, in all Member States timely preparations to tackle the budgetary

implications of ageing will have to rely on the three-pronged strategy of raising employment rates, reducing public debt, and reforming pension systems". As the European Commission acknowledged the seriousness of this issue and the necessity of applying diverse policy means in order to tackle with it will, it can be hoped that this will be followed by concrete actions, both on the level of the EU and of the Member States.

The evaluation of the long-term plausibility of the demographic policies aimed at fertility increase requires a cost-efficiency analysis of particular policy means, especially important given the advancement of social modernisation processes in Europe (Okólski, 2004). The indirect preventive policy measures (as defined by Grant et al., 2004), focusing on long-term sustainable economic development, gender issues and investments in the human capital (education), are more likely to give durable results in terms of fertility increase. The efficiency of the direct preventive measures (family support, child benefits and family-friendly employment), should be perceived rather in the short and middle term. Van de Kaa (2003) suggested that the real and sustainable transition to higher fertility can occur solely through the changes in the normative systems of the societies. Perceiving children and family life as a way of self-realisation of parents is the only possibility to achieve this goal in the individualised post-modern world. Nevertheless, the questions whether and to what extent can the societal values and norms be influenced by the policy means, and whether the return to the replacement levels of fertility is possible, remain unanswered.

The policies aimed at increasing fertility may be seen as a way to slow down the ageing process in a longer term, bearing in mind the reservations discussed above. It has to be noted that, as pointed out by Lutz et al. (2003), the process of ageing in Europe is already so advanced that it causes a negative population momentum. In the other words, even if total fertility rates would instantly return to the replacement level, negative population growth would still be observed over a period of time, due to the ever smaller generations of the newborn from the recent decades. For the same reasons a fertility increase would decelerate the ageing process also with a time delay. This has to be considered when thinking about plausible demographic policy measures aimed at counteracting population ageing, as the effects of such policy means would be observed years after these policies are implemented.

Regarding the goals set in the Green Paper of the European Commission (2005), the proposed policy objectives based on the idea of a return to demographic growth are to some extent controversial. Lutz et al. (2004) pointed out that demographic growth alone should not be perceived as an ultimate policy goal, as opposed to the maximisation of social welfare through investments in human capital.

There is also a need for ameliorative policies, including direct reforms in the areas of social security, labour force, health and elderly care, regardless of their ultimate long-term capability to overcome the negative consequences of population ageing. Lesthaeghe (2000) noted that this capability is by nature temporary, as only the proper population policies can change the demographic trends in the long run. This issue is already acknowledged by the policy-makers, at least at the EU level.

The impact of ameliorative policy means on realisation of the goals set up in the Lisbon Strategy by 2010 is expected to be limited. Given the short timeframe set for achieving these objectives and that the progress in most of the relevant priority policy areas is far from satisfactory halfway the time horizon (European Commission, 2005), one cannot expect rapid changes in that regard. The results of the current study show that the aims of the Lisbon Strategy with regard to the labour force participation (i.e. increase of the overall rate to 70%) are not realistic both in the short and in the long term, primarily due to the changes in the age structure of the population. Our simulation with the 'maximum' economic activity pattern shows that the plausible limits of the overall activity rates would barely exceed 60%.

Summing up, migration policy cannot constitute a sustainable long-term 'remedy' for problems related to population ageing. Migration can be helpful in the short term through selective recruitment of foreign personnel in such sectors as health and elderly care. In the long run, however, the idea of replacing the ageing generations with ever larger waves of immigrants is neither plausible, nor efficient. Korcelli (2003) stated that as 'replacement migration' is a purely theoretical concept, it cannot be seen as an instrument to balance demographic losses, but the related migration policies should focus on economic and labour market areas instead.

In the light of the results of the current study, as well as of the discussion presented above, the following social, population and labour force policy directions are recommended with respect to dealing with the issues related to population ageing in Europe:

- The idea that immigration can in the long run offset the outcome of the population ageing should be abandoned. European policy-makers should focus on developing migration policy measures aiming at balancing current shortages on the labour markets through the means of selective immigration. These selective policies should be rather cautious and must not be seen as measures of offsetting the decreasing fertility.
- Attempts should be made to gradually increase fertility levels in the long run, through creating a supportive environment for individual decisions concerning childbearing, including enhanced gender equality, family support and family-friendly employment. It has

to be borne in mind that the outcome of such measures would be observed years after their implementation and that the return to the replacement fertility may be difficult, given the changes in the systems of values and norms.

- Labour force participation should be increased, especially among women and the elderly, in order to partially compensate the relative labour force decline resulting from ageing. However, these are only auxiliary measures, as the activity rates cannot increase indefinitely. In the case of women, attention needs to be paid to creating an institutional framework for the reconciliation of work and childbearing. Experience of the Scandinavian countries provides a good example in that respect.
- The demographic inequilibrium brings about a deep and urgent need for the reform of the *pay-as-you-go* pension systems that should be replaced with solutions not directly dependent on the demographic dynamics. Such systems should be based on individual savings throughout the working life rather than on repartition between generations.
- In order to reduce the impact of ageing on the society, certain policy measures should be introduced also in the areas of health care and support for the elderly. Promotion of education and investments in the human capital is another important policy goal itself, both from the point of view of the individuals (lifelong learning) and of the societies (increase in productivity and maximisation of the social welfare).
- More attention should be paid to interdisciplinary policy-oriented research on causes and consequences of population ageing, as well as on its implications on various areas of socio-economic life (National Research Council, 2001). Such research should also address the issues of interactions between policy measures, for example, aimed at increasing fertility and female economic activity.
- Finally, more efforts are needed to increase the awareness of the society , to change the attitudes and the public opinion.

Given the pace of population changes, Europe has hardly more time for a thorough discussion and a relatively painless implementation of appropriate policy measures that would give results in the coming decades. Further delays will result in the accumulation of the negative side-effects of ageing over time, that would eventually require significant changes anyway, only more drastic and associated with higher social costs.

7. Final remarks, summary and conclusions

This study had the following main objectives:

- to simulate demographic consequences of the additional inflow of population needed to maintain the size of population or various support ratio indicators;
- to assess the impact of international migration on population dynamics and labour force resources in Europe;
- to discuss and recommend plausible social and population policies based on these simulations, paying attention to migration issues.

There is a lot of research, including this one, showing that the population and labour force deficit and age structure imbalances caused by the ageing process will become important, if not overwhelming, phenomena all over Europe. The forecasted demographic changes bring about a lot of concerns. Roseveare et al. (1996) showed that by 2030 in 20 studied OECD countries expenditures on social security and health services will exceed the income. In consequence in many countries pension payments in the *pay-as-you-go* system will exceed the contributions. This is quite understandable: When Bismarck introduced his Law on Health Insurance for Workers (*Gesetz betreffend die Kranken-versicherung der Arbeiter*) in 1883 and the Law on Invalidity and Old Age Insurance for Workers (*Gesetz über Invaliditäts- und Alterssicherung für Arbeiter, Gehilfen und Lehrlinge*) in 1889, setting up the foundation of the modern European social security framework, the demographic scene was entirely different: every worker paid into the system, but relatively few survived to draw the benefits. Over the years the situation changed: most of those who pay, survive until their retirement and use the retirement funds. The demographic change results therefore in a declining relative number of workers and an increasing number of retired. The system of repartition of payments from workers to retirees is very sensitive to the size of both groups. Therefore, it seems that the future sustainability of social security systems may be achieved only through transformation from the *pay-as-you-go* redistribution to systems based on individual savings.

This study deals with some demographic and labour force aspects of the forecasted imbalances. There are three theoretical possibilities to reduce these imbalances: two of a demographic nature (increased fertility and increased immigration) and the third one through the changes on the labour market. The former two would result in the increase of population in the younger age groups due to fertility and, due to immigration predominantly in the age groups between 20 and 34 years. The third one focuses on the increase of the labour force participation, reducing the imbalance between the number of those who work and the number of those who use the public funds as a source of making their living, without changing the

size and age structure of the population. Obviously neither of these possibilities is exclusive. One may expect that only a combination of all of them may bring any significant changes.

We focused, first of all, on the issue of the use of inflow of migrants, not that much as a remedy for aging – as we knew from earlier studies that the numbers of migrants needed to stop it would be extremely large – but as a measure allowing for the assessment of the magnitude of demographic deficit generated over long time by the persistent below replacement fertility. Therefore it would be misleading to see the migration as the sole or main issue of this research. The underlying problem is the measurement of the deficit in the population size and distortion of the age structure.

We have estimated what magnitude of migration flows would be needed to maintain the potential support ratio (PSR) fifty years from now. In 2052 alone the annual inflow of migrants from the outside of the 27 studied countries would have to exceed 35 million, well above any reasonable absorption capacity of Europe. By 2052 the total population would nearly treble, with a vast share of immigrant populations. If we look at the replacement migration as a measure of the demographic deficit, it is clear that the combined increased life expectancy and a long-term low fertility result in a need for a remarkably high number of persons needed to prevent certain parameters of population from declining.

We wondered, to what extent the changes on the labour market, in particular an increase in labour force participation rates could improve the labour supply side of labour-retirement relationship. Under the assumption of a universal increase in labour force participation rates, especially in the youngest and the oldest age groups, we estimated the number of migrants needed to maintain the EESR and LMSR and arrived at the potential inflow of respectively 26 and 15 million of persons per year in 2052. However large and infeasible these values are, it should be noted that they are lower respectively by 27% and 58% than the number of immigrants required to keep the PSR non-decreasing. This confirms that the policies aiming at the changes on the labour markets and at the increase in labour force participation rates may be effective in curbing the consequences of demographic imbalances. As it has been shown in the experiment with maximum labour force participation patterns, increased economic activity can postpone the negative labour market effects of ageing, measured by the LMSR, at least for the next half a century in most of the European countries.

A long term increase in fertility patterns might bring in the demographic change indispensable to reduce the ageing process. In that respect, the simulations outcome confirms the results of numerous earlier studies and re-iterate their conclusions. Policy-makers should

see the consequences of demographic change in a long-term perspective and address it with serious proposals of the reforms, not limited to partial, marginal or temporary solutions, designed with next elections in mind. An effective policy combination should include measures aiming at fertility and labour force participation increase, combined with reasonable measures of migration management and in-depth reforms of social security systems. Raising the awareness of the aging problems in the society is important for the success of any action. Only such combined policy means can address problems related to population ageing with due attention; the sooner, the better.

Notes and Acknowledgements

Central European Forum for Migration Research (CEFMR) is a research partnership of the Foundation for Population, Migration and Environment (BMU-PME) from Zurich, Institute of Geography and Spatial Organization of the Polish Academy of Sciences and International Organization for Migration, managed by the Warsaw Office of the latter. This paper contains partial results of the project *Impact of international migration on population dynamics and labour force resources in Europe*, conducted by the CEFMR and financed by the Foundation for Population, Migration, Environment. Jakub Bijak benefited from the Stipend for Young Scientists of the Foundation for Polish Science.

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Table 1. Potential Support Ratio (PRS), Economic Elderly Support Ratio (EESR) and Labour Market Support Ratio (LMSR) in Europe, 2002

Rank	Country	PSR	Country	EESR	Country	LMSR
1	Slovak Republic	6.11	Romania	5.59	Switzerland	2.06
2	Ireland	6.09	Ireland	4.52	Denmark	1.99
3	Poland	5.49	Slovak Republic	4.30	Norway	1.96
4	Czech Republic	5.07	Denmark	3.92	the Netherlands	1.72
5	the Netherlands	4.95	the Netherlands	3.88	Portugal	1.64
6	Romania	4.88	Portugal	3.87	United Kingdom	1.63
7	Slovenia	4.80	Poland	3.83	Sweden	1.63
8	Luxembourg	4.80	Switzerland	3.82	Finland	1.61
9	Lithuania	4.58	Norway	3.82	Romania	1.59
10	Denmark	4.48	Czech Republic	3.78	Lithuania	1.58
11	Hungary	4.47	Slovenia	3.66	Slovak Republic	1.50
12	Finland	4.39	Lithuania	3.61	Czech Republic	1.48
13	Norway	4.38	Estonia	3.48	Ireland	1.44
14	Austria	4.38	United Kingdom	3.41	Austria	1.41
15	Switzerland	4.35	Finland	3.41	Slovenia	1.40
16	Latvia	4.34	Latvia	3.34	Germany	1.39
17	Estonia	4.30	Austria	3.23	Estonia	1.39
18	United Kingdom	4.19	Luxembourg	3.12	Latvia	1.35
19	Greece	4.13	Sweden	3.10	France	1.23
20	Portugal	4.07	Germany	2.94	Poland	1.22
21	Spain	4.04	Greece	2.86	Spain	1.15
22	Bulgaria	4.02	France	2.78	Luxembourg	1.15
23	France	4.00	Spain	2.74	Greece	1.13
24	Germany	3.91	Hungary	2.72	Belgium	1.07
25	Belgium	3.86	Bulgaria	2.62	Bulgaria	1.03
26	Sweden	3.77	Belgium	2.55	Hungary	0.96
27	Italy	3.55	Italy	2.21	Italy	0.88
	All 27 countries	4.19	All 27 countries	3.09	All 27 countries	1.30

Sources: own calculations based on the Eurostat and International Labour Organisation data

Table 2. Assumptions for target values of demographic parameters for 2052 for all simulations

Country	Total fertility rate (TFR)	Life expectancy		Yearly net migration rate per 1,000 population of a given country *			Labour Force Participation Type
		Males	Females	Among 27 countries	External	Total	
Austria	1.5	84.8	88.9	–0.19	2.57	2.38	B
Belgium	1.8	84.5	88.4	0.29	2.30	2.58	A
Bulgaria	1.4	79.8	83.3	–2.01	1.75	–0.26	C
Czech Republic	1.5	82.6	86.3	0.16	2.85	3.01	C
Denmark	1.5	84.4	87.0	–0.44	1.85	1.41	B
Estonia	1.6	76.5	84.8	–1.15	1.96	0.81	C
Finland	1.9	84.4	88.8	–0.15	1.89	1.73	B
France	1.9	84.7	89.7	–0.41	2.12	1.71	A
Germany	1.5	84.7	88.6	–0.28	2.68	2.40	B
Greece	1.5	84.7	88.2	0.49	3.06	3.55	A
Hungary	1.5	79.4	84.4	0.47	2.91	3.38	C
Ireland	1.9	84.6	87.9	1.11	1.72	2.83	A
Italy	1.5	85.0	89.8	0.73	3.18	3.91	A
Latvia	1.5	76.1	83.7	–0.59	2.07	1.47	C
Lithuania	1.5	77.4	85.2	–1.16	2.06	0.90	C
Luxembourg	1.8	84.4	88.8	–0.49	2.00	1.52	A
the Netherlands	1.9	84.8	88.1	–0.67	2.13	1.46	B
Norway	1.9	84.9	88.7	–0.80	1.72	0.92	B
Poland	1.5	81.2	86.3	–0.42	1.83	1.42	C
Portugal	1.7	83.8	87.9	–0.07	3.00	2.93	A
Romania	1.4	78.6	82.6	–3.56	1.63	–1.94	C
Slovak Republic	1.5	80.7	85.4	0.68	1.75	2.44	C
Slovak Republic	1.5	83.0	87.9	0.88	3.23	4.12	C
Slovenia	1.5	84.8	89.8	2.23	2.56	4.79	A
Spain	1.9	85.0	89.2	0.46	1.79	2.25	B
Sweden	1.5	85.0	89.8	1.21	2.12	3.33	A
Switzerland	1.8	84.8	87.9	–0.62	2.26	1.65	A
United Kingdom	1.5	84.8	88.9	–0.19	2.57	2.38	B
All 27 countries	-	-	-	0.00	2.41	2.41	-

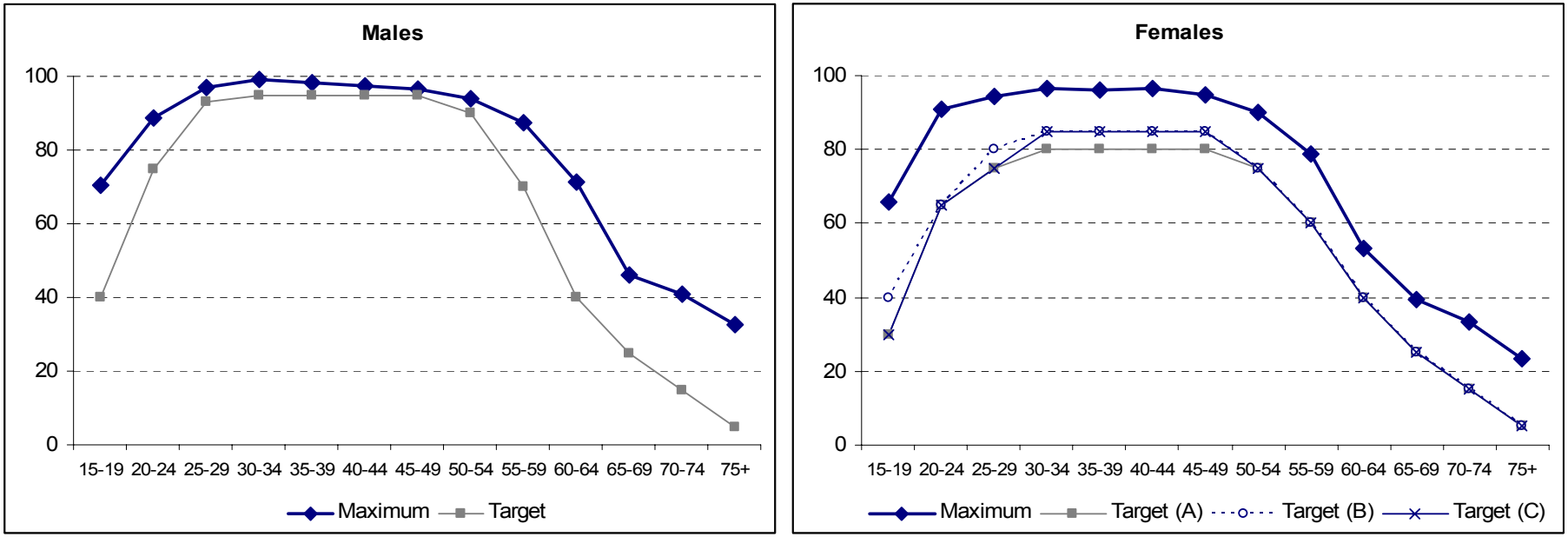
* Assumptions have been set in terms of emigration rates for migration between 27 countries and net migration volume for ‘external’ migration from the remaining countries.
Net migration rates for 2052 shown in the table have been computed after running the model.
** Types: A – Low Female Participation Countries, B – High Female Participation Countries, C – Central and Eastern Europe. Male labour force participation pattern common for all the countries.

Table 3. ‘Replacement migration’ volume: cumulated 2002–2052 and annual arithmetic average for 2047–2052, four simulations

Country	Population in mid-2002, thousands	Cumulated ‘replacement migration’ volume, 2002–2052, thousands				Average yearly ‘replacement migration’ simulated for 2047–2052, thousands			
		Non-dec. pop.	Non-dec. PSR	Non-dec. EESR	Non-dec. LMSR	Non-dec. pop.	Non-dec. PSR	Non-dec. EESR	Non-dec. LMSR
Austria	8 053.1	363.0	17 571.1	13 562.1	11 271.9	23.6	714.4	514.8	366.4
Belgium	10 332.8	0.0	10 301.5	6 278.3	2 533.5	0.0	392.2	220.5	58.7
Bulgaria	7 868.9	3 512.1	9 917.0	5 760.9	1 269.3	69.6	411.1	212.2	36.2
Czech Republic	7 289.5	1 089.7	27 549.6	22 912.4	15 325.3	29.8	1 353.8	1 037.4	471.0
Denmark	10 204.9	0.0	9 168.5	8 888.5	10 032.7	0.0	373.8	356.2	359.8
Estonia	82 488.5	296.7	1 641.1	1 288.7	746.8	5.9	78.7	58.4	23.7
Finland	5 375.9	1.7	10 482.4	9 060.1	8 012.9	0.0	517.1	409.9	220.9
France	1 358.2	0.0	77 116.7	41 501.9	23 717.2	0.0	3 383.9	1 623.2	463.3
Germany	41 200.6	4 663.9	132 302.6	99 655.6	68 208.2	214.0	5 052.0	3 567.1	2 220.7
Greece	5 200.6	335.0	20 147.2	15 915.0	8 633.8	21.6	829.6	626.0	298.9
Hungary	59 486.1	1 245.7	14 159.4	7 110.8	939.4	23.6	647.6	307.4	29.5
Ireland	11 003.2	0.0	13 157.2	10 436.7	5 121.6	0.0	699.3	529.6	202.6
Italy	10 158.6	3 221.9	89 160.4	64 480.6	38 021.4	161.3	2 893.7	1 951.0	837.3
Latvia	3 931.8	604.4	2 886.1	2 308.0	1 831.7	11.8	141.2	103.4	44.3
Lithuania	57 157.4	911.2	5 079.4	3 881.6	2 349.4	19.7	236.3	170.8	93.1
Luxembourg	3 469.1	0.0	637.0	467.7	291.8	0.0	25.7	17.3	5.0
the Netherlands	446.2	0.0	36 042.3	29 967.5	25 030.5	0.0	1 618.9	1 256.7	939.2
Norway	2 338.6	0.0	7 494.8	6 221.4	7 666.9	0.0	317.6	253.9	288.4
Poland	16 148.9	6 640.6	108 874.3	80 825.6	26 324.6	179.4	5 765.7	3 872.2	782.8
Portugal	4 538.2	159.0	17 232.8	13 453.3	9 929.7	13.2	652.3	494.6	335.9
Romania	38 425.5	8 801.9	34 397.7	46 990.5	42 611.3	189.3	1 455.5	2 045.7	1 015.1
Slovak Republic	10 368.4	712.2	18 224.7	13 270.5	6 442.6	24.0	955.2	637.6	210.7
Slovenia	21 803.1	139.7	5 337.7	3 793.2	1 842.2	5.7	240.3	158.4	56.0
Spain	8 925.0	107.8	78 358.5	63 177.6	56 857.1	21.6	2 706.8	2 175.9	1 880.3
Sweden	1 994.5	0.0	10 067.7	9 135.8	14 722.4	0.0	448.4	387.3	360.4
Switzerland	5 379.1	0.0	12 462.3	12 007.4	15 200.8	0.0	551.7	525.5	700.0
United Kingdom	59 231.9	0.0	69 788.5	60 713.9	65 804.0	0.0	2 700.8	2 328.1	2 617.6
All 27 countries	494 178.6	32 806.4	839 558.4	653 065.7	470 739.0	1 013.9	35 163.5	25 841.0	14 917.7

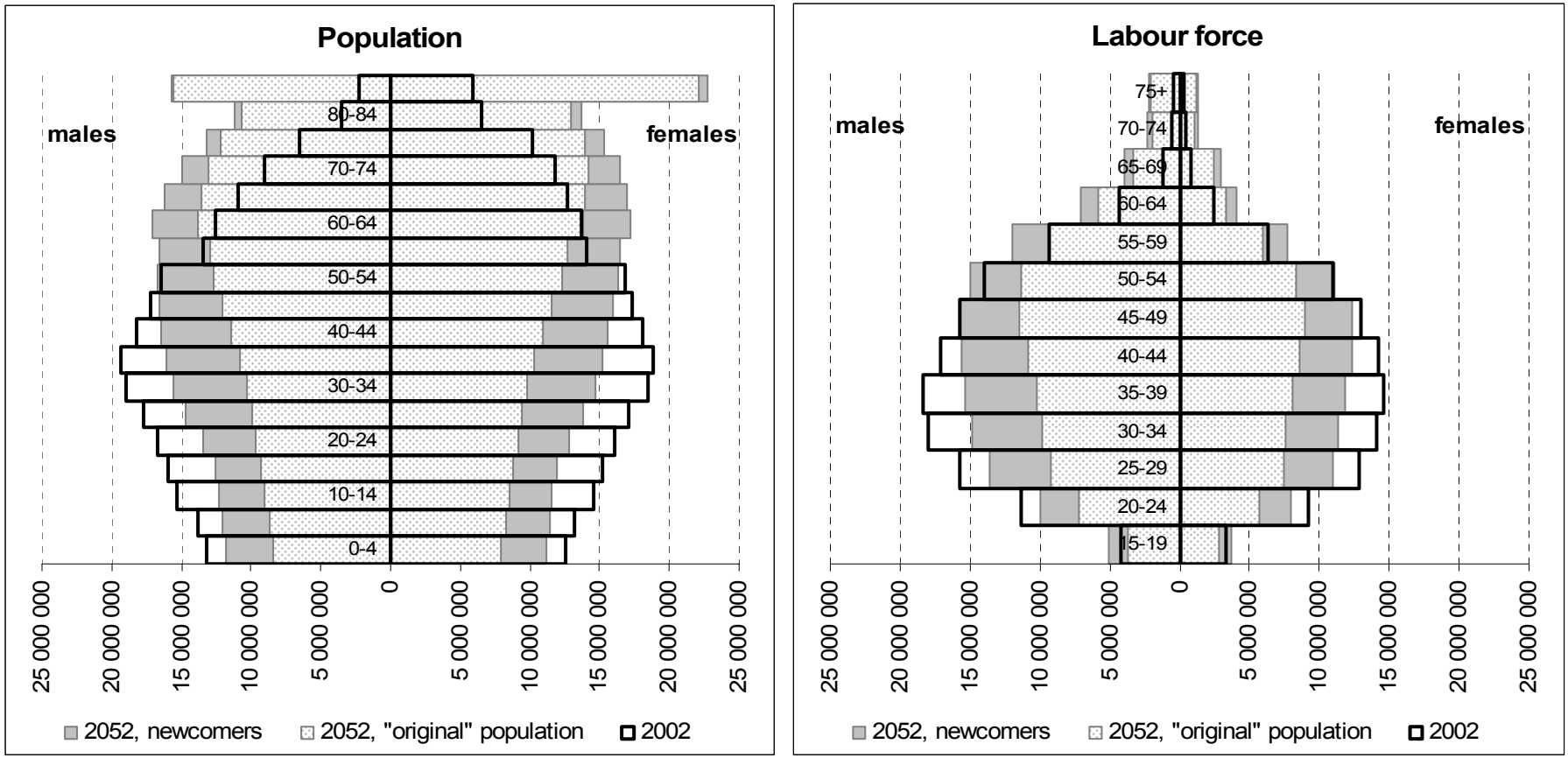
Sources: Eurostat, NewCronos; own calculations

Figure 1. Assumptions on the target age-specific labour force participation rates for 2052 (percent of the population in a given age group)



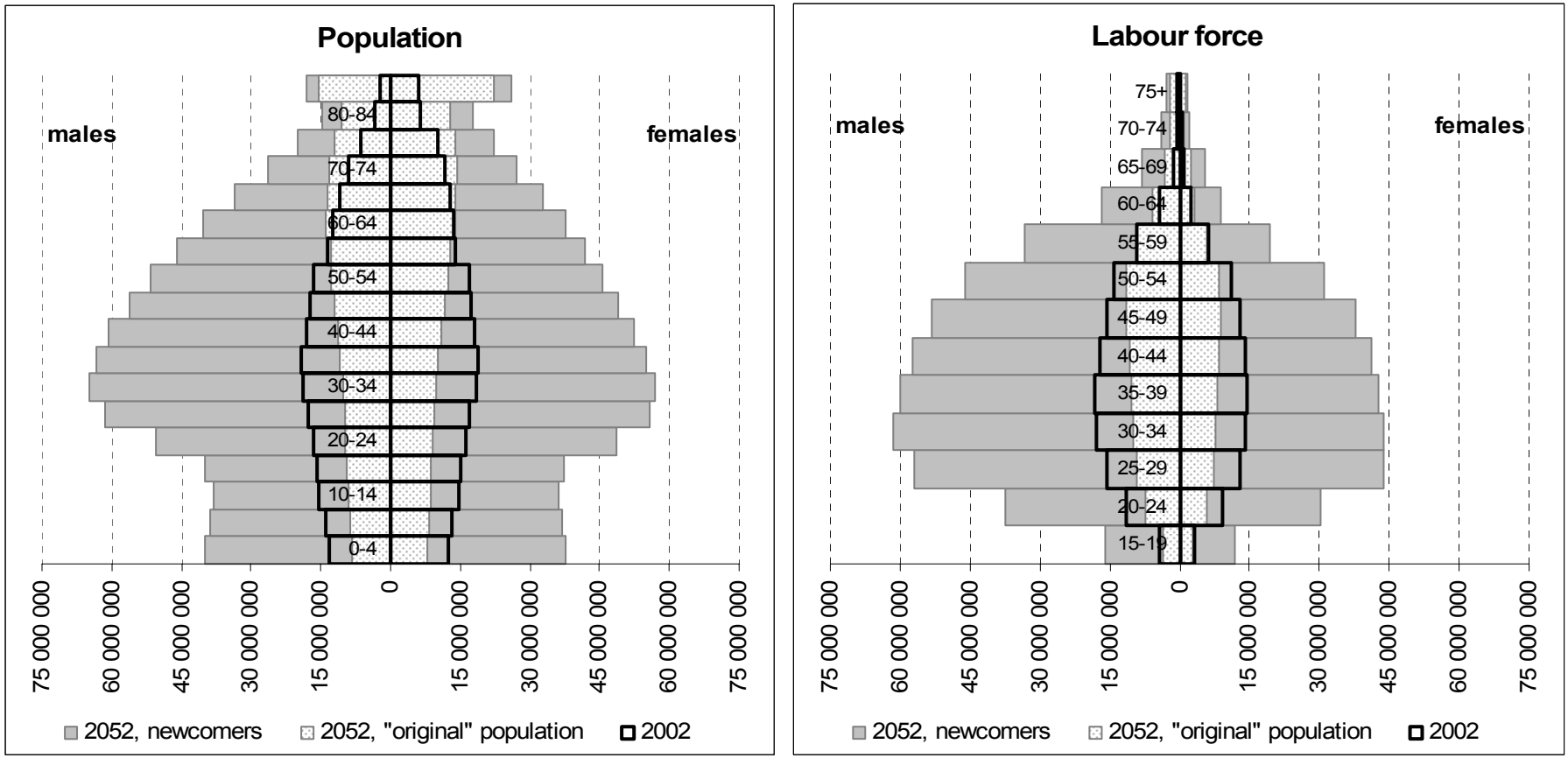
Sources: International Labour Organisation (2003); own elaboration

Figure 2. Population and labour force structures in 27 European countries, 2002–2052, the non-decreasing population scenario



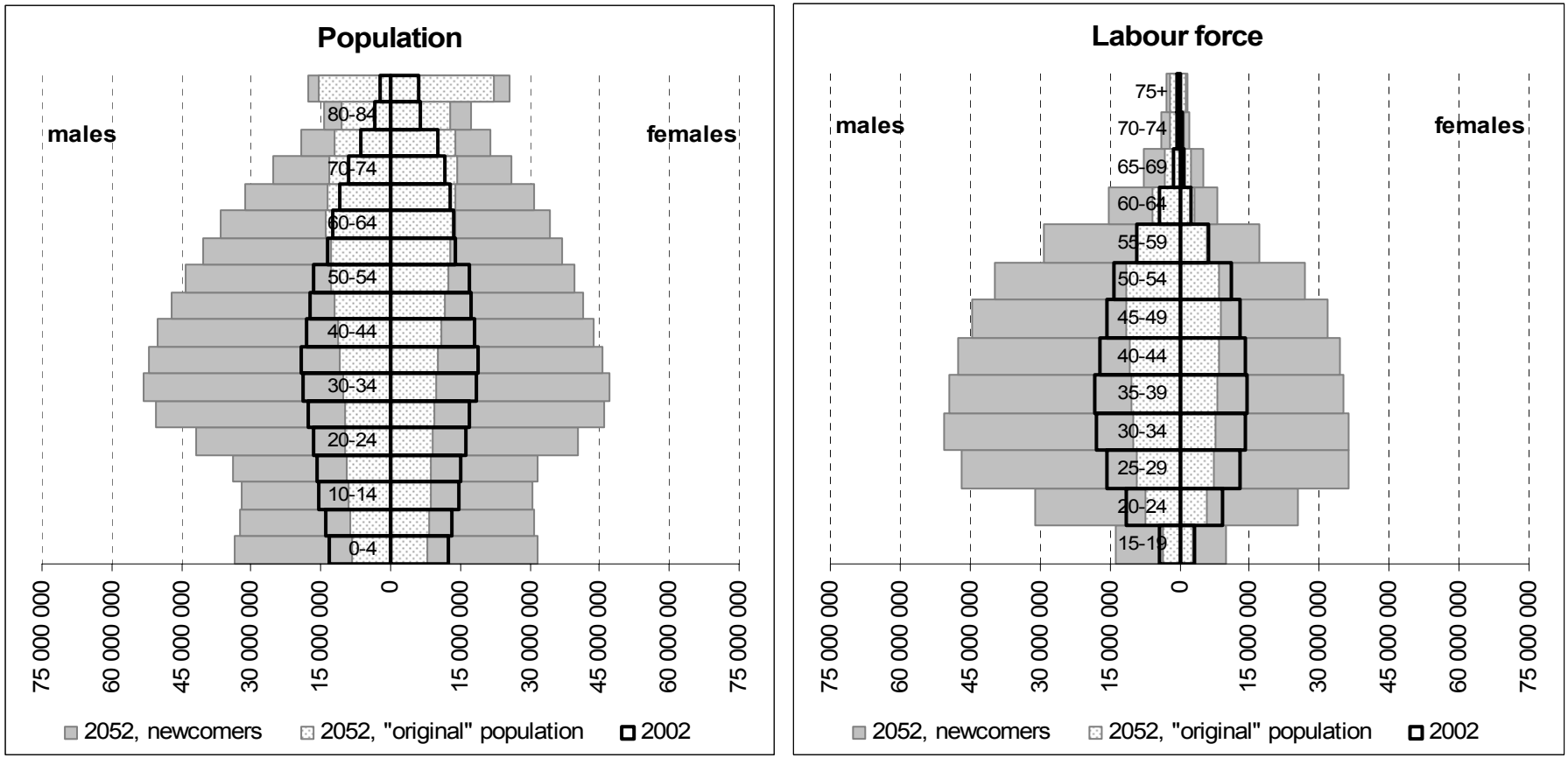
Sources: own calculations based on the Eurostat and International Labour Organisation data

Figure 3. Population and labour force structures in 27 European countries, 2002–2052, the non-decreasing PSR scenario



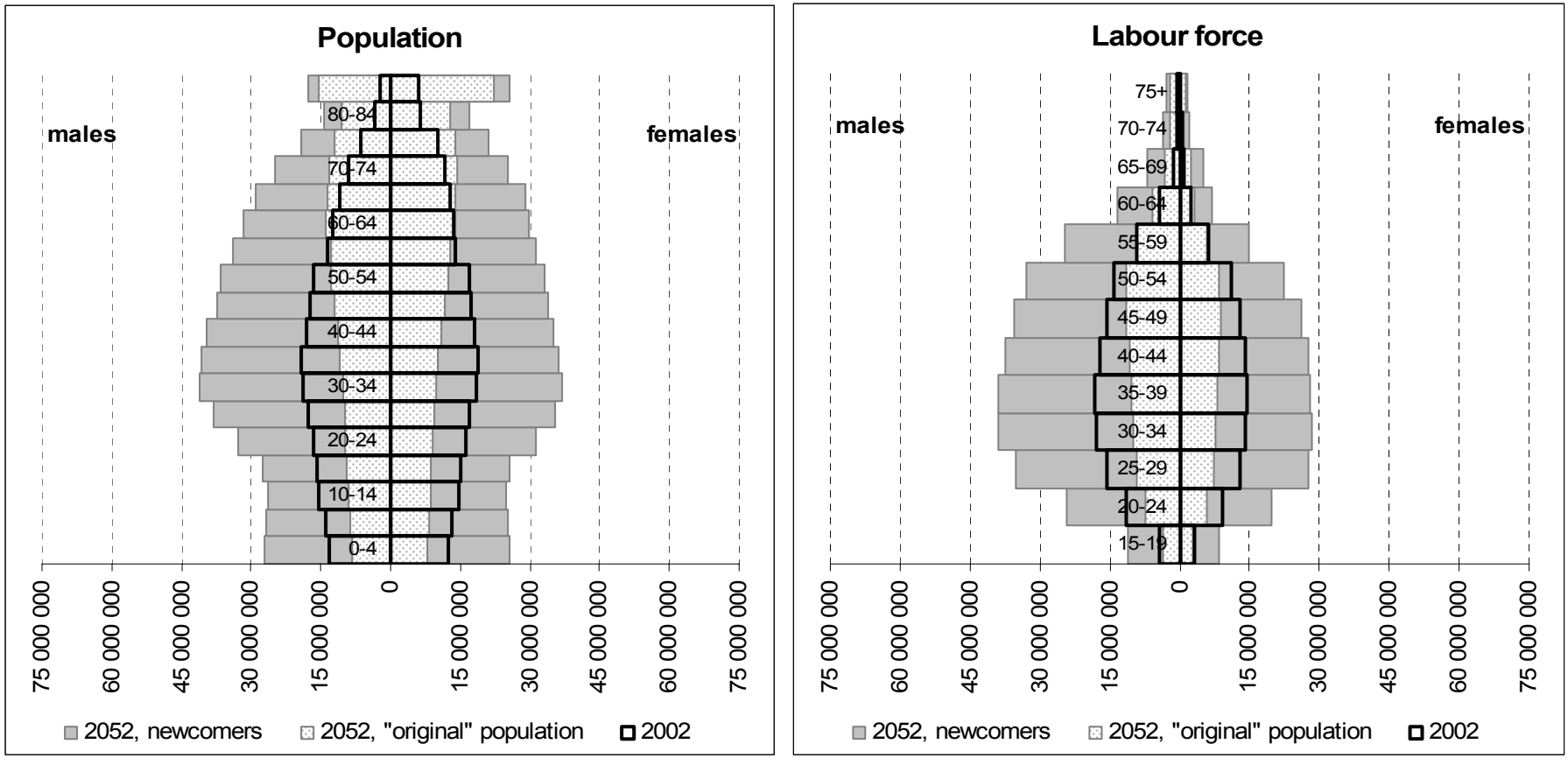
Sources: own calculations based on the Eurostat and International Labour Organisation data

Figure 4. Population and labour force structures in 27 European countries, 2002–2052, the non-decreasing EESR scenario



Sources: own calculations based on the Eurostat and International Labour Organisation data

Figure 5. Population and labour force structures in 27 European countries, 2002–2052, the non-decreasing LMSR scenario



Sources: own calculations based on the Eurostat and International Labour Organisation data