Population Division
Department of Economic and Social Affairs
United Nations Secretariat

Replacement Migration

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Replacement Migration:
Is it A Solution to Declining and Ageing Populations?

NOTE

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The designations “developed” and “developing” countries and “more developed” and “less developed” regions are intended for statistical convenience and do not necessarily express a judgement about the stage reached by a particular country or area in the development process.

The term “country” as used in the text of this publication also refers, as appropriate, to territories or areas.

PREFACE

The Population Division of the Department of Economic and Social Affairs at the United Nations Secretariat is responsible for providing the international community with up-to-date and scientifically objective information on population and development. The Population Division provides guidance to the United Nations General Assembly, Economic and Social Council and the Commission on Population and Development on population and development issues and undertakes regular studies on population levels and trends, population estimates and projections, population policies and population and development interrelationships.

In particular, the Population Division is concerned with the following substantive areas: patterns of mortality, fertility and international and internal migration, including levels and trends, their causes and consequences, and socio-economic, geographic and gender differentials; spatial distribution of population between urban and rural areas and among cities; estimates and projections of population size, age and sex structure, spatial distribution and demographic indicators for all countries of the world; population and development policies at the national and international levels; and the relationship between socio-economic development and population change.

The work of the Population Division is published in a variety of formats, including electronically, in order to meet the needs of diverse audiences. These publications and materials are used by Governments, national and international organisations, research institutions and individuals engaged in social and economic planning, research and training, and by the general public.

Replacement Migration: Is it A Solution to Declining and Ageing Populations? may also be accessed on the Population Division world wide web site at *www.un.org/esa/population/unpop.htm*. For further information, please contact the office of Mr. Joseph Chamie, Director, Population Division, United Nations, New York 10017, USA.

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Symbols of United Nations documents are composed of capital letters combined with figures.

Various symbols have been used in the tables throughout this report, as follows:

Two dots (..) indicate that data are not available or are not separately reported.
An em dash (—) indicates that the population is less than 500 persons.
A hyphen (-) indicates that the item is not applicable.
A minus sign (-) before a figure indicates a decrease.
A full stop (.) is used to indicate decimals.
Years given refer to 1 July.
Use of a hyphen (-) between years, for example, 1995-2000, signifies the full period involved, from 1 July of the beginning year to 1 July of the end year.

The following abbreviations are used in the present report:

EC	European Community
EU	European Union
PSR	Potential support ratio
TFR	Total fertility rate

Details and percentages in tables do not necessarily add to totals because of rounding.

Countries and areas are grouped geographically into six major areas: Africa; Asia; Europe; Latin America and the Caribbean; Northern America; and Oceania. Those major areas are further divided geographically into 21 regions. In addition, the regions are classified as belonging, for statistical convenience, to either of two general groups: more developed and less developed regions. The less developed regions include all regions of Africa, Asia (excluding Japan), Latin America and the Caribbean, Melanesia, Micronesia and Polynesia. The more developed regions comprise Northern America, Japan, Europe and Australia/New Zealand.

The European Union comprises 15 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom.

Europe comprises 47 countries and areas: Albania, Andorra, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Channel Islands, Croatia, Czech Republic, Denmark, Estonia, Faeroe Islands, Finland, France, Germany, Gibraltar, Greece, Holy See, Hungary, Iceland, Ireland, Isle of Man, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Netherlands, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, San Marino, Slovakia, Slovenia, Spain, Sweden, Switzerland, The former Yugoslav Republic of Macedonia, Ukraine, United Kingdom, and Yugoslavia.

REPLACEMENT MIGRATION: IS IT A SOLUTION TO DECLINING AND AGEING POPULATION?

United Nations Population Division

EXECUTIVE SUMMARY

The United Nations Population Division monitors fertility, mortality and migration trends for all countries of the world, as a basis for producing the official United Nations population estimates and projections. Among the demographic trends revealed by those figures, two are particularly salient: population decline and population ageing.

Focusing on these two striking and critical trends, the present study addresses the question of whether replacement migration is a solution to declining and ageing populations. Replacement migration refers to the international migration that would be needed to offset declines in the size of population, the declines in the population of working age, as well as to offset the overall ageing of a population.

The study computes the size of replacement migration and investigates the possible effects of replacement migration on the population size and age structure for a range of countries that have in common a fertility pattern below the replacement level. Eight countries are examined: France, Germany, Italy, Japan, Republic of Korea, Russian Federation, United Kingdom and United States. Two regions are also included: Europe and the European Union. The time period covered is roughly half a century, i.e., from 1995 to 2050.

According to the United Nations population projections (medium variant), Japan and virtually all the countries of Europe are expected to decrease in population size over the next 50 years. For example, the population of Italy, currently 57 million, is projected to decline to 41 million by 2050. The Russian Federation is expected to decrease from 147 million to 121 million between 2000 and 2050. Similarly, the population of Japan, currently 127 million, is projected to decline to 105 million by 2050.

In addition to the decrease in population size, Japan and the countries of Europe are undergoing a relatively rapid ageing process. In Japan, for example, over the next half century the median age of the population is expected to increase by some eight years, i.e., from 41 to 49 years. And the proportion of the Japanese population 65 years or older is expected to increase from its current 17 per cent to 32 per cent. Similarly in Italy, the median age of the population increases from 41 years to 53 years and the proportion of the population 65 years or older goes from 18 per cent to 35 per cent.

Building upon these estimates and projections, the present study considers five different scenarios with regard to the international migration streams needed to achieve specific population objectives or outcomes for the eight countries and two regions mentioned above. The five scenarios are:

Scenario I. The medium variant of the projections from the United Nations *World Population Prospects: 1998 Revision*.

Scenario II. The medium variant of the *1998 Revision*, amended by assuming zero migration after 1995.

Scenario III. This scenario computes and assumes the migration required to maintain the size of the total population at the highest level it would reach in the absence of migration after 1995.

Scenario IV. This scenario computes and assumes the migration required to maintain the size of the working-age population (15 to 64 years) at the highest level it would reach in the absence of migration after 1995.

Scenario V. This scenario computes and assumes the migration required to maintain the potential support ratio (PSR), i.e., the ratio of the working-age population (15 to 64 years) to the old-age population (65 years or older), at the highest level it would reach in the absence of migration after 1995.

The total and average annual numbers of migrants for the period 2000-2050 for each scenario are presented in table 1. Scenario I shows the numbers of migrants assumed for the eight countries and two regions in the medium variant of the United Nations projections. For example, the total number of migrants for the United States for the fifty-year period is 38 million; and the average annual number is 760 thousand. Scenario II assumes zero migration for the entire period; the resulting populations and age structures are given in the text of this report.

TABLE 1. NET NUMBER OF MIGRANTS BY COUNTRY OR REGION AND SCENARIO, 2000-2050
(*Thousands*)

Scenario	*I*	*II*	*III*	*IV*	*V*
Country or region	*Medium variant*	*Medium variant with zero migration*	*Constant total population*	*Constant age group 15-64*	*Constant ratio 15-64/65 years or older*
		A. Total number			
France	325	0	1 473	5 459	89 584
Germany	10 200	0	17 187	24 330	181 508
Italy	310	0	12 569	18 596	113 381
Japan	0	0	17 141	32 332	523 543
Republic of Korea	-350	0	1 509	6 426	5 128 147
Russian Federation	5 448	0	24 896	35 756	253 379
United Kingdom	1 000	0	2 634	6 247	59 722
United States	38 000	0	6 384	17 967	592 572
Europe	18 779	0	95 869	161 346	1 356 932
European Union	13 489	0	47 456	79 375	673 999
		B. Average annual number			
France	7	0	29	109	1 792
Germany	204	0	344	487	3 630
Italy	6	0	251	372	2 268
Japan	0	0	343	647	10 471
Republic of Korea	-7	0	30	129	102 563
Russian Federation	109	0	498	715	5 068
United Kingdom	20	0	53	125	1 194
United States	760	0	128	359	11 851
Europe	376	0	1 917	3 227	27 139
European Union	270	0	949	1 588	13 480

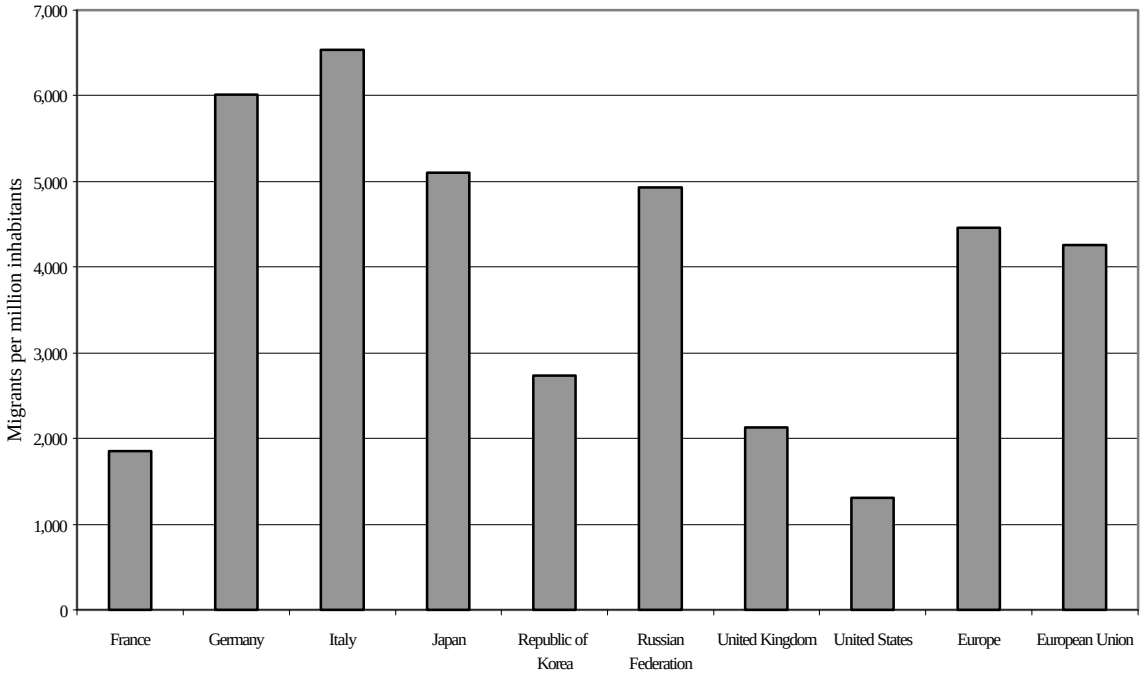
Except for the United States, the numbers of migrants needed to maintain the size of the total population (scenario III) are considerably larger than those assumed in the medium variant of the United Nations projections (scenario I). In Italy, for example, the total number of migrants is 12.6 million (or 251 thousand per year) in scenario III versus 0.3 million (or 6 thousand per year) in scenario I. For the European Union, the respective numbers are 47 million versus 13 million (or 949 thousand per year versus 270 thousand per year).

In scenario IV, that is in order to keep constant the size of the working-age population (15 to 64 years), the numbers of migrants are even larger than those in scenario III. In Germany, for instance, the total number of migrants is 24 million (or 487 thousand per year) in scenario IV versus 17 million (or 344 thousand per year) in scenario III.

Figure 1 provides a standardised comparison by presenting the migration flows expressed in per million inhabitants in 2000. This comparison shows that relative to country size the number of migrants between 2000-2050 needed to maintain the size of the working-age population (scenario IV) is the highest for Italy, with 6,500 annual immigrants per million inhabitants, followed by Germany, with 6,000 annual immigrants per million inhabitants. Among the countries and regions studied in this report, the United States would require the smallest number of immigrants, approximately 1,300 per million inhabitants to prevent the decline of its working-age population.

The numbers in scenario V, which keeps the potential support ratio constant, are extraordinarily large. In Japan, for example, the total number of migrants in scenario V is 524 million (or 10.5 million per year). For the European Union, the total number of migrants in this scenario is 674 million (or 13 million per year).

Figure 1. Average annual net number of migrants between 2000-2050 to maintain size of working-age population per million inhabitants in 2000



Major findings of this study include:

- During the first half of the 21st century, the populations of most developed countries are projected to become smaller and older as a result of below-replacement fertility and increased longevity.

- In the absence of migration, the declines in population size will be even greater than those projected and population ageing will be more rapid.

- Although fertility may rebound in the coming decades, few believe that fertility in most developed countries will recover sufficiently to reach replacement level in the foreseeable future, thus, making population decline inevitable in the absence of replacement migration.

- The projected population decline and population ageing will have profound and far-reaching consequences, forcing Governments to reassess many established economic, social and political policies and programmes, including those relating to international migration.

- For France, United Kingdom, the United States and the European Union, the numbers of migrants needed to offset population decline are less than or comparable to recent past experience. While this is also the case for Germany and the Russian Federation, the migration flows in the 1990s were relatively large due to reunification and dissolution, respectively.

- For Italy, Japan, the Republic of Korea and Europe, a level of immigration much higher than experience in the recent past would be needed to offset population decline.

- The numbers of migrants needed to offset declines in the working-age population are significantly larger than those needed to offset total population decline. Whether those larger numbers of migrants are within the realm of options open to Governments depends to a great extent on the social, economic and political circumstances of the particular country or region.

- If retirement ages remain essentially where they are today, increasing the size of the working-age population through international migration is the only option in the short to medium term to reduce declines in the potential support ratio.

- The levels of migration needed to offset population ageing (i.e., maintain potential support ratios) are extremely large, and in all cases entail vastly more immigration than occurred in the past.

- Maintaining potential support ratios at current levels through replacement migration alone seems out of reach, because of the extraordinarily large numbers of migrants that would be required.

- In most cases, the potential support ratios could be maintained at current levels by increasing the upper limit of the working-age population to roughly 75 years of age.

- The new challenges being brought about by declining and ageing populations will require objective, thorough and comprehensive reassessments of many established economic, social and political policies and programmes. Such reassessments will need to incorporate a long-term perspective. Critical issues to be addressed in those reassessments would include: (a) the appropriate ages for retirement; (b) the levels, types and nature of retirement and health-care benefits for the elderly; (c) the labour-force participation; (d) the assessed amounts of contributions from workers and employers to support retirement and health-care benefits for the increasing elderly population; and (e) policies and programmes relating to international migration, in particular replacement migration, and the integration of large numbers of recent migrants and their descendants.

I. INTRODUCTION: THE ISSUES

As part of its regular work programme, the United Nations Population Division continuously monitors fertility, mortality and migration trends for all countries of the world, as a basis for producing the official United Nations population estimates and projections. Among the demographic trends revealed by those figures, two are particularly salient: population decline and population ageing.

Focusing on these two striking and critical trends, the present study addresses the question of whether replacement migration is a solution to population decline and population ageing. Replacement migration refers to the international migration that would be needed to offset declines in the size of population, the declines in the population of working age, as well as to offset the overall ageing of a population.

Eight countries and two regions which are treated as individual countries, have been selected to be in this study. All of them are relatively large countries that have below-replacement fertility. The countries and regions are: France, Germany, Italy, Japan, Republic of Korea, Russian Federation, United Kingdom, United States, Europe and the European Union. Through the technique of population projection, calculations are made of the amount of replacement migration that would be necessary for each of the eight countries and two regions to offset the expected declines in the size of the total population and working-age population, as well as to offset the overall ageing of the population.

The process of population aging, i.e., the transformation of the age structure to relatively greater proportions in the older age groups, is being brought about by declining fertility and increased longevity. Since fertility and mortality levels have to some extent declined in most populations, population ageing is a nearly universal process. Where fertility has dropped to particularly low levels, such as in Europe and Japan, the ageing of population is reaching unprecedented proportions.

In a smaller, yet significant number of countries, fertility has dropped so much that deaths exceed births, resulting in declining populations. Table I.1 shows the list of countries that are projected to have smaller populations in 2050 compared to 2000 and the extent to which they will be experiencing population decline and ageing. In most cases, populations that are simultaneously ageing and declining will experience severe reductions in the ratio of persons of working age (15 to 64 years) to older persons (65 years or older).

These observations evoke an important set of issues and related questions. The first concerns the robustness of the projection figures. The second issue deals with the social and economic consequences of such unprecedented demographic trends and population changes. The third centers on the extent to which replacement migration is a solution to these expected trends and changes. And finally, the fourth issue relates to the policy and programmatic implications of the results from this study.

With regard to the figures themselves, it should be noted that most of the countries where population is projected to decline have well-developed statistical systems and considerable amounts of data and analytical insight on their demographic situation and trends. Having such a sound basis is of great help to suggest what the most likely course of events in the future would be and how various alternative scenarios would diverge from or fall in line with present population trends.

TABLE I.1. COUNTRIES WHOSE POPULATION IS EXPECTED TO DECLINE BETWEEN 2000 AND 2050: CHANGES IN THE TOTAL POPULATION AND IN THE PROPORTION AGED 65 YEARS OR OLDER

	Population (thousands)		*Population Change*		*Per cent 65 years or older*		*Change in proportion 65 years or older*
*Country or area**	*2000*	*2050*	*(thousands)*	*(per cent)*	*2000*	*2050*	*(per cent)*
Austria	8 211	7 094	-1 117	-14	15	30	106
Belarus	10 236	8 330	-1 907	-19	14	25	86
Belgium	10 161	8 918	-1 243	-12	17	28	65
Bosnia and Herzegovina	3 972	3 767	-205	-5	10	27	171
Bulgaria	8 225	5 673	-2 552	-31	16	30	88
China, Hong Kong SAR[a]	6 927	6 664	-263	-4	11	33	217
Croatia	4 473	3 673	-800	-18	15	26	77
Cuba	11 201	11 095	-105	-1	10	27	176
Czech Republic	10 244	7 829	-2 415	-24	14	33	144
Denmark	5 293	4 793	-500	-9	15	24	59
Estonia	1 396	927	-469	-34	14	29	107
Finland	5 176	4 898	-278	-5	15	26	72
Germany	82 220	73 303	-8 917	-11	16	28	73
Greece	10 645	8 233	-2 412	-23	18	34	92
Hungary	10 036	7 488	-2 548	-25	15	28	92
Italy	57 298	41 197	-16 101	-28	18	35	92
Japan	126 714	104 921	-21 793	-17	17	32	86
Latvia	2 357	1 628	-728	-31	14	27	86
Lithuania	3 670	2 967	-704	-19	13	27	102
Luxembourg	431	430	-1	0	14	27	84
Netherlands	15 786	14 156	-1 629	-10	14	28	104
Poland	38 765	36 256	-2 509	-6	12	26	118
Portugal	9 875	8 137	-1 738	-18	16	31	99
Romania	22 327	16 419	-5 908	-26	13	31	131
Russian Federation	146 934	121 256	-25 678	-17	13	25	100
Slovakia	5 387	4 836	-551	-10	11	27	139
Slovenia	1 986	1 487	-499	-25	14	32	131
Spain	39 630	30 226	-9 404	-24	17	37	117
Sweden	8 910	8 661	-249	-3	17	27	53
Switzerland	7 386	6 745	-641	-9	15	30	104
Ukraine	50 456	39 302	-11 154	-22	14	27	91
United Kingdom	58 830	56 667	-2 163	-4	16	25	56
Yugoslavia	10 640	10 548	-92	-1	13	23	73

Source: United Nations Population Division, *World Population Prospects: The 1998 Revision*.
[a]As of 1 July 1997, Hong Kong became a Special Administrative Region (SAR) of China.
*Countries or areas with 150,000 persons or more in 1995.

From the demographic point of view, there is little doubt that the most likely course of events for those countries will result in smaller and older populations. To the extent that persons of working age (15 to 64 years) can be seen as supporting the older population (65years or older), the ratio between the two (i.e., the "potential support ratio" or PSR) will decline dramatically. However, it is useful to ask a number of "what if" questions. What would happen, for example, if fertility, mortality and migration changed course? Or more specifically *how much* would they have to change course in order to reverse the most likely demographic outcomes?

Fertility is presently at record low levels in many countries where total fertility rates (TFR) as low as 1.2 children per woman have been recorded in recent years – well below the level of 2.1 children per

woman that would ensure the replacement of the parents' generation. Although fertility may rebound in the coming decades, few believe that fertility in most countries will recover sufficiently to reach the replacement level in the foreseeable future.

Table I.2 below shows the range of values that the potential support ratio might take in 2050 for the eight selected countries and two selected regions, according to the three variants (low, medium and high) of the standard population projections prepared by the United Nations Population Division. These variants correspond essentially to alternative assumptions about the course of fertility. For ease of comparison, the values of the PSR in 1995 are also shown. In France, for instance, the most likely course of events (medium variant) leads to a decline of the PSR from 4.36 to 2.26 - in other words, a halving of the number of working age persons per older person. In case fertility rises to what appears at this point to be the highest plausible level in the context of France (a TFR of 2.36 children per woman in 2040-2050), the PSR would somewhat improve in relation to the medium variant, but it would still be nearly halved. If, on the other hand, fertility stabilizes at a TFR of 1.58 after 2005 - which at this point appears to be the lowest plausible level - the PSR would decline even more drastically, to less than two persons in the working age group per older person.

Thus, while the range of outcomes of alternative fertility levels in terms of the PSR by 2050 would be significant (1.95 against 2.52) the difference is relatively small in relation to the level from which the PSR will be dropping (4.36). Moreover, the impact of alternative fertility levels would not be felt until the later part of the period. While in the long run fertility levels will be the determinant factor in shaping the age structure of the population, plausible ranges of increases in fertility rates in the next decades would only contribute at best marginally to slow the process of population aging by 2050. In the short to medium term - say over the next 20 years or so - measures to shore up fertility levels would not have any impact on the PSR.

With regard to mortality, its reduction will continue to be an overriding policy goal, so action in this area would by design further the population ageing process. Longevity is in any case projected to increase, even in absence of possible new medical breakthroughs.

Therefore, among the demographic variables, only international migration could be instrumental in addressing population decline and population ageing in the short to medium term. As noted above, the most likely changes in fertility and mortality rates for Europe and Japan are unlikely to counter population decline and population ageing over the next half century.

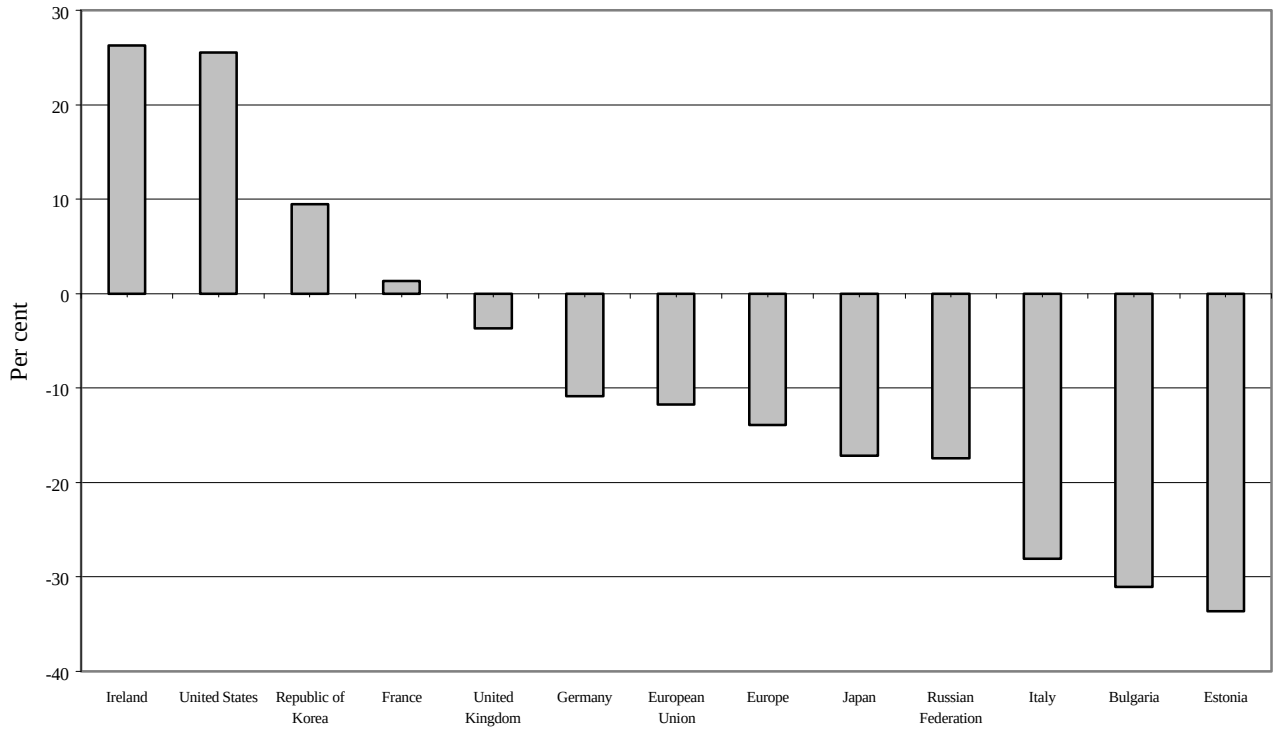
TABLE I.2. VALUES OF THE POTENTIAL SUPPORT RATIO (PSR) BY PROJECTION VARIANT

		PSR in 2050 by projection variant		
Country or region	*PSR in 1995*	*Low*	*Medium*	*High*
France	4.36	1.95	2.26	2.52
Germany	4.41	1.81	2.05	2.35
Italy	4.08	1.35	1.52	1.75
Japan	4.77	1.47	1.71	1.91
Republic of Korea	12.62	2.04	2.40	2.70
Russian Federation	5.62	2.05	2.43	3.04
United Kingdom	4.09	2.02	2.37	2.75
United States	5.21	2.43	2.82	3.26
Europe	4.81	1.84	2.10	2.51
European Union	4.31	1.72	1.96	2.26

Source: United Nations Population Division, *World Population Prospects: The 1998 Revision*.

The prospects of population decline and population ageing during the coming decades, and particularly the rapid and extensive reduction of the potential support ratio in many countries raise a number of crucial issues in the areas of employment, economic growth, health care services, pensions and social support services. Moreover, while most developed countries will experience population decline, a few will not. Differentials in population growth, as illustrated in figure I.1, will in some cases result in dramatic repositioning of countries and regions according to their relative population size. While these issues fall outside the scope of the present study, it is clear, however, that current demographic realities and expected future population changes, and their likely far-reaching consequences will force reassessments of many established economic, social and political policies and programmes, including those relating to international migration.

Figure I.1. Per cent change in total population for selected countries and regions, 2000-2050



Source: United Nations Population Division, *World Population Prospects: The 1998 Revision*.

II. LITERATURE REVIEW

Population ageing is an inevitable outcome of the demographic transition. Due primarily to declines of fertility, and secondarily to mortality declines, the age structure of a population becomes older, with a growing number and proportion of elderly persons. While many countries, especially those in the more developed regions, have experienced such a demographic process for some time, there is great variation among them in terms of the level and pace of population ageing. In recent years, the issue of population ageing has received renewed attention in developed countries, because of the continuance of fertility below the replacement level and on-going trends towards lower mortality. Thus, the trends of population ageing are expected to increase further in these countries and their populations are projected to level off and decline in the foreseeable future. These changes have profound consequences and far-reaching implications, especially for pension schemes, heath-care systems and the economic vitality and growth of a country.

The future population size and age-sex structure of any country depends basically on the three demographic components: fertility, mortality and international migration. As no policies to increase the mortality of a population are socially acceptable, there are, in theory, two possible ways of retarding or reversing demographic ageing. First, a reversal of declines of fertility would lead the age structure of the population back towards a younger one, thus slowing down the ageing process. However, the recent experience of low-fertility countries suggests that there is no reason to assume that their fertility will return anytime soon to the above-replacement level (United Nations, 1997).

Hence, as a second option, the potential role that international migration could play in offsetting population decline and population ageing has been considered. Given the possibility of attracting larger number of immigrants into economically affluent developed countries, virtually all of which are experiencing low fertility, it appears appropriate to consider the impact that international migration may have on the demographic challenges of ageing. The Organisation for Economic Cooperation and Development (OECD) commissioned research on these issues and published in 1991 a special report on the demographic impact of migration (OECD, 1991).

A number of studies have examined the demographic impact of a constant influx of migrants on the growth of a population with below replacement fertility. For example, taking the twelve countries in Europe or members of then the European Community (EC) together, Lesthaeghe and others (1988) carried out population projections. With the present below-replacement fertility and with no further immigration, the total population of these European countries would be reduced by approximately 20 to 25 per cent by the year 2050. The calculations showed that an overall population decline during the first half of the twenty-first century can be avoided, if about one million immigrants move into the area every year. More recently, Ulrich (1998), in his study on Germany applied different fertility assumptions for natives and foreigners and different immigration levels by group of immigrants, and estimated the population size of Germany and its structure in 2030. His projections showed that, even with a relatively high level of immigration, the population of the country would start falling in the near future. Therefore, he concluded that immigration can only slow an inevitable decline of the population of Germany. Wanner (2000), in his study of Switzerland, showed that the total population of the country, which was projected to be slightly below 7 million in 2050, would be 5.6 million in the absence of future migration.

The importance of immigration for the growth of population in traditional countries of immigration is relatively well recognized (Appleyard, 1991; Foot, 1991; United Nations, 1998a).

However, the current level of immigration may not be sufficient for these countries to prevent their population size from declining in the future. Espenshade (1986) projected the changes of the population of the United States, assuming both the fertility and mortality rates remain constant at their 1980 level and the number of immigrants remains at the level in 1983 with the same age and sex structure. According to these assumptions, the population in the United States would grow until 2025, but decline thereafter. In a similar exercise for Canada it was found that in order to avoid population decline, a volume of immigratioin exceeding the current annual quota would be necessary after 2050, under the assumption that the current fertility level will be maintained (Wattelar and Roumans, 1991).

Many of these studies demonstrate that long-lasting below-replacement fertility and immigration streams offsetting the negative natural growth of the national population would eventually lead to a significant increase in the foreign population and therefore a marked change in the composition of a host country (Espenshade 1986; Ulrich, 1998).

As the age structure of immigrants is often younger than that of the host population, there is a popular belief that a large influx of immigrants makes the population of the host country significantly younger. Accordingly, it is commonly believed that a more generous immigration policy can immediately increase the number in the working-age population and help reduce markedly the dependency costs of the elderly. However, the analyses of migration flows of recent decades in developed countries provided scant evidence to support these conclusions. For instance, the study of the migration to and from the United Kingdom by Coleman (1995) revealed that after World War II immigration neutralized the previously dominant pattern of emigration. Thus, without New Commonwealth immigration and the contribution of births from immigrants, the population of the country would have been smaller by 3 million than it was in the early 1990s. He asserts, however, that the cumulative effects of migration alone on the age structure of the country have been limited, because the age structures of immigrant and emigrant flows are similar and the level of migration is relatively small in relation to natural change. Similarly, Le Bras (1991) explored the demographic consequences of the migration flows since the end of the Second World War in seven developed countries, namely Australia, Belgium, Canada, France, Germany, Italy and Sweden. He also concluded that the “rejuvenating”effect of migration on the host populations had been fairly modest. Immigration had lowered the average age of the population in these seven countries by 0.4 to 1.4 years.

A number of other studies analyzed the effects of the steady influx of migration on the future age structure of a host population. For instance, Lesthaeghe and others (1988) projected the age structure of the total population of the twelve European countries with and without migration up to the year 2060. Their calculations show that the overall ageing trend in Europe can be attenuated through immigration, but it cannot be prevented. Assuming that the total fertility of nationals remains constant at 1.6 and that of non-nationals falls to the replacement level by 2010, the proportion aged 65 years or older among females would rise from 16.3 per cent in 1985 to 25.8 per cent in 2060 in the absence of migration. The proportion was projected to be 21.3 per cent in 2060, if an additional 400,000 female immigrants would arrive every year, other things being equal.

Research for the United States also indicates that immigration is not a realistic solution to demographic ageing (Coale, 1986; Espenshade, 1994; Day, 1996). Assuming that immigrants adopt the low fertility of a host population, Coale (1986) compared the age structure of the United States population in 2100 with and without a net immigration of 700,000 per year. He illustrated that the difference in projected age distributions of the two populations is fairly modest, regardless of four different levels of below-replacement fertility scenarios. Similar results were presented a decade later by Day (1996). According to her projections, should fertility and mortality follow the middle-series assumption and net migration be held at 820,000 per year or near the current level, the proportion aged 65 years or older in the United States would increase from 12.8 per cent in 1990 to 20.0 per cent in 2050. Even if a fairly

larger level of immigration (1.4 million per year) occurs, it would reduce the future percentage of elderly in the population only slightly (to 19.4 per cent). Espenshade (1994) confirmed the finding that immigration has relatively little effect on overall age composition of the population of the United States, because previous years' immigrants also age along with the rest of the population.

Concerns about an ageing society often arise not only from the growing number and proportion of elderly, but also from the rapidly changing ratio of the working-age population to the retired population. In particular, the sharp drop of the ratio may directly affect the viability of pension systems. In the study cited earlier, Lesthaeghe and others (1988) computed the ratio of adult women (20-59 years) to elderly women (60 years or older) for the total population of the twelve European countries under five different scenarios. If the countries keep their current below-replacement fertility, the ratio would decline from 2.4 in 1985 to 1.5 in 2060. Immigration of 400,000 women per year from 1985 onwards would be of some help to alleviate the decline, but still yield a ratio of 1.8 in 2060. In his study cited earlier, Wanner (2000) showed that in Switzerland, the ratio of the population aged 20 to 64 years to the population aged 65 years or older would be 1.5 in 2050 in the absence of migration, as compared to 2.1 which is currently projected.

Instead of assuming a fixed number of immigrants arriving and examining the consequences of this immigration on the age structure of a population, some researchers estimated the level of migration necessary to keep constant the ratio of the adult population to the elderly. Both studies by Blanchet (1988) on France and by Wattelar and Roumans (1991) on Austria, Belgium, Canada and Spain demonstrated, however, that initial structural irregularities of the population would inevitably cause sudden changes in future age pyramids. For this reason, the scenario that aims to keep constant the ratio of adults to elderly may lead to explosive cycles of immigration peaks to make up for the shortfalls of population. Furthermore, such massive inflows of migrants are likely to bring about a phenomenal increase in the population of a country, as immigrant themselves would become older and call for further immigration of younger population (Wattelar and Roumans, 1991).

In sum, although there is a considerable variation in terms of the choice of the base year, the period of projection, the fertility scenarios adopted for nationals and non-nationals, and the migration assumptions, available research studies reach several conclusions. First, inflows of migrants will not be able to prevent population declines in the future, nor rejuvenate a national population, unless the migration streams reach comparatively high levels. Second, international migration can only act as a partial means to offset the effects of population ageing arising from below-replacement fertility. The inadequacy of migration to serve as a counter for population ageing, and in most cases for population decline, has been further consolidated by questions regarding the feasibility of formulating and adopting suitable migration policies (Watteler and Roumans, 1991; Espenshade, 1994; McDonald and Kippen, 1999). In many countries, additional large volumes of immigrants are likely to face serious social and political objections, even as a means of slowing population decline and population ageing. Therefore, regulating the level and composition of replacement migration streams to reach a desired population size or population age structure poses enormous challenges for Governments that may wish to do so.

III. THE APPROACH: METHODOLOGY AND ASSUMPTIONS

As part of its regular work programme, the Population Division biennially prepares population estimates and projections for all countries of the world, with estimates for the period from 1950 to 1995, and with four projection variants for the period 1995 to 2050. The last such revision is published in *World Population Prospects: The 1998 Revision* (United Nations, 1999a, 1999b and 1999c).

The four projection variants in the *1998 Revision*, i.e., high, medium, low and constant, are prepared for countries and areas using the cohort-component method. The different variants are based on different assumptions about the future course of fertility. All variants incorporate the same assumptions about the future course of mortality and, for most countries, the assumptions about future international migration trends are also the same for all four variants.

The high, medium and low variants constitute the core of the official estimates and projections of the United Nations. They are meant to encompass the likely future path of population growth for each country and area of the world. The high and low variants provide upper and lower bounds for that growth. The medium variant is a useful central reference for trends over the longer-term future. The constant variant projects the population of each country by maintaining fertility constant at the level estimated for 1990-1995. The results of this variant are meant to be used for illustrative purposes and are not considered to represent a likely future path for any country or area.

Building upon the medium variant of the *1998 Revision*, the replacement migration study considers five different scenarios with regard to migration streams needed to achieve particular population objectives or outcomes. The five scenarios for the above-mentioned ten countries and regions are:

Scenario I. The medium variant of the *1998 Revision*.

Scenario II. The medium variant of the *1998 Revision*, amended by assuming zero migration after 1995.

Scenario III. This scenario computes and assumes the migration required to maintain the size of the total population at the highest level it would reach in the absence of migration after 1995.

Scenario IV. This scenario computes and assumes the migration required to maintain the size of the working-age population (15 to 64 years) at the highest level it would reach in the absence of migration after 1995.

Scenario V. This scenario computes and assumes the migration required to maintain the ratio of the working-age population to the retired-age population (population 15-64 years divided by population 65 or older) at the highest level it would reach in the absence of migration after 1995.

The study examines the situation for eight countries, namely: France, Germany, Italy, Japan, Republic of Korea, Russian Federation, United Kingdom and United States. In addition, computations are also done for Europe and for the European Union, treating them as if they were each a single country from 1995 on. The time period covered is roughly a half a century, i.e., from 1995 to 2050.

All the data pertaining to the eight countries and two regions mentioned above for the period 1950 to 1995 come from the estimates in the *1998 Revision*. For the period 1995 to 2050, projections are carried out using the cohort-component method, taking as a base the 1995 population by sex and five-year age groups and applying the age-specific fertility and mortality rates assumed in the medium variant of the *1998 Revision*.

More specifically, the number of survivors in each age and sex category at the end of each five-year period is calculated by applying to the base-year population age- and sex-specific survival rates which are derived from an observed or estimated national life-table, using the United Nations model for future mortality improvement. The number of births expected to take place during each five-year period is derived by applying the estimated age-specific fertility rate, which is obtained from the national fertility pattern and assumed future fertility trend, to the average number of women in the age-group. The births are distributed by sex on the basis of the estimated sex ratio at birth. The assumed net number of international migrants, classified by age and sex, is incorporated into the calculations.

The detailed past results and future assumptions of the *1998 Revision* for each of the countries and regions examined in this study are presented in the annex tables. A detailed description of the methodology used for the estimates and projections may be found in *World Population Prospects: The 1998 Revision, volume III* (United Nations, 1999c).

The future population trends according to the medium variant are mainly determined by the assumed future course of fertility. For each of the countries and regions considered in this study, the total fertility rate is below replacement level, i.e., below 2.1 children per woman. For those countries whose latest estimated total fertility rate was between 1.5 and 2.1 children per woman (France, Republic of Korea, United Kingdom, and the United States,), it is assumed that the fertility rate will move toward a target level of 1.9 children per woman and will remain constant to the end of the projection period, i.e., 2050. For those countries and regions whose latest estimated total fertility rate was less than 1.5 children per woman (Germany, Italy, Japan, Russian Federation, Europe and European Union), the fertility rate is expected to rise to a target level of 1.7 children per woman and remain constant thereafter. It should also be noted that the target total fertility rate was modified when there was information on the completed fertility of the cohort of women born in 1962. In those cases (France, Germany, Italy, Japan, Europe and European Union), the target level is set as the average of either 1.9 or 1.7 and the estimated completed fertility of the 1962 cohort. In general, recorded post-1995 trends in fertility were assumed to continue until the year 2000, and then stabilize at the 2000 level until 2005. After 2005, fertility was assumed to move toward the target level at a pace of 0.07 children per woman per quinquennium.

Scenario I, which is the medium variant of the *1998 Revision*, already has migration assumptions for the period 1995-2050. In each of the other four scenarios the net total number of migrants during each five-year period is computed so that the projected results meet the particular requirements of the scenario.

Scenario II assumes that the total net number of migrants is zero for each five year period. Scenario III involves computing the total net number of migrants for each five-year period needed to maintain the size of the total at the highest level it would reach in the absence of migration after 1995. Scenario IV determines the total net number of migrants for each five-year period required to maintain the size of the working age population (15-64 years) at the highest level it would reach in the absence of migration after 1995. Finally, scenario V computes the total net number of migrants required to maintain the ratio of the working age population to the retired age population, that is those 15-64 years old divided by those 65 years or older) at the highest level it would reach in the absence of migration after 1995.

Another critical assumption concerns the age and sex distribution of the total net number of migrants. The age and sex structure of the migrants is assumed to be the same for all countries. This

assumption, while unlikely, permits comparisons among the countries and regions. It is assumed that the structure of the migration streams is the average age and sex structure of migrants into the United States, Canada and Australia. These three countries were selected because they are the three major traditional countries of immigration.

The age structures of the three countries and their average, or model pattern for this study, are shown for males and females in figures III.1 and III.2, respectively. The per cent distribution by age and sex of the immigrants in the model pattern, which are used in the scenarios, is shown in table III.1 and illustrated as an age-sex pyramid in figure III.3.

The projection methodology also assumes that, after the immigrants arrive in a country, they experience the average fertility and mortality conditions of that country. While this is typically not the case, especially when immigrants come from a country that differs greatly demographically from the receiving country, this assumption permits computations to be more straightforward and also facilitates comparisons between countries and regions.

Figure III.1. Per cent distribution of male immigrants by age in Australia, Canada, United States of America and model pattern

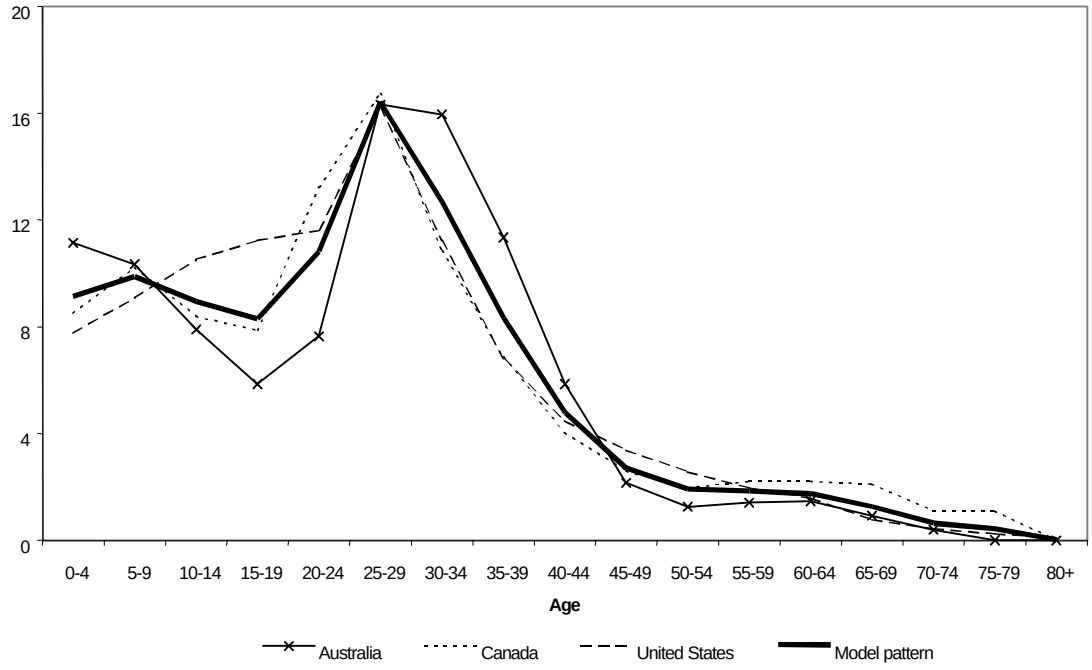
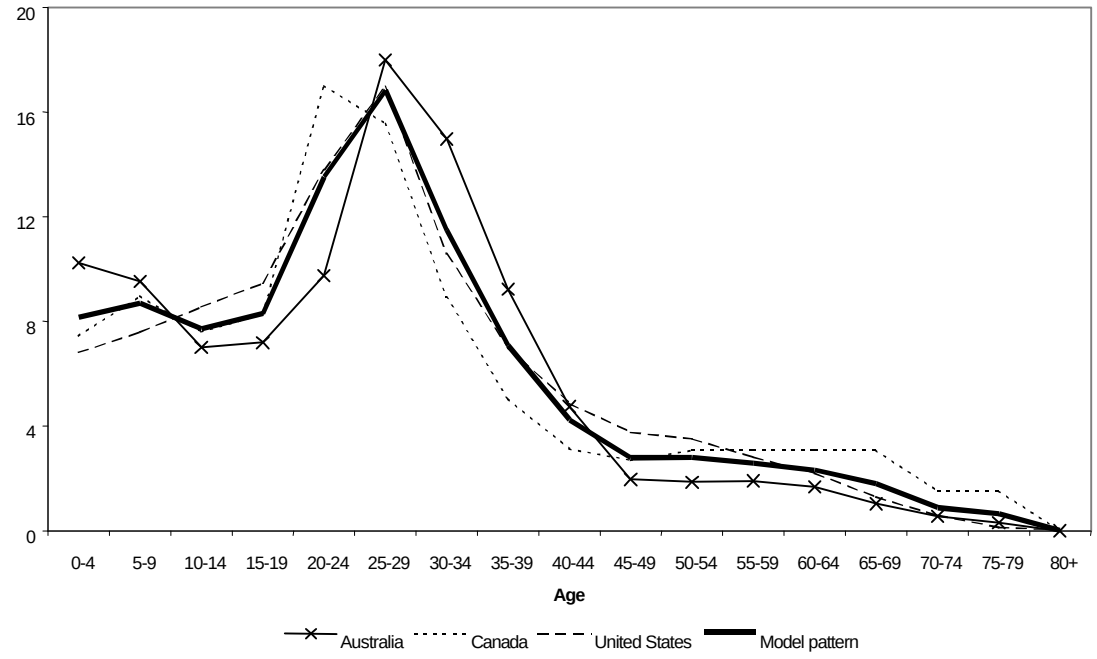


Figure III.2. Per cent distribution of female immigrants by age in Australia, Canada, United States of America and model pattern

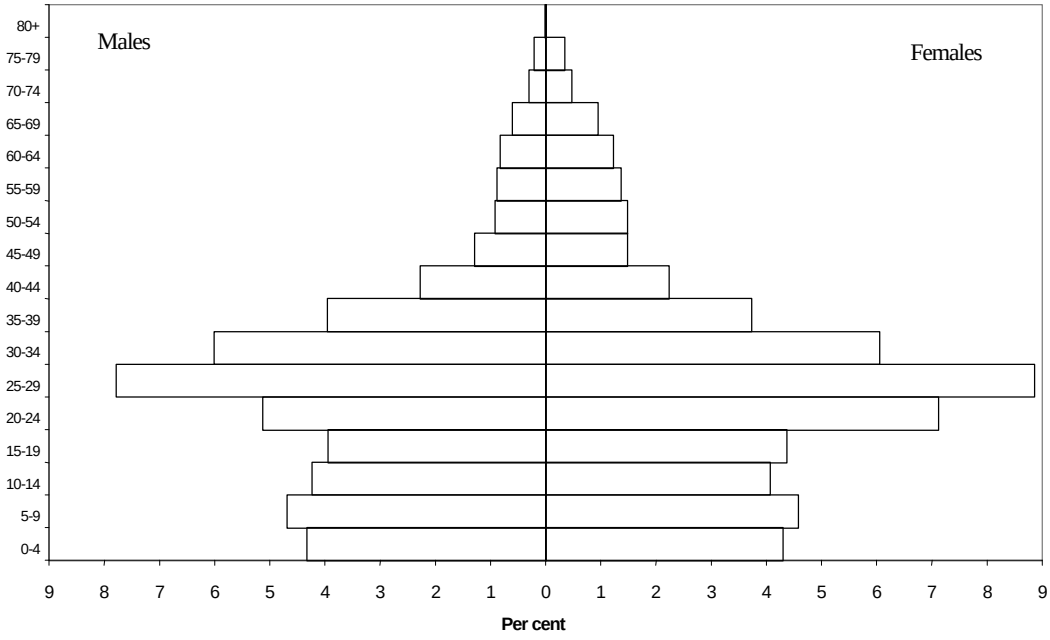


NOTE: The model pattern is the average of the three countries.

TABLE III.1. PER CENT DISTRIBUTION OF NET NUMBER OF MIGRANTS BY AGE AND SEX, MODEL PATTERN

Age groups	*Males*	*Females*	*Both sexes*
0-4	4.33	4.29	8.63
5-9	4.69	4.58	9.26
10-14	4.24	4.06	8.30
15-19	3.94	4.37	8.31
20-24	5.13	7.12	12.25
25-29	7.79	8.86	16.65
30-34	6.01	6.05	12.06
35-39	3.95	3.73	7.68
40-44	2.27	2.24	4.51
45-49	1.28	1.47	2.76
50-54	0.91	1.48	2.40
55-59	0.88	1.37	2.25
60-64	0.83	1.22	2.05
65-69	0.60	0.95	1.55
70-74	0.30	0.47	0.77
75-79	0.21	0.34	0.56
80+	0.01	0.01	0.02
Total	47.40	52.60	100.00

Figure III.3. Age-sex pyramid of immigrants, model pattern



IV. RESULTS

A. OVERVIEW

Past trends

At the middle of the 20th century, the average fertility level stood at 2.6 children per woman in Europe, and 2.4 children for the countries of the European Union (see table IV.1). For the countries in this study the range was from 2.2 children per woman in Germany and the United Kingdom, to 2.7 children in France and in Japan. Fertility was markedly higher in the United States, 3.4 children, and even higher in the Republic of Korea, 5.4 children per woman. By 1965-1970, fertility had increased a little on average for the countries of the European Union, to 2.5 children per woman, but had fallen below replacement level in the Russian Federation and in Japan, at 2.0 children, and had also decreased in the United States, to 2.5 children and more slowly in the Republic of Korea, to 4.7 children. By 1995-2000, fertility was below replacement level in all countries and regions of the study, with a relatively wide range of levels, from a high of 2.0 children in the United States to 1.2 children in Italy. The average for Europe and for the European Union was 1.4 children per woman.

As a consequence of this low, and decreasing, fertility history, coupled with a continuous decline of mortality, all populations aged rapidly. The potential support ratio (PSR), which is defined as the ratio of the population aged 15-64 years to the population aged 65 years or older, ranged between 6 and 8 in 1950 for the European Union countries, the United States and for Europe, and was 10 in the Russian Federation, 12 in Japan and 18 in the Republic of Korea. By 2000, the PSR had decreased by about 40 per cent, to 4 in the countries of the European Union and in Japan, 5 in the United States, the Russian Federation and Europe, and 11 in the Republic of Korea.

Scenario I

According to scenario I, the medium variant of the *1998 Revision*, the eight countries and two regions considered in this study would have below-replacement fertility levels until 2050 (see table IV.1). As a result, all of them, with the exception of the United States, would see their total population start declining before 2050. The population of Europe, for example, would be 101 million less (14 per cent) in 2050 than in 2000. The population of the European Union would be 44 million less in 2050 than in 2000, a 12 per cent reduction. Italy would see the largest relative loss, 28 per cent, followed by Japan, 17 per cent. The population of the United States would keep increasing significantly because its fertility does not fall far below replacement and substantial immigration is assumed to continue into the future. (The results of the *1998 Revision* are shown in the annex tables.)

All populations would continue to age rapidly. The PSR of the European Union and that of Europe would decrease by more than half between 2000 and 2050, from 4.1 to 2.0 and from 4.6 to 2.1, respectively. The largest decline, however, would be in the Republic of Korea, where the PSR would fall from 10.7 persons in the age-group 15-64 years per one person aged 65 or older, to 2.4.

Scenario II

Scenario II is the medium variant of the *1998 Revision* in which no migration is assumed after 1995. It serves mostly as a backdrop, in order to measure, by comparison, the effects of the migrations assumed in the other scenarios. The European Union would lose 62 million people (17 per cent) between 2000 and 2050, and Europe would lose 123 million people (17 per cent) (see table IV.2). Because the migration streams assumed in scenario I are not very large, the results of scenario II are not substantially

different from those of scenario I. The exception is the United States, where large flows of migration were assumed in scenario I. In scenario II the population of the United States would also start decreasing before 2050, and the increase between 2000 and 2050 would be 16 million (6 per cent), instead of 71 million as in scenario I. The only other countries in the group being studied where the population would be higher in 2050 than in 2000 are the Republic of Korea (10 per cent higher) and France (1 per cent higher).

In all countries and regions, the population aged 15-64 years would decline earlier and faster than the total population. For example, while the European Union would see its total population decline by 17 per cent between 2000 and 2050, the population aged 15-64 would decline by 30 per cent.

The proportion of the population aged 65 years or older would continue to increase rapidly, and, in 2050, would reach 30 per cent for the European Union and 28 per cent for Europe. The highest proportion aged 65 years or older in 2050 would be in Italy (35 per cent) and in Germany and Japan (32 per cent), and the lowest in the United States (23 per cent), with the Russian Federation, the Republic of Korea and the United Kingdom at 25 per cent, and France at 26 per cent. The potential support ratio would decrease rapidly for all countries and regions, reaching 1.9 for the European Union and 2.0 for Europe in 2050 (see table IV.3). The lowest level for the PSR in 2050, 1.5, would be in Italy, and the highest, 2.6, in the United States.

Scenario III

In the absence of migration after 1995, all countries and the two regions would see their populations start declining before 2050. Scenario III keeps the size of the total population at the maximum level it would reach in the absence of migration. The dates at which this maximum will be reached differ by country. The earliest is 1995 for Germany, Italy, the Russian Federation and Europe, and 2000 for the European Union. The latest is 2035 for the Republic of Korea and 2030 for the United States. The total number of migrants needed to keep the total population constant at its maximum size until 2050, would be 47 million for the European Union and 100 million for Europe (see table IV.4). It would be 28 million in the Russian Federation, 18 million in Germany and 17 million in Japan, but only 1.5 million in France and in the Republic of Korea. In 2050 the proportion of the total population which would be made up of post-1995 immigrants and their descendants would range from 2 per cent in the United States and 3 per cent in France and in the Republic of Korea, to 28 per cent in Germany and 29 per cent in Italy. The potential support ratios in 2050 would be a little higher than in scenario II, and range from 2.0 in Italy and 2.1 in Japan to 2.6 in the United States and 2.9 in the Russian Federation (see table IV.5).

Scenario IV

Scenario IV keeps the size of the population aged 15-64 years at the maximum level it would reach in the absence of migration. The dates at which this maximum will be reached differ by country. They range from 1995 for the European Union, Germany, Italy and Japan, 2000 for the Russian Federation and 2005 for Europe, to 2010 for France and for the United Kingdom, 2015 for the United States and 2020 for the Republic of Korea. The total number of migrants needed to keep the population aged 15-64 constant until 2050 would be larger than in scenario III. The number that would be needed under scenario IV is 80 million for the European Union and 161 million for Europe (see table IV.4). The numbers range from 5 million in France and 6 million in the Republic of Korea and the United Kingdom, to 25 million in Germany and 33 million in Japan. However, when the number of migrants are related to population size in the year 2000, it is Italy and Germany which need the largest number of migrants over the period to 2050, respectively 6,500 and 6,000 annually per million inhabitants (see table IV.6 and figure IV.1). Among the countries studied, the United States needs the smallest number, approximately 1,300 per million inhabitants. In 2050 the proportion of the total population which would be made up of post-1995 immigrants and their descendants would range from 8 per cent in the United States and 12 per

cent in France, to 36 per cent in Germany and 39 per cent in Italy (see table IV.7). The potential support ratios would range from 2.2 in Italy and in Japan, to 2.8 in the Republic of Korea and 3.1 in the Russian Federation.

Scenario V

Scenario V keeps the potential support ratio at its 1995 level, which was 4.3 for the European Union and 4.8 for Europe, and ranged from 4.1 in Italy and in the United Kingdom to 5.6 in the Russian Federation and 12.6 in the Republic of Korea. The total number of migrants needed to keep the potential support ratio constant until 2050 is extremely large in all countries (see table IV.4). It is 700 million for the European Union and nearly 1.4 billion for Europe. It ranges from 60 million in the United Kingdom and 94 million in France to more than half a billion in Japan and in the United States, and 5 billion in the Republic of Korea. In 2050, the proportion of the population that would be post-1995 migrants or their descendants would range from 59 per cent in the United Kingdom to 99 per cent in the Republic of Korea.

Discussion

In the absence of migration all eight countries and the two regions with fertility below replacement will see their total population start declining before 2050 and their populations in the working-age group 15-64 years will decline even faster. Their populations will also age very rapidly. However many, if not most of them, have had immigrants in the recent past, and can be expected to have immigrants in the future also. Table IV.8 shows the annual net numbers of migrants for the period 1990 to 1998.

During the period 1990 to 1994, for example, the European Union received an average of a little over a million net immigrants per year, and a little over 600,000 per year during 1995 to 1998. These numbers are quite close to the numbers of migrants that the European Union would need to receive to prevent its total population from declining: 612, 000 per year between 2000 and 2025 and 1.3 million per year between 2025 and 2050. However, the annual numbers of immigrants who would be needed to prevent the population in working-age from declining are about double the numbers received in the last decade.

While the situation varies from country to country, it is somewhat similar in many of the countries with past experience with immigration. In France, Germany and the United Kingdom, the numbers of immigrants needed to keep constant the total population or the working-age population vary irregularly through time because of specific age-structures. They are comparable to, or at most double, the numbers of immigrants received during the past decade. In the United States, the annual numbers of immigrants needed for both purposes are smaller than past immigration. In addition, the proportion in 2050 of the post-1995 migrants and their descendants in the total population (see table IV.7), in scenarios III and IV, is less than or equal to the proportion of migrants in the total population in 1990 in France (10.4 per cent) and in the United States (7.9 per cent). In Germany and in Italy, however, scenario III would result in about 30 per cent, and scenario IV about 40 per cent, of post-1995 migrants and their descendants in the 2050 population, which is much more than the current situation (see table IV.9).

In scenarios III and IV, in all countries and regions, the potential support ratio would be much lower in 2050 than its 1995 level, and in some cases the decline in the PSR is substantial.

The annual numbers of immigrants needed to keep the potential support ratios constant at their 1995 levels (scenario V) are vastly larger, in every country, than any past experience (see figure IV.2). Scenario V would furthermore result in having between 59 per cent and 99 per cent of the population of all countries in 2050 composed of post-1995 migrants and their descendants.

In the absence of migration (scenario II), the figures show that the ratios between population in working-age and population past working-age would remain in 2050 at their 1995 levels if, by 2050, the upper limits of the working-age span were increased from 65 years to about 72 years in the United Kingdom, 73 years in the Russian Federation, 74 years in France and in the United States, 77 years in Germany, Italy and Japan, and 82 years in the Republic of Korea (see table IV.10).

The European Union and the United States - the world's two largest economic blocks, often in competition which each other - are projected to follow starkly contrasting demographic paths in the coming decades: while the population of the United States would increase by 82 million between 1995 and 2050, that of the European Union would decline by 41 million (see table IV.11). As a result, the population of the United States, which in 1995 was 105 million smaller than that of European Union, will become larger by 18 million in 2050. The same trends will characterize their working-age populations: while the number of people aged 15-65 years will decline by 61 million in the European Union, in the United States it will increase by 39 million. By 2050, the working age population of the United States will outnumber that of the European Union by 26 million, while in 1995 it was outnumbered by 75 million. Therefore, although the elderly population would increase more and faster in the United States than in the European Union, the potential support ratio will continue to be less favourable in the European Union compared to the United States – in 2050 it would stand at 2.0 persons of working-age per elderly person in the case of the European Union, against 2.8 in the United States.

TABLE IV.1. TOTAL FERTILITY RATES, 1950 TO 2050, BY COUNTRY OR REGION
(*Number of children per woman*)

	Period				
Country or region	*1950-1955*	*1965-1970*	*1995-2000*	*2020-2025*	*2045-2050*
France	2.73	2.61	1.71	1.96	1.96
Germany	2.16	2.32	1.30	1.58	1.64
Italy	2.32	2.49	1.20	1.47	1.66
Japan	2.75	2.00	1.43	1.73	1.75
Republic of Korea	5.40	4.71	1.65	1.90	1.90
Russian Federation	2.51	2.02	1.35	1.70	1.70
United Kingdom	2.18	2.52	1.72	1.90	1.90
United States	3.45	2.55	1.99	1.90	1.90
Europe	2.56	2.35	1.42	1.67	1.78
European Union	2.39	2.52	1.44	1.45	1.80

Source: United Nations Population Division, *World Population Prospects: The 1998 Revision*.

TABLE IV.2. TOTAL POPULATION (ZERO MIGRATION AFTER 1995), 1950 TO 2050, BY COUNTRY OR REGION
(*Thousands*)

	Year				
Country or region	*1950*	*1975*	*2000*	*2025*	*2050*
France	41 289	52 699	58 879	61 121	59 357
Germany	68 376	78 679	80 985	72 643	58 812
Italy	47 104	55 441	56 950	50 679	40 722
Japan	83 625	111 524	126 714	121 150	104 921
Republic of Korea	20 357	35 281	46 946	53 020	51 751
Russian Federation	102 192	134 233	144 960	131 824	114 248
United Kingdom	50 616	56 226	58 600	58 768	55 594
United States	157 813	220 165	274 335	296 616	290 643
Europe	547 318	676 390	723 482	684 055	600 464
European Union	296 151	349 313	372 440	354 500	310 839

TABLE IV.3. POTENTIAL SUPPORT RATIO (ZERO MIGRATION AFTER 1995), 1950 TO 2050, BY COUNTRY OR REGION
(*Number of persons aged 15-64 per person aged 65 or older*)

	Year				
Country or region	*1950*	*1975*	*2000*	*2025*	*2050*
France	5.79	4.65	4.10	2.82	2.26
Germany	6.90	4.29	4.11	2.45	1.75
Italy	7.92	5.29	3.72	2.40	1.52
Japan	12.06	8.60	3.99	2.24	1.71
Republic of Korea	18.16	16.25	10.67	4.43	2.40
Russian Federation	10.49	7.66	5.51	3.63	2.41
United Kingdom	6.24	4.50	4.08	2.93	2.36
United States	7.83	6.15	5.21	3.09	2.57
Europe	7.99	5.67	4.65	3.03	2.04
European Union	6.97	4.84	4.06	2.66	1.89

TABLE IV.4. NET NUMBER OF MIGRANTS, 1995-2050, BY SCENARIO AND COUNTRY OR REGION
(*Thousands*)

Scenario	*I*	*II*	*III*	*IV*	*V*
Country or region	*Medium variant*	*Medium variant with zero migration*	*Constant total population*	*Constant age group 15-64*	*Constant ratio 15-64/65 years or older*
		A. Total number			
France	525	0	1 473	5 459	93 794
Germany	11 400	0	17 838	25 209	188 497
Italy	660	0	12 944	19 610	119 684
Japan	0	0	17 141	33 487	553 495
Republic of Korea	-450	0	1 509	6 426	5 148 928
Russian Federation	7 417	0	27 952	35 756	257 110
United Kingdom	1 200	0	2 634	6 247	59 775
United States	41 800	0	6 384	17 967	592 757
Europe	23 530	0	100 137	161 346	1 386 151
European Union	16 361	0	47 456	79 605	700 506
		B. Average annual number			
France	10	0	27	99	1 705
Germany	207	0	324	458	3 427
Italy	12	0	235	357	2 176
Japan	0	0	312	609	10 064
Republic of Korea	-8	0	27	117	93 617
Russian Federation	135	0	508	650	4 675
United Kingdom	22	0	48	114	1 087
United States	760	0	116	327	10 777
Europe	428	0	1 821	2 934	25 203
European Union	297	0	863	1 447	12 736

TABLE IV.5. POTENTIAL SUPPORT RATIO IN 1995, AND IN 2050 BY SCENARIO AND COUNTRY OR REGION
(*Number of persons aged 15-64 per person aged 65 or older*)

		2050				
		I	*II*	*III*	*IV*	*V*
Country or region	*1995*	*Medium variant*	*Medium variant with zero migration*	*Constant total population*	*Constant age group 15-64*	*Constant ratio 15-64/65 years or older*
France	4.36	2.26	2.26	2.33	2.49	4.36
Germany	4.41	2.05	1.75	2.26	2.44	4.41
Italy	4.08	1.52	1.52	2.03	2.25	4.08
Japan	4.77	1.71	1.71	2.07	2.19	4.77
Republic of Korea	12.62	2.40	2.40	2.49	2.76	12.62
Russian Federation	5.62	2.43	2.44	2.86	3.12	5.62
United Kingdom	4.09	2.37	2.36	2.49	2.64	4.09
United States	5.21	2.82	2.57	2.63	2.74	5.21
Europe	4.81	2.11	2.04	2.38	2.62	4.81
European Union	4.31	1.97	1.89	2.21	2.42	4.31

TABLE IV.6. AVERAGE ANNUAL NET NUMBER OF MIGRANTS BETWEEN 2000 AND 2050, PER MILLION INHABITANTS IN 2000, BY SCENARIO AND COUNTRY OR REGION

Scenario	*I*	*II*	*III*	*IV*	*V*
Country or region	*Medium Variant*	*Medium variant with zero migration*	*Constant total population*	*Constant age group 15-64*	*Constant ratio 15-64/65 years or older*
France	110	0	500	1 854	30 430
Germany	2 519	0	4 244	6 009	44 825
Italy	109	0	4 414	6 531	39 818
Japan	0	0	2 705	5 103	82 634
Republic of Korea	138	0	643	2 738	2 184 700
Russian Federation	752	0	3 435	4 933	34 958
United Kingdom	341	0	899	2 132	20 383
United States	2 770	0	465	1 310	43 201
Europe	519	0	2 650	4 460	37 511
European Union	724	0	2 548	4 262	36 194

TABLE IV.7. PER CENT OF POST-1995 MIGRANTS AND THEIR DESCENDANTS IN TOTAL POPULATION IN 2050, BY SCENARIO AND COUNTRY OR REGION

Scenario	*I*	*II*	*III*	*IV*	*V*
Country or region	*Medium variant*	*Medium variant with zero migration*	*Constant total population*	*Constant age group 15-64*	*Constant ratio 15-64/65 years or older*
France	0.9	0.0	2.9	11.6	68.3
Germany	19.8	0.0	28.0	36.1	80.3
Italy	1.2	0.0	29.0	38.7	79.0
Japan	0.0	0.0	17.7	30.4	87.2
Republic of Korea	-0.9	0.0	3.2	13.9	99.2
Russian Federation	5.8	0.0	22.9	27.6	71.9
United Kingdom	1.9	0.0	5.5	13.6	59.2
United States	16.8	0.0	2.5	7.9	72.7
Europe	4.3	0.0	17.5	25.8	74.4
European Union	6.2	0.0	16.5	25.7	74.7

TABLE IV.8. NET ANNUAL MIGRATION FLOWS, 1990 TO 1998

Country or region/Year	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*
France	80 000	90 000	90 000	70 000	50 000	40 000	35 000	40 000	40 000
Germany	656 166	602 563	776 397	462 284	315 568	398 263	281 493	93 433	50 821
Italy	24 212	4 163	181 913	181 070	153 364	95 499	149 745	126 554	113 804
Japan	2 000	38 000	34 000	-10 000	-82 000	-50 000	-13 000	14 000	38 000
Republic of Korea[a]	-	-	-10 000	-	-	-	-	-20 000	-
Russian Federation	164 000	51 600	176 100	430 100	810 000	502 200	343 600	352 600	285 200
United Kingdom	68 384	76 416	44 887	90 141	84 242	116 869	104 075	88 476	-12 406
United States	1 536 483	1 827 167	973 977	904 292	804 416	720 461	915 900	798 378	660 477
Europe[a]	-	-	1 047 000	-	-	-	-	950 000	-
European Union	1 008 251	1 078 441	1 350 132	1 062 116	782 855	805 363	734 596	512 208	378 687

Sources: European Union, France, Germany, Italy and the United Kingdom: European Commission, Eurostat, *Demographic Statistics: Data 1960-99* (Luxembourg, 1999); Japan: Management and Coordination Agency, Statistics Bureau, *Japan Statistical Yearbook 2000* (Tokyo, 1999); Russian Federation: State Committee of the Russian Federation, *Russian Statistical Yearbook 1999* (Moscow, 1999); United States: Department of Justice, Immigration and Naturalization Service, *1997 Statistical Yearbook of the Immigration and Naturalization Service* (Washington, D.C., 1999a); Ibid, *Legal Immigration, Fiscal Year 1998*, Annual report No.2 (Washington, D.C., 1999b).

[a] Europe and the Republic of Korea: Averages for 1990-1995 and 1995-2000 from *World Population Prospects: The 1998 Revision*, vol.1 (United Nations).

NOTE: Data for the United States of America contains only immigration; data for all other countries is net migration

TABLE IV.9. MIGRANT STOCK (FOREIGN-BORN), 1990

Country or region	*Number of migrants (thousands)*	*Per cent of total population*
France	5 897	10.4
Germany[a]	5 037	6.4
Italy	1 549	2.7
Japan[a]	868	0.7
Russian Federation[b]	..	..
Republic of South Korea	900	2.1
United Kingdom	3 718	6.5
United States	19 603	7.9
Europe[c]	11 152	4.3
European Union	21 378	5.8

Source: *Trends in total migration stock, Revision 4* (POP/IB/DB/96/1/Rev.4), database maintained by the Population Division, Department of Economic and Social Affairs of the United Nations Secretariat.

[a]The data refer to foreign citizen.

[b]Data are not readily available.

[c]Data includes Bulgaria, Hungary, Poland, Romania, Denmark, Finland, Iceland, Ireland, Norway, Sweden, United Kingdom, Albania, Andorra, Greece, Italy, Malta, Liechtenstein, Luxembourg, Monaco, Netherlands, Switzerland; for the other European countries data are not readily available.

TABLE IV.10. UPPER LIMIT OF WORKING-AGE NEEDED TO OBTAIN IN 2050 THE POTENTIAL SUPPORT RATIO OBSERVED IN 1995, SCENARIO II, BY COUNTRY OR REGION

Country or region	*Age*
France	73.9
Germany	77.2
Italy	77.3
Japan	77.0
Republic of Korea	82.2
Russian Federation	72.7
United Kingdom	72.3
United States	74.3
Europe	75.1
European Union	75.7

TABLE IV.11. TOTAL POPULATION IN 1995 AND IN 2050, AND GROWTH RATES BY SCENARIO, BY COUNTRY OR REGION

		2050				
		I	*II*	*III*	*IV*	*V*
Country or region	*1995*	*Medium variant*	*Medium variant with zero migration*	*Constant total population*	*Constant age group 15-64*	*Constant ratio 15-64/65 years or older*
		A. Total population (thousands)				
France	58 020	59 883	59 357	61 121	67 130	187 193
Germany	81 661	73 303	58 812	81 661	92 022	299 272
Italy	57 338	41 197	40 722	57 338	66 395	193 518
Japan	125 472	104 921	104 921	127 457	150 697	817 965
Republic of Korea	44 949	51 275	51 751	53 470	60 125	6 233 275
Russian Federation	148 097	121 256	114 178	148 097	157 658	406 551
United Kingdom	58 308	56 667	55 594	58 833	64 354	136 138
United States	267 020	349 318	290 643	297 970	315 644	1 065 174
Europe	727 912	627 691	600 464	727 912	809 399	2 346 459
European Union	371 937	331 307	310 839	372 440	418 509	1 228 341
		B. Average annual growth rate 1995-2050 (per cent)				
France		0.06	0.04	0.09	0.27	2.13
Germany		-0.20	-0.60	0.00	0.22	2.36
Italy		-0.60	-0.62	0.00	0.27	2.21
Japan		-0.33	-0.33	0.03	0.33	3.41
Republic of Korea		0.24	0.26	0.32	0.53	8.97
Russian Federation		-0.36	-0.47	0.00	0.11	1.84
United Kingdom		-0.05	-0.09	0.02	0.18	1.54
United States		0.49	0.15	0.20	0.30	2.52
Europe		-0.27	-0.35	0.00	0.19	2.13
European Union		-0.21	-0.33	0.00	0.21	2.17

Figure IV.1. Average annual net number of migrants between 2000 and 2050 to maintain size of working-age population, per million inhabitants in 2000

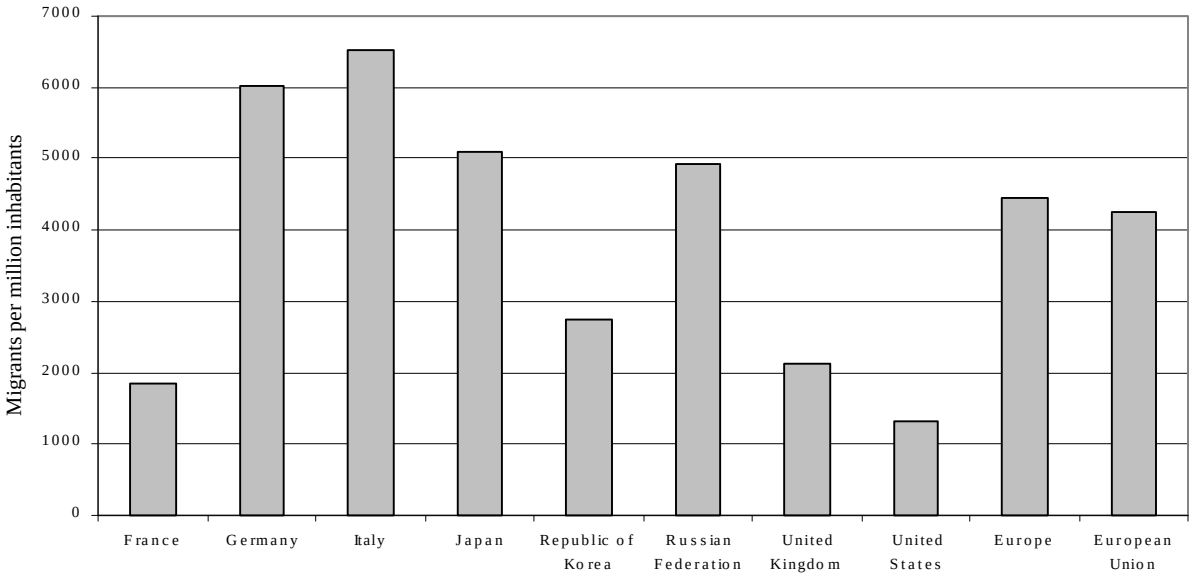
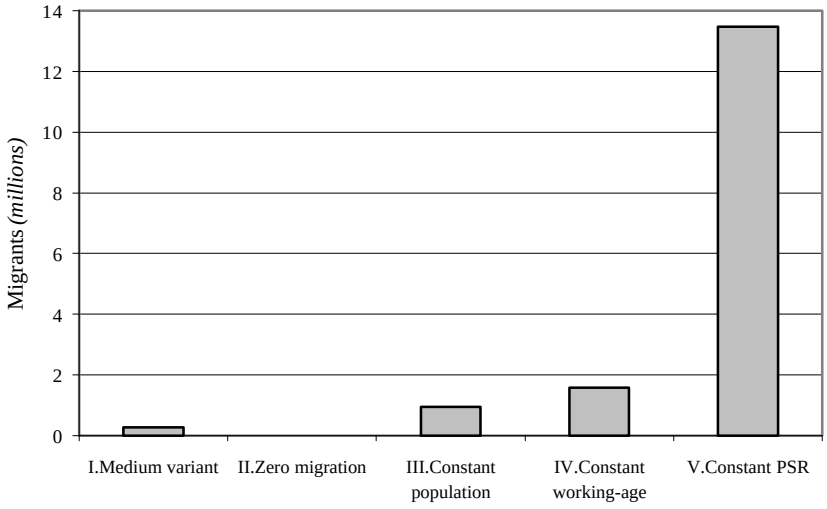


Figure IV.2. Average annual net number of migrants between 2000 and 2050, by scenario, for the European Union



B. COUNTRY RESULTS

ITALY

Past trends

The total fertility rate in Italy went up from 2.3 in 1950-1960 to 2.5 in 1960-1970, and has been declining ever since. It has been below replacement level since 1975, and in 1995-2000 it is estimated at 1.20 children per woman, one of the lowest in the world. Since 1950 mortality has declined consistently, resulting in an increase in life expectancy for both sexes from 66.0 years in 1950-1955 to 77.2 years in 1990-1995. Despite an estimated net annual immigration of 70,000 in 1995-2000, the population of Italy declined during 1995-2000. Among the consequences of these demographic changes is the more than doubling of the proportion of the population aged 65 or older, from 8.3 per cent of the population in 1950 to 16.8 per cent in 1995.

As a result of these changes, the potential support ratio for Italy has declined from 7.9 persons aged 15-64 for each person aged 65 or older in 1950 to 4.1 in 1995.

Scenario I

This scenario, which is the medium variant of the United Nations *1998 Revision*, assumes that there will be 660,000 net immigrants between 1995 and 2020, after which there would be no more migration to Italy. Under this scenario, the population of Italy would decline by 28 per cent, from 57.3 million in 1995 to 41.2 million in 2050 (The results of the 1998 United Nations projections are shown in the annex tables). The population aged 15-64 would decline by 44 per cent over the same period, while the population over 65 years old would increase by 49 per cent, from 9.6 million to 14.4 million. Persons aged 65 or older would constitute more than one-third of the population of Italy by 2050. As a result, the potential support ratio would decrease by 63 per cent from 4.1 in 1995 to 1.5 in 2050.

Scenario II

Scenario II, which is the medium variant with zero migration, assumes that fertility and mortality will change according to the medium variant projections of the United Nations *1998 Revision*, but that there will be no migration into Italy after 1995. The results are very similar to those in Scenario I. Italy's population in 2050 would be 40.7 million, only 475,000 persons less than under Scenario I. There would be 21.6 million and 14.2 million persons aged 15-64 and 65 or older, respectively, in 2050. As in Scenario I, the potential support ratio would decrease by 63 per cent from 4.1 in 1995 to 1.5 in 2050.

Scenario III

It is assumed, for Scenario III, that between 1995 and 2050 the total population of Italy will remain constant at its 1995 size of 57.3 million persons. A total of 12.9 million net migrants between 1995 and 2050 would be required to attain this goal. The annual net immigration would increase steadily from 75,000 in 1995-2000 to 318,000 in 2045-2050. Under this scenario, by 2050, 16.6 million persons, or about 29 per cent of the population, would be post-1995 immigrants or their descendants.

Scenario IV

This scenario assumes that Italy's population aged 15-64 would remain constant at its 1995 level of 39.2 million, stopping the decline in the size of this age group. To achieve this objective, 19.6 million immigrants would be needed between 1995 and 2050. The average annual number of migrants would vary, reaching a peak of 613,000 persons per year between 2025 and 2030 and then declining to 173,000 per year in 2045-2050. Under this scenario, the population of Italy would grow by 16 per cent from 57.3 million in 1995 to 66.4 million in 2050. By the year 2050, 39 per cent of the population would be post-1995 migrants or their descendants. The potential support ratio would decrease from 4.1 in 1995 to 2.2 in 2050.

Scenario V

Scenario V keeps the potential support ratio at its 1995 level of 4.08. A total of 120 million immigrants between 1995 and 2050 would be required to maintain this constant ratio, yielding an overall average of 2.2 million immigrants per year. The resultant population of Italy in 2050 under this scenario would be 194 million, more than three times the size of the 1995 Italian population. Of this population, 153 million, or 79 per cent, would be post-1995 immigrants or their descendants.

Discussion

In 1995-2000, Italy's population growth rate is estimated at –0.01 per cent. This decline in population is expected despite a net immigration of 70,000 persons per year. The numbers of foreign-born in Italy have almost doubled from 821,000 in 1965 (1.6 per cent of the total population) to 1.5 million in 1995 (2.7 per cent of the population). According to Scenario III, to keep Italy's population from declining from its 1995 size, annual migration flows would have to be more than three times as large, on average, between 1995 and 2050 as was the case between 1990 and 1995. To keep the population in working-age from declining would require more than five times the 1990-1995 annual level of migration. In addition, for scenarios III and IV, the proportions of Italy's population in 2050 that would be made up of post-1995 immigrants or their descendants, 29 per cent and 39 per cent, respectively, are more than 10 times the proportion of the foreign-born population in 1995. Figure IV.8 shows, for scenarios I, II, III and IV, the population of Italy in 2050, indicating the share that are post-1995 migrants and their descendants.

The demographic changes are even greater in scenario V. This scenario requires more than twice as many immigrants between 1995 and 2050 as the total 1995 population of the country. Moreover, nearly four fifths of the resulting 2050 population of 194 million would be made up of post-1995 immigrants or their descendants.

In the absence of migration, the figures show that in order to maintain in 2050 the 1995 ratio of 4.1 persons in working-age for each older person past working-age, would require increasing by 2050 the upper limit of the working-age span to 77 years.

TABLE IV.14. POPULATION INDICATORS FOR ITALY BY PERIOD FOR EACH SCENARIO

Scenario	*I*	*II*	*III*	*IV*	*V*
Period	*Medium variant*	*Medium variant with zero migration*	*Constant total population*	*Constant age group 15-64*	*Constant ratio 15-64/65 years or older*
		A. Average annual number of migrants (thousands)			
1995-2000	70	0	75	203	1 261
2000-2025	12	0	214	315	1 310
2025-2050	0	0	289	428	3 225
2000-2050	6	0	251	372	2 268
1995-2050	12	0	235	357	2 176
		B. Total number of migrants (thousands)			
1995-2000	350	0	375	1 015	6 305
2000-2025	310	0	5 340	7 887	32 759
2025-2050	0	0	7 229	10 709	80 622
2000-2050	310	0	12 569	18 596	113 381
1995-2050	660	0	12 944	19 610	119 684
		C. Total population (thousands)			
1950	47 104	-	-	-	-
1975	55 441	-	-	-	-
1995	57 338	-	-	-	-
2000	57 298	56 950	57 338	58 000	63 477
2025	51 270	50 679	57 338	61 064	96 664
2050	41 197	40 722	57 338	66 395	193 518
		D. Age group 0-14 (thousands)			
1950	12 397	-	-	-	-
1975	13 436	-	-	-	-
1995	8 483	-	-	-	-
2000	8 165	8 116	8 214	8 380	9 760
2025	5 871	5 802	7 246	8 013	15 280
2050	4 945	4 888	8 124	9 717	35 615
		E. Age group 15-64 (thousands)			
1950	30 817	-	-	-	-
1975	35 326	-	-	-	-
1995	39 234	-	-	-	-
2000	38 721	38 486	38 762	39 234	43 139
2025	32 026	31 659	36 506	39 234	65 358
2050	21 875	21 623	32 985	39 234	126 808
		F. Age group 65+ (thousands)			
1950	3 890	-	-	-	-
1975	6 678	-	-	-	-
1995	9 621	-	-	-	-
2000	10 412	10 349	10 362	10 386	10 578
2025	13 373	13 218	13 586	13 817	16 026
2050	14 377	14 211	16 230	17 444	31 094
		G. Potential support ratio 15-65/65+			
1950	7.92	-	-	-	-
1975	5.29	-	-	-	-
1995	4.08	-	-	-	-
2000	3.72	3.72	3.74	3.78	4.08
2025	2.39	2.40	2.69	2.84	4.08
2050	1.52	1.52	2.03	2.25	4.08

ITALY

Figure IV.7. Age-sex structures by scenario for 2000, 2025 and 2050
(*Population in millions*)

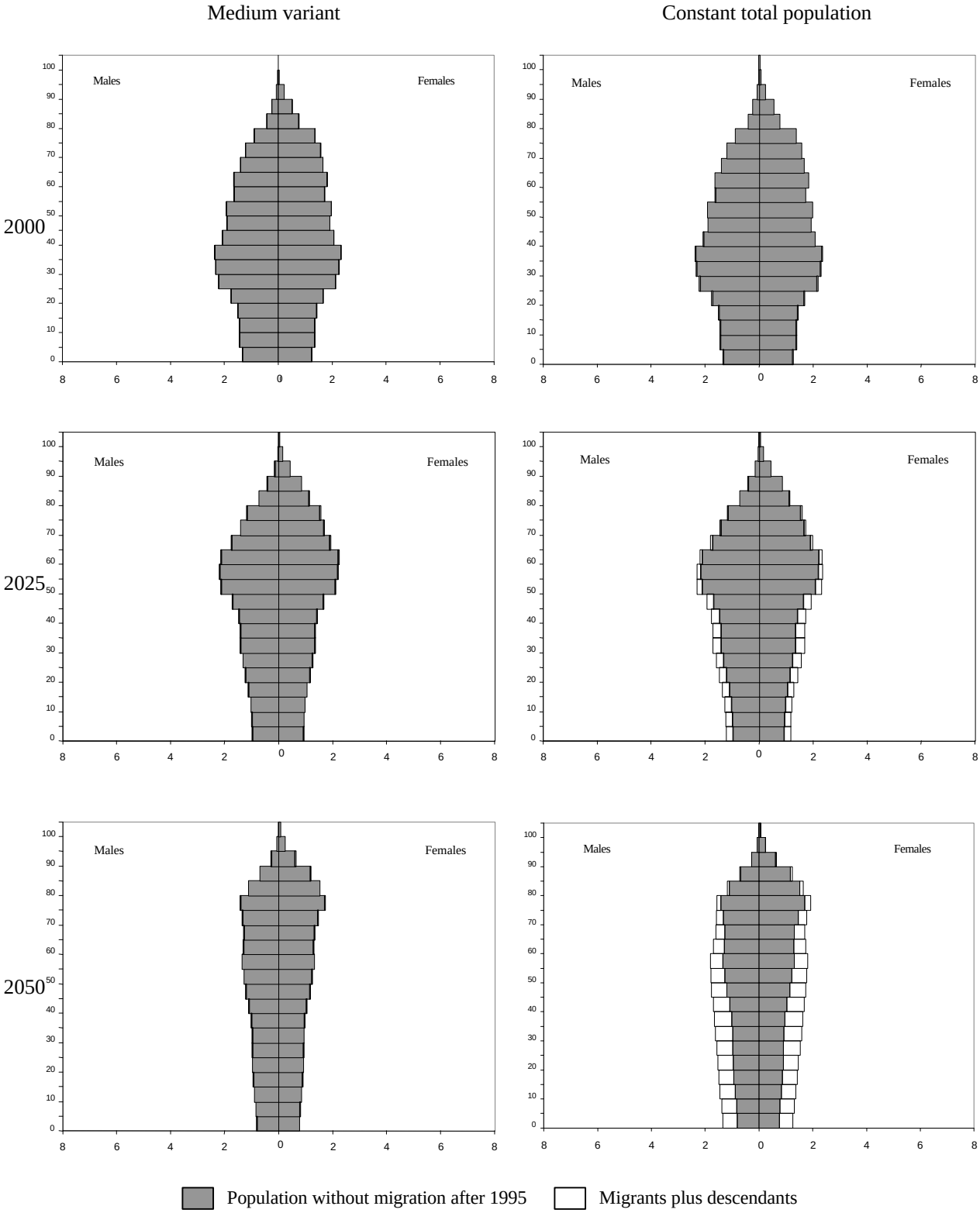


Figure IV.7 (continued)

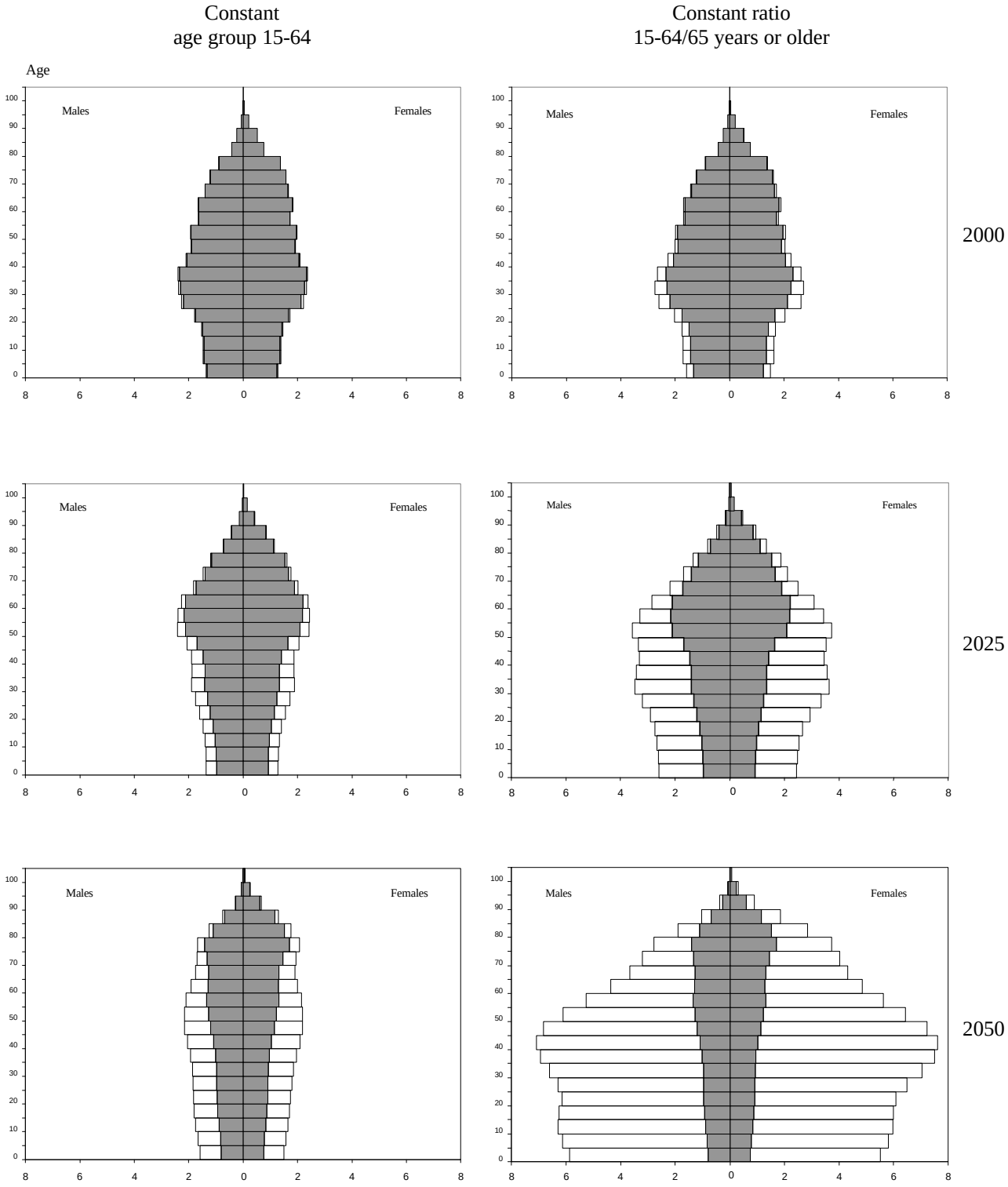
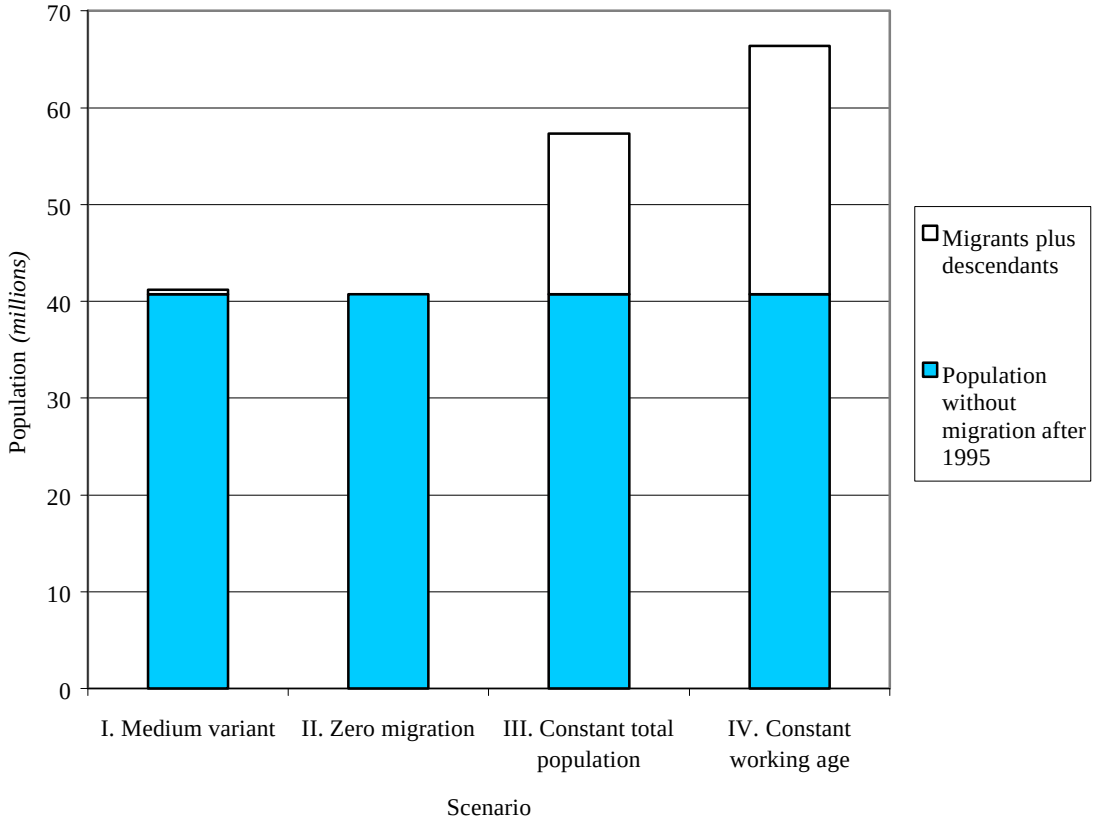


Figure IV.8. Population of Italy in 2050, indicating those who are post-1995 migrants and their descendants, by scenario



EUROPEAN UNION

Past trends

The total fertility rate in the 15 countries that presently constitute the European Union was on a rising curve until 1960-65, when it attained 2.69 births per woman. Since 1995, fertility has constantly decreased, coming under the replacement level of two children per woman around 1975. By 1990-95, it stood at 1.5 births per woman. Life expectancy at birth, meanwhile, has risen from 67.0 years in 1950-1955 to 76.5 years in 1990-1995. As a consequence of these trends, the proportion of the population aged 65 or older rose from 9.5 per cent in 1950 to 15.5 per cent in 1995, and the potential support ratio (the number of persons aged 15-64 for each person aged 65 or older) fell in the same period from 7.0 to 4.3.

Scenario I

Scenario I, the medium variant of the United Nations *1998 Revision*, assumes an average net intake very close to 300 thousand migrants per year between 1995-2050, for a total of almost 16.4 migrants during the period. The medium variant projects that the total population of the 15 countries would briefly continue to grow until around 2005, by which time it would attain 376.5 million; from that point, it would start to decline at increasing speed, so that by 2050 some 331.3 million people would remain - a loss of 40.6 million persons in relation to 1995 and 45.2 million persons in relation to the projected peak level in 2005 (The results of the 1998 United Nations projections are shown in the annex tables). This loss would be equivalent to the combined present population of the seven smallest members of the European Union, namely Austria, Finland, Denmark, Ireland, Luxembourg, Sweden and Portugal (see table IV.21). The European Union population, which in 1995 was some 100 million larger than that of the United States, in 2050 would have become smaller than the United States by about 20 million.

TABLE IV.21. POPULATION OF THE MEMBER COUNTRIES OF THE EUROPEAN UNION, 1995 AND 2050, SCENARIO I

Member countries as of 2000	*Population (thousands)*		*Projected change 1995-2050*	
	1995	*2050 (Scenario I)*	*(thousands)*	*(per cent)*
Austria	8 001	7 094	- 907	- 11.3
Belgium	10 088	8 918	- 1 170	- 11.6
Denmark	5 225	4 793	- 567	- 10.9
Finland	5 108	4 898	- 210	- 4.1
France	58 020	59 883	1 863	+ 3.2
Germany	81 661	73 303	- 8 358	- 10.2
Greece	10 489	8 233	- 2 256	- 21.5
Ireland	3 609	4 710	1 101	+ 30.5
Italy	57 338	41 197	- 16 141	- 28.2
Luxembourg	407	430	23	+ 5.7
Netherlands	15 459	14 156	- 1 303	- 8.4
Portugal	9 856	8 137	- 1 719	- 17.4
Spain	39 568	30 226	9 342	- 23.6
Sweden	8 800	8 661	- 139	- 1.6
United Kingdom	58 308	56 667	- 1 641	- 2.8
European Union	371 937	331 307	- 40 630	- 10.9

The population aged 15-64 would register first a slight increase from 249 million in 1995 to less than 252 in 2005, but it would be followed by an accelerating decline that would bring it down to slightly under 188 million by 2050. The projected decline (61.5 million between 1995 and 2050) would thus reduce the working-age population by one quarter in relation to 1995 levels. On the other hand, the population aged 65 or older would register steady growth, rising from 58 million in 1995 to 96 million in 2050, an increase of approximately 65 per cent. As a result, the potential support ratio would decrease from 4.3 in 1995 to slightly less than 2.0 in 2050.

Scenario II

Scenario II, which is the medium variant with zero migration, uses the fertility and mortality assumptions of the medium variant of the *1998 Revision*, but without any migration to the 15 countries of the European Union after 1995. In this scenario, the total population would start declining already after 2000 rather than five years later, and by 2050 it would be down to approximately 311 million, which is 20 million less than in scenario I. The population aged 15-64 would immediately start declining, dropping from 249 million in 1995 to 174 million in 2050. Thus, without migration, the working age population would be cut by 30 per cent rather then by 25 per cent as in scenario I. The population aged 65 or older would increase from 58 million in 1995 to 92 million in 2050, entailing a decline of the potential support ratio to 1.9 in 2050, 0.1 less than projected in scenario I.

Scenario III

Scenario III keeps the size of the total population constant at its projected peak level of 372 million in 2000 (assuming no in-migration in the period 1995-2000). In order to keep the total population constant at that level, it would be necessary to have 47.4 million migrants between 2000 and 2050, an average of 949,000 migrants per year. By 2050, out of a total population of 372 million, 61.6 million, or 16.5 per cent, would be post-2000 immigrants or their descendants**.** The potential support ratio in 2050 would be 2.2, which is only 0.2 point higher than in scenario I.

Scenario IV

Scenario IV keeps the size of the population aged 15-64 constant at its 1995 level of 249 million (which would be the maximum level that it would have ever reached in absence of post-1995 migration). In order to keep the working age population constant at that level, it would be necessary in fact to have 79.6 million migrants between 1995 and 2050, an average of 1.4 million migrants per year. Due to irregularities in the age structure of the population, the annual number of migrants required to keep the working-age population constant would first grow rapidly and then decline. It would peak in 2025-2030, with an annual number of net migrants in excess of 2.8 million. By 2050, out of a total population of 418.5 million, post-1995 immigrants and their descendents would be 107.7 million, or 25.7 per cent. The potential support ratio in 2050 according to this scenario would be significantly higher than in scenario I, (2.4 against 2.0) but the difference is modest compared to magnitude of the drop from the level of 4.3 in 1995.

Scenario V

Scenario V keeps the potential support ratio at its 1995 value of 4.3 persons aged 15-64 for each person aged 65 or older. In order to keep the potential support ratio constant at that level, it would be necessary for the European Union to have 701 million immigrants from 1995 to 2050, an average of 12.7 million per year. Also, as under scenario IV, the irregularities in the age structure of the population would cause fluctuations in the annual number of migrants required to keep the potential support ratio constant. The peak levels would be attained in 2030-2035, with 20.3 million net immigrants per year. By 2050, out

of a total population of 1.2 billion, 918 million, or about 75 per cent, would be post-1995 immigrants or their descendants.

Discussion

According to recent national estimates, the European Union had an average annual net migration of 857,000 persons from 1990 to 1998. Thus, the number of migrants needed to prevent a decline in the total population is roughly comparable to the level of migration in the 1990s. However, in order to prevent a decline of the working-age population, the annual number of migrants would need to nearly double in relation to recent experience. Figure IV.21 shows, for scenarios I, II, III and IV, the population of the European Union in 2050, indicating the share that are post-1995 migrants and their descendants.

The number of migrants necessary annually to keep the potential support ratio constant at its 1995 level would be 15 times greater than the net migration level in the 1990s. Towards the end of the period, i.e. by 2040-2050, the net annual number of migrants required by the European Union would be equivalent to half the world's annual population growth.

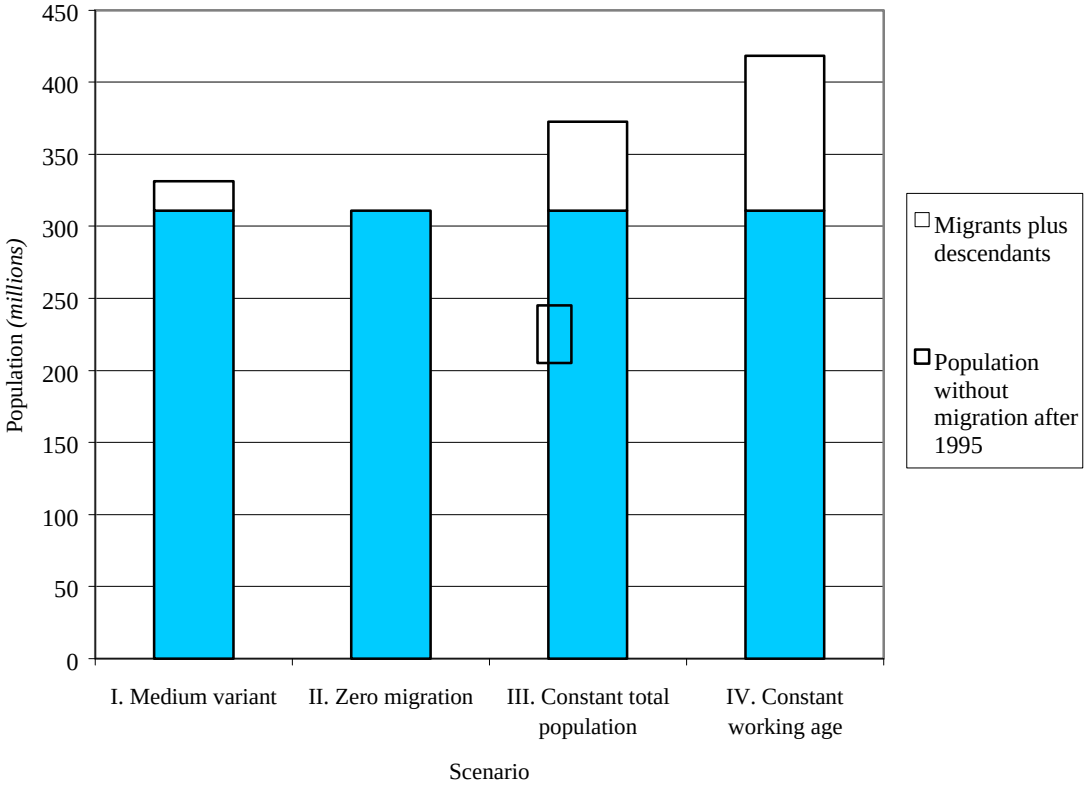
Thus, if replacement migration were to be used as the mechanism for shoring up the potential support ratio in the European Union at its present level, by 2050 the total population of the European Union would have grown to more than three times its present level. In this process, the European Union's share of world population would have more than doubled, from 6.6 per cent in 1995 to 13.8 percent 2050. In addition, three-quarters of the total population in 2050 would consist of post-1995 migrants from outside the present boundaries of the Union and their descendants.

In absence of migration, the calculations in this report indicate that the upper limit of the working age would need to be raised to about 76 years in the European Union in order to obtain in 2050 the same potential support ratio observed in 1995, i.e. 4.3 persons of working age per older person.

TABLE IV.22. POPULATION INDICATORS FOR EUROPEAN UNION BY PERIOD FOR EACH SCENARIO

Scenario	*I*	*II*	*III*	*IV*	*V*
Period	*Medium variant*	*Medium variant with zero migration*	*Constant total population*	*Constant age group 15-64*	*Constant ratio 15-64/65 years or older*
		A. Average annual number of migrants (thousands)			
1995-2000	574	0	0	46	5 302
2000-2025	330	0	612	1 380	8 556
2025-2050	210	0	1 287	1 795	18 404
2000-2050	270	0	949	1 588	13 480
1995-2050	297	0	863	1 447	12 736
		B. Total number of migrants (thousands)			
1995-2000	2 870	0	0	230	26 510
2000-2025	8 239	0	15 290	34 502	213 911
2025-2050	5 250	0	32 166	44 874	460 088
2000-2050	13 489	0	47 456	79 375	673 999
1995-2050	16 361	0	47 456	79 605	700 506
		C. Total population (thousands)			
1950	296 151	-	-	-	-
1975	349 313	-	-	-	-
1995	371 937	-	-	-	-
2000	375 276	372 440	372 440	372 680	400 089
2025	367 342	354 500	372 440	394 551	641 056
2050	331 307	310 839	372 440	418 509	1 228 341
		D. Age group 0-14 (thousands)			
1950	72 524	-	-	-	-
1975	82 958	-	-	-	-
1995	64 740	-	-	-	-
2000	62 380	61 879	61 879	61 941	69 006
2025	52 926	50 320	54 641	60 204	116 157
2050	47 856	44 130	57 445	65 846	237 981
		E. Age group 15-64 (thousands)			
1950	195 578	-	-	-	-
1975	220 708	-	-	-	-
1995	249 382	-	-	-	-
2000	251 299	249 213	249 213	249 382	268 773
2025	230 090	221 083	233 826	249 382	426 112
2050	187 851	174 470	216 929	249 382	803 974
		F. Age group 65+ (thousands)			
1950	28 049	-	-	-	-
1975	45 647	-	-	-	-
1995	57 815	-	-	-	-
2000	61 596	61 349	61 349	61 357	62 310
2025	84 326	83 096	83 973	84 964	98 786
2050	95 600	92 240	98 067	103 280	186 386
		G. Potential support ratio 15-64/65+			
1950	6.97	-	-	-	-
1975	4.84	-	-	-	-
1995	4.31	-	-	-	-
2000	4.08	4.06	4.06	4.06	4.31
2025	2.73	2.66	2.78	2.94	4.31
2050	1.96	1.89	2.21	2.41	4.31

Figure IV.21. Population of the European Union in 2050, indicating those who are post-1995 migrants and their descendants, by scenario



EUROPEAN UNION

Figure IV.22. Age-sex structures by scenario for 2000, 2025 and 2050
(*Population in millions*)

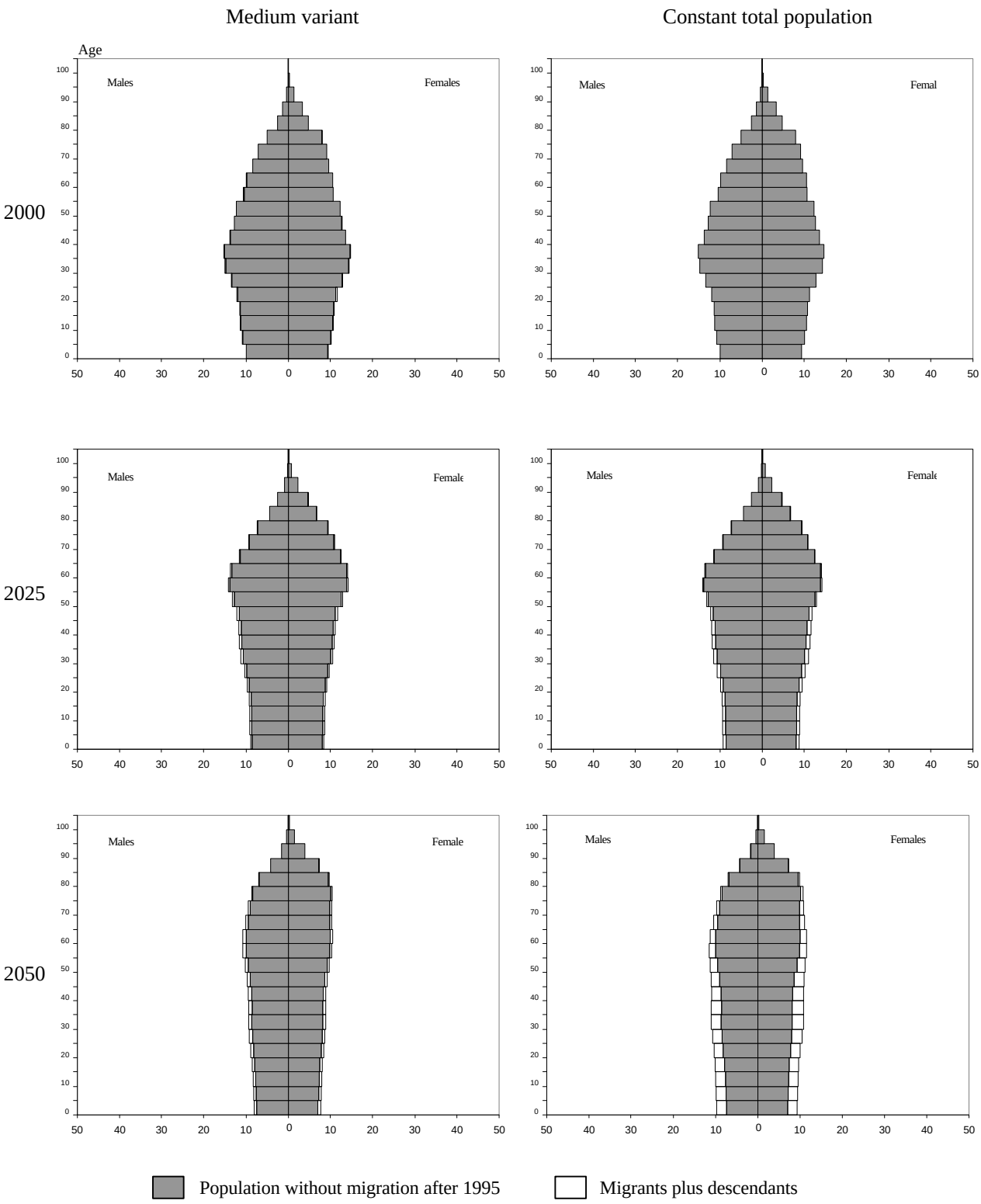
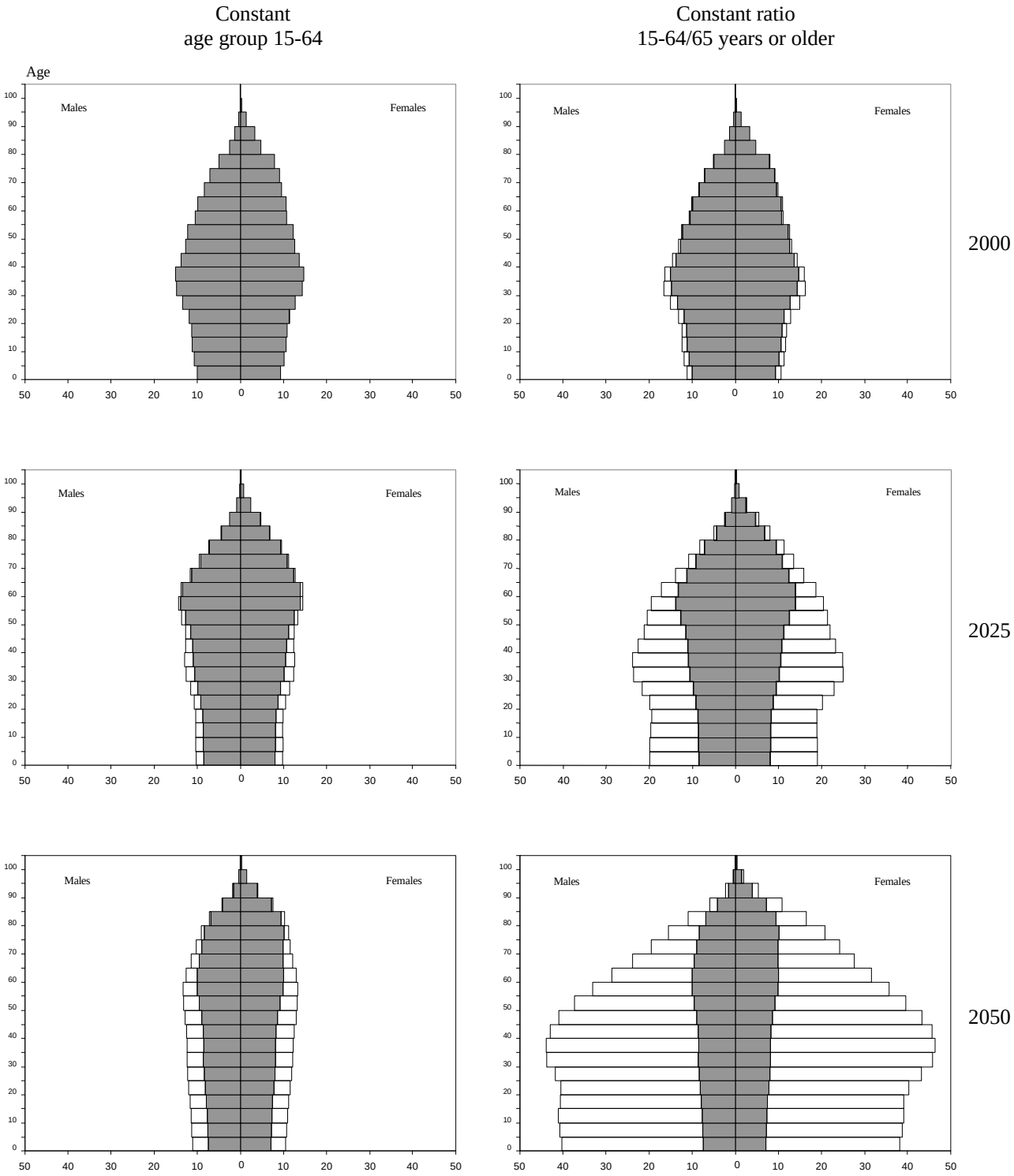


Figure IV.22 (continued)



V. CONCLUSIONS AND IMPLICATIONS

The present study focuses on the question of whether replacement migration is a solution to population decline and population ageing. Replacement migration refers to the international migration that would be needed to offset declines in the size of a population, declines in the population of working age as well as to offset the overall ageing of a population.

This replacement migration study focuses its investigation on the possible effects of international migration on the population size and age structure of a range of countries that have in common a fertility pattern below the replacement level. In the absence of migration, all countries with fertility below replacement level will see their population size start declining at some point of time in the near future, if it is not already the case today. In some countries, the projected declines in population size during the first half of the 21st century are as high as a quarter or a third of the entire population of the country.

In addition, the lower the levels of fertility decline, the more pronounced will be the aging of the population of the country. One of the major consequences of population aging is the reduction in the ratio between the population in working-age group 15-64 years and the population 65 years or older, i.e., the potential support ratio (PSR). Everything else being equal, a lower potential support ratio means that it is much more onerous for the working-age population to support the needs of the older retired population.

While to some extent an increase in the proportion of elderly persons aged 65 years or older is accompanied by a decrease in the proportion of children under 15 years of age, the two age groups are not directly comparable. Some studies have estimated that for an industrialized country, on average, the cost to support a person aged 65 years and over is substantially greater than the cost to support a young person less than 20 years old. A number of researchers, for example, Foot (1989), Cutler, Poterba, Sheiner, and Summers (1990), and Ahlburg and Vaupel (1993), report that when considering the public provision of programs or taking into account private non-medical expenses, public education expenses and medical care, the costs are roughly two and a half times greater to support an older person (aged 65 or older) than to support a young person (under 20 years of age).

While below-replacement fertility is the major cause of population decline and population aging, even a sudden sharp increase in fertility in the short to medium term would not substantially alter the situation regarding the potential support ratios. Of course, as was shown earlier in this report, the potential support ratios could be maintained at current levels by increasing the upper limit to the working-age population. In most cases, the upper limit would need to be raised to roughly 75 years. However, if retirement ages remain essentially where they are today, increasing the size of the working-age population through international migration is the only option in the short to medium term to reduce the declines in the potential support ratio.

The present study considers countries where current fertility ranges from 1.2 to 2.0 children per woman. For France, United Kingdom, the United States and the European Union, the number of migrants needed to offset population decline are less than or comparable to recent past experience. While this is also the case for Germany and the Russian Federation, their migration flows in the 1990s were relatively large due to reunification and dissolution, respectively. In contrast, for Italy, Japan, the Republic of Korea and Europe, a level of immigration much higher than experienced in the recent past would be needed to offset population decline. This higher level of immigration for Italy, Japan and Europe would result in 18 to 29 per cent of the 2050 population being post-1995 immigrants and their descendants; for the Republic of Korea the comparable figure is 3 per cent.

In the absence of migration, the size of the working-age population declines faster than the overall population. As a result of this faster rate of decline, the amount of migration needed to prevent a decline in the working-age population is larger than that for the overall population. In the four countries where fertility levels are close to the replacement level, the resultant population in 2050 would have 8 to 14 per cent being post-1995 migrants and their descendants. In the other six countries and regions, the post-1995 migrants and their descendants would be between 26 and 39 per cent of the 2050 population. While some of these numbers may appear to be high, they remain within the range of migration experienced in the recent past in some industrialized countries. For example, in 1990, 16 per cent of the population of Canada and Switzerland, and 23 per cent of the population of Australia, were foreign-born.

In contrast to the migration streams needed to offset total or working-age population decline, the levels of migration that would be needed to prevent the countries from ageing are of substantially larger magnitudes. By 2050, these larger migration flows would result in populations where the proportion of post-1995 migrants and their descendants would range between 59 per cent and 99 per cent. Such high levels of migration have not been observed in the past for any of these countries or regions. Moreover, it seems extremely unlikely that such flows could happen in these countries in the foreseeable future. Therefore, it appears inevitable that the populations of the low-fertility countries will age rapidly in the 21st century.

The consequences of a much older population age-structure than in the past are numerous and far-reaching. One important consideration that has been examined in this study is the potential support ratio (PSR). The current system of providing income and health services for older no-longer-working persons has been based, by and large, on an age structure with a potential support ratio of 4 to 5 persons in working-age for each older person aged 65 years or older. If the current age at retirement does not change, the PSR is projected to decline to about 2.

A decline of the PSR from 4 or 5 to 2 would certainly create the need to reconsider seriously the modalities of the present system of pensions and health care for the elderly. Theoretically, as noted above, a possible option would be to increase the upper limit of the working age sufficiently to attain a sustainable PSR. Such an option would simultaneously increase the numbers of working-age people and reduce the number of non-working older persons. Other possible options that may need to be examined thoroughly include adjusting economic measures, such as increased labour-force participation, higher contributions from workers and employers and lower benefits provided to retirees. Certainly, increased productivity in the future may increase the available resources from the working-age population. However, it is also possible that increased productivity may lead to increased aspirations and demands from both the working-age and the retired populations.

During the second half of the 20th century, the industrialized countries have benefited from population sizes and population age-structures that were the result of a history of moderate levels of fertility and low mortality. These favourable demographic circumstances made possible, to a large extent, the provision of relatively generous benefits to retirees at comparatively low costs to workers and employers. However, these age-structures were not permanent, but merely transitional.

During the first half of the 21st century, the populations of most industrialized countries are projected to become smaller and older in response to below-replacement fertility as well as increased longevity. The consequences of significant population decline and population ageing are not well understood as they are new demographic experiences for countries. Keeping retirement and health-care systems for older persons solvent in the face of declining and ageing populations, for example, constitutes a new situation that poses serious challenges for Governments and civil society.

The new challenges being brought about by declining and ageing populations will require objective, thorough and comprehensive reassessments of many established economic, social and political policies and programmes. Such reassessments will need to incorporate a long-term perspective. Critical issues to be addressed in those reassessments would include: (a) the appropriate ages for retirement; (b) the levels, types and nature of retirement and health-care benefits for the elderly; (c) the labour-force participation; (d) the assessed amounts of contributions from workers and employers to support retirement and health-care benefits for the increasing elderly population; and (e) policies and programmes relating to international migration, in particular replacement migration, and the integration of large numbers of recent migrants and their descendants.

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ANNEX TABLES

TABLE A.5. ITALY, *1998 REVISION*

ITALY

A. ESTIMATES

Indicator	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
Population (thousands)										
Total	47 104	48 633	50 200	52 112	53 822	55 441	56 434	56 771	57 023	57 338
Males	22 934	23 815	24 584	25 508	26 325	27 072	27 472	27 586	27 677	27 840
Females	24 170	24 818	25 616	26 605	27 497	28 369	28 962	29 185	29 346	29 498
Sex ratio (per 100 females)	94.9	96.0	96.0	95.9	95.7	95.4	94.9	94.5	94.3	94.4
Age distribution:										
Percentage aged 0-4	9.2	8.3	8.4	8.9	8.5	7.8	6.4	5.3	4.8	4.9
Percentage aged 5-14	17.1	16.7	16.4	15.4	16.0	16.4	15.9	14.2	11.0	9.9
Percentage aged 15-24	17.0	16.7	15.5	15.1	14.8	14.2	15.3	16.4	15.6	13.5
Percentage aged 60 or over	12.2	12.7	13.6	14.6	16.1	17.4	17.0	18.4	21.1	22.5
Percentage aged 65 or over	8.3	8.7	9.3	10.0	10.9	12.0	13.1	12.7	15.3	16.8
Percentage of women aged 15-49	51.4	51.4	49.8	48.3	48.1	46.8	47.1	48.3	49.0	48.7
Median age (years)	29.0	30.0	31.3	32.1	32.8	33.4	34.0	35.2	37.4	38.8
Population density (per sq km)	156	161	167	173	179	184	187	188	189	190

	1950-1955	1955-1960	1960-1965	1965-1970	1970-1975	1975-1980	1980-1985	1985-1990	1990-1995
Population change per year (thousands)	306	313	383	342	324	199	67	50	63
Births per year (thousands)	877	890	963	968	877	728	606	570	559
Deaths per year (thousands)	472	474	501	514	537	546	539	539	596
Population growth rate (percentage)	0.64	0.63	0.75	0.65	0.59	0.36	0.12	0.09	0.11
Crude birth rate (per 1,000 population)	18.3	18.0	18.8	18.3	16.1	13.0	10.7	10.0	9.8
Crude death rate (per 1,000 population)	9.9	9.6	9.8	9.7	9.8	9.8	9.5	9.5	10.4
Total fertility rate (per woman)	2.32	2.35	2.55	2.49	2.28	1.92	1.55	1.35	1.28
Gross reproduction rate (per woman)	1.13	1.14	1.24	1.21	1.10	0.93	0.75	0.65	0.62
Net reproduction rate (per woman)	1.09	1.07	1.16	1.15	1.05	0.88	0.74	0.63	0.61
Infant mortality rate (per 1,000 births)	60	48	40	33	26	18	13	10	8
Life expectancy at birth (years)									
Males	64.3	66.3	67.4	68.2	69.2	70.4	71.5	73.1	74.2
Females	67.8	70.8	72.6	73.9	75.2	76.9	78.0	79.6	80.7
Both sexes combined	66.0	68.5	69.9	71.0	72.1	73.6	74.5	76.2	77.2

B. MEDIUM-VARIANT PROJECTIONS

	1995	2000	2005	2010	2015	2020	2025	2030	2040	2050
Population (thousands)										
Total	57 338	57 298	56 780	55 782	54 448	52 913	51 270	49 533	45 642	41 197
Males	27 840	27 806	27 564	27 087	26 446	25 714	24 928	24 082	22 150	19 951
Females	29 498	29 492	29 216	28 695	28 002	27 199	26 342	25 452	23 492	21 247
Sex ratio (per 100 females)	94.4	94.3	94.3	94.4	94.4	94.5	94.6	94.6	94.3	93.9
Age distribution:										
Percentage aged 0-4	4.9	4.5	4.2	3.9	3.7	3.7	3.8	3.8	3.8	3.8
Percentage aged 5-14	9.9	9.8	9.5	8.9	8.4	7.9	7.7	7.8	8.2	8.2
Percentage aged 15-24	13.5	11.1	10.1	10.0	9.9	9.4	8.9	8.4	8.4	9.0
Percentage aged 60 or over	22.5	24.2	25.5	27.4	29.1	31.4	34.6	37.7	41.5	41.2
Percentage aged 65 or over	16.8	18.2	19.7	20.8	22.6	24.1	26.1	29.1	34.5	34.9
Percentage in school ages 6-11	5.9	5.9	5.6	5.3	4.9	4.6	4.6	4.7	4.9	4.9
Percentage in school ages 12-14	3.1	2.9	3.0	2.8	2.7	2.5	2.4	2.4	2.5	2.6
Percentage in school ages 15-17	3.4	3.0	3.0	3.0	2.8	2.7	2.5	2.4	2.5	2.6
Percentage in school ages 18-23	8.6	6.8	6.1	6.0	6.1	5.7	5.5	5.1	5.1	5.5
Percentage of women aged 15-49	48.7	46.9	45.4	43.8	40.9	38.1	35.2	33.6	32.5	32.2
Median age (years)	38.8	40.6	42.7	44.8	47.0	49.0	50.9	52.2	53.0	53.2
Population density (per sq km)	190	190	188	185	181	176	170	164	152	137

	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030	2030-2040	2040-2050
Population change per year (thousands)	-8	-104	-200	-267	-307	-329	-347	-389	-445
Births per year (thousands)	517	484	437	405	391	387	381	360	323
Deaths per year (thousands)	595	621	652	679	702	716	728	749	767
Net migration per year (thousands)	70	34	16	8	4	0	0	0	0
Population growth rate (percentage)	- 0.01	- 0.18	- 0.36	- 0.48	- 0.57	- 0.63	- 0.69	- 0.82	- 1.03
Crude birth rate (per 1,000 population)	9.0	8.5	7.8	7.3	7.3	7.4	7.6	7.5	7.4
Crude death rate (per 1,000 population)	10.4	10.9	11.6	12.3	13.1	13.7	14.5	15.7	17.7
Net migration rate (per 1,000 population)	1.2	0.6	0.3	0.1	0.1	0.0	0.0	0.0	0.0
Total fertility rate (per woman)	1.20	1.22	1.26	1.33	1.40	1.47	1.54	1.63	1.66
Gross reproduction rate (per woman)	0.58	0.59	0.61	0.65	0.68	0.71	0.75	0.79	0.81
Net reproduction rate (per woman)	0.57	0.58	0.60	0.64	0.67	0.71	0.74	0.78	0.80
Infant mortality rate (per 1,000 births)	7	7	6	6	6	6	6	5	5
Mortality under age 5 (per 1,000 births)	8	8	8	7	7	7	6	6	6
Life expectancy at birth (years)									
Males	75.0	75.8	76.3	76.8	77.3	77.8	78.2	78.8	79.6
Females	81.2	81.7	82.2	82.7	83.1	83.5	83.9	84.5	85.3
Both sexes combined	78.2	78.8	79.3	79.8	80.2	80.7	81.1	81.7	82.4

Source: United Nations Population Division, *World Population Prospects: The 1998 Revision.*

ITALY

C. HIGH-VARIANT PROJECTIONS

	1995	2000	2005	2010	2015	2020	2025	2030	2040	2050
Population (thousands)										
Total	57 338	57 405	57 201	56 582	55 626	54 490	53 306	52 128	49 651	46 772
Males	27 840	27 861	27 781	27 499	27 053	26 527	25 977	25 418	24 213	22 818
Females	29 498	29 544	29 420	29 083	28 573	27 964	27 329	26 711	25 438	23 954
Age distribution:										
Percentage aged 0-4	4.9	4.7	4.8	4.5	4.3	4.3	4.5	4.7	5.0	5.1
Percentage aged 5-14	9.9	9.7	9.6	9.6	9.5	9.1	8.9	9.1	10.0	10.5
Percentage aged 15-24	13.5	11.1	10.0	9.9	9.9	9.9	9.9	9.4	9.5	10.6
Percentage aged 60 or over	22.5	24.2	25.3	27.0	28.5	30.5	33.3	35.8	38.1	36.3
Percentage aged 65 or over	16.8	18.1	19.6	20.5	22.1	23.4	25.1	27.7	31.7	30.7
Percentage of women aged 15-49	48.7	46.9	45.1	43.2	40.3	37.8	35.3	34.2	33.9	34.9
Median age (years)	38.8	40.5	42.4	44.4	46.3	48.1	49.6	50.2	49.4	48.0

	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030	2030-2040	2040-2050
Population change per year (thousands)	13	- 41	- 124	- 191	- 227	- 237	- 236	- 248	- 288
Population growth rate (percentage)	0.02	- 0.07	- 0.22	- 0.34	- 0.41	- 0.44	- 0.45	- 0.49	- 0.60
Crude birth rate (per 1,000 population)	9.4	9.5	9.0	8.6	8.6	8.9	9.4	9.9	10.0
Crude death rate (per 1,000 population)	10.4	10.9	11.5	12.1	12.8	13.3	13.8	14.7	16.0
Net migration rate (per 1,000 population)	1.2	0.6	0.3	0.1	0.1	0.0	0.0	0.0	0.0
Total fertility rate (per woman)	1.25	1.38	1.48	1.58	1.68	1.78	1.88	2.01	2.06
Gross reproduction rate (per woman)	0.61	0.67	0.72	0.77	0.81	0.86	0.91	0.97	1.00
Net reproduction rate (per woman)	0.60	0.66	0.71	0.76	0.81	0.85	0.90	0.97	0.99

D. LOW-VARIANT PROJECTIONS

	1995	2000	2005	2010	2015	2020	2025	2030	2040	2050
Population (thousands)										
Total	57 338	57 170	56 494	55 341	53 765	51 904	49 841	47 594	42 508	36 789
Males	27 840	27 740	27 416	26 860	26 095	25 194	24 192	23 083	20 536	17 683
Females	29 498	29 430	29 077	28 481	27 670	26 709	25 649	24 511	21 972	19 106
Age distribution:										
Percentage aged 0-4	4.9	4.3	4.0	3.6	3.3	3.1	3.0	2.9	2.6	2.5
Percentage aged 5-14	9.9	9.8	9.3	8.5	7.9	7.3	6.8	6.5	6.2	5.8
Percentage aged 15-24	13.5	11.1	10.2	10.1	9.8	9.1	8.5	7.9	7.3	7.1
Percentage aged 60 or over	22.5	24.3	25.6	27.6	29.5	32.0	35.6	39.3	44.6	46.2
Percentage aged 65 or over	16.8	18.2	19.8	21.0	22.9	24.5	26.8	30.3	37.0	39.1
Percentage of women aged 15-49	48.7	47.0	45.7	44.1	41.2	38.3	35.3	33.6	31.6	29.7
Median age (years)	38.8	40.7	42.8	45.1	47.4	49.6	51.7	53.6	55.9	57.4

	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030	2030-2040	2040-2050
Population change per year (thousands)	-34	-135	-230	-315	-372	-413	-449	-509	-572
Population growth rate (percentage)	- 0.06	- 0.24	- 0.41	- 0.58	- 0.71	- 0.81	- 0.92	- 1.13	- 1.45
Crude birth rate (per 1,000 population)	8.6	8.0	7.3	6.5	6.1	5.9	5.7	5.3	4.9
Crude death rate (per 1,000 population)	10.4	10.9	11.7	12.4	13.3	14.1	14.9	16.6	19.3
Net migration rate (per 1,000 population)	1.2	0.6	0.3	0.1	0.1	0.0	0.0	0.0	0.0
Total fertility rate (per woman)	1.14	1.14	1.17	1.17	1.17	1.17	1.17	1.17	1.17
Gross reproduction rate (per woman)	0.55	0.55	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Net reproduction rate (per woman)	0.55	0.55	0.56	0.56	0.56	0.56	0.56	0.56	0.56

E. CONSTANT-VARIANT PROJECTIONS

	1995	2000	2005	2010	2015	2020	2025	2030	2040	2050
Population (thousands)										
Total	57 338	57 470	57 069	56 105	54 697	53 007	51 149	49 146	44 542	39 227

	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030	2030-2040	2040-2050
Population growth rate (percentage)	0.05	- 0.14	- 0.34	- 0.51	- 0.63	- 0.71	- 0.80	- 0.98	- 1.27
Crude birth rate (per 1,000 population)	9.6	8.9	7.8	7.0	6.7	6.6	6.5	6.1	5.6
Crude death rate (per 1,000 population)	10.4	10.9	11.5	12.3	13.0	13.7	14.5	16.0	18.3

Source: United Nations Population Division, *World Population Prospects: The 1998 Revision.*

TABLE A.6. ITALY, MIGRATION REPLACEMENT SCENARIOS

ITALY

Scenario	I	II	III	IV	V
Period	Medium variant	Medium variant with zero migration	Constant total population	Constant age group 15-64	Constant ratio 15-64/65 years or older
		A. Average annual net migration (thousands)			
1995-2000	70	0	75	203	1 261
2000-2005	34	0	127	266	1 402
2005-2010	16	0	193	179	757
2010-2015	8	0	236	341	1 362
2015-2020	4	0	255	335	1 146
2020-2025	0	0	256	456	1 886
2025-2030	0	0	260	613	3 267
2030-2035	0	0	269	581	3 892
2035-2040	0	0	289	507	4 132
2040-2045	0	0	309	268	2 740
2045-2050	0	0	318	173	2 094
Grand total 1995-2050	660	0	12 944	19 610	119 684
		B. Total population (thousands)			
1995	57 338	57 338	57 338	57 338	57 338
2000	57 298	56 950	57 338	58 000	63 477
2005	56 780	56 267	57 338	58 767	70 487
2010	55 782	55 200	57 338	58 783	74 207
2015	54 448	53 840	57 338	59 393	80 939
2020	52 913	52 303	57 338	59 902	86 764
2025	51 270	50 679	57 338	61 064	96 664
2030	49 533	48 962	57 338	63 104	114 329
2035	47 671	47 122	57 338	65 066	136 391
2040	45 642	45 116	57 338	66 630	160 856
2045	43 460	42 959	57 338	66 846	178 891
2050	41 197	40 722	57 338	66 395	193 518
		C. Age group 15-64 (thousands)			
1995	39 234	39 234	39 234	39 234	39 234
2000	38 721	38 486	38 762	39 234	43 139
2005	37 781	37 439	38 208	39 234	47 661
2010	37 015	36 630	38 174	39 234	50 477
2015	35 576	35 179	37 715	39 234	55 064
2020	34 061	33 669	37 332	39 234	59 072
2025	32 026	31 659	36 506	39 234	65 358
2030	29 365	29 026	35 101	39 234	76 176
2035	26 773	26 464	33 799	39 234	89 650
2040	24 432	24 147	32 790	39 234	104 784
2045	22 946	22 681	32 675	39 234	116 546
2050	21 875	21 623	32 985	39 234	126 808
		D. Potential support ratio 15-64/65 or older			
1995	4.08	4.08	4.08	4.08	4.08
2000	3.72	3.72	3.74	3.78	4.08
2005	3.37	3.37	3.43	3.50	4.08
2010	3.19	3.19	3.30	3.37	4.08
2015	2.90	2.90	3.06	3.16	4.08
2020	2.67	2.68	2.91	3.02	4.08
2025	2.39	2.40	2.69	2.84	4.08
2030	2.04	2.04	2.37	2.59	4.08
2035	1.76	1.76	2.13	2.39	4.08
2040	1.55	1.55	1.97	2.24	4.08
2045	1.50	1.50	1.96	2.22	4.08
2050	1.52	1.52	2.03	2.25	4.08

TABLE A.6 (*continued*)

ITALY

Scenario	I	II	III	IV	V
Period	Medium variant	Medium variant with zero migration	Constant total population	Constant age group 15-64	Constant ratio 15-64/65 years or older
		E. Age group 65 or older (thousands)			
1995	9 621	9 621	9 621	9 621	9 621
2000	10 412	10 349	10 362	10 386	10 578
2005	11 213	11 113	11 155	11 212	11 687
2010	11 609	11 487	11 578	11 651	12 377
2015	12 286	12 150	12 310	12 417	13 502
2020	12 733	12 586	12 837	12 984	14 485
2025	13 373	13 218	13 586	13 817	16 026
2030	14 415	14 249	14 780	15 167	18 679
2035	15 249	15 074	15 839	16 442	21 983
2040	15 745	15 566	16 661	17 509	25 694
2045	15 303	15 128	16 647	17 690	28 578
2050	14 377	14 211	16 230	17 444	31 094
		F. Percentage in age group 65 or older			
1995	16.8	16.8	16.8	16.8	16.8
2000	18.2	18.2	18.1	17.9	16.7
2005	19.7	19.7	19.5	19.1	16.6
2010	20.8	20.8	20.2	19.8	16.7
2015	22.6	22.6	21.5	20.9	16.7
2020	24.1	24.1	22.4	21.7	16.7
2025	26.1	26.1	23.7	22.6	16.6
2030	29.1	29.1	25.8	24.0	16.3
2035	32.0	32.0	27.6	25.3	16.1
2040	34.5	34.5	29.1	26.3	16.0
2045	35.2	35.2	29.0	26.5	16.0
2050	34.9	34.9	28.3	26.3	16.1
		G. Age group 0-14 (thousands)			
1995	8 483	8 483	8 483	8 483	8 483
2000	8 165	8 116	8 214	8 380	9 760
2005	7 785	7 716	7 976	8 320	11 140
2010	7 157	7 083	7 586	7 898	11 353
2015	6 586	6 512	7 313	7 741	12 373
2020	6 119	6 048	7 169	7 683	13 207
2025	5 871	5 802	7 246	8 013	15 280
2030	5 754	5 687	7 458	8 703	19 474
2035	5 650	5 585	7 700	9 390	24 758
2040	5 466	5 403	7 887	9 887	30 379
2045	5 211	5 150	8 016	9 922	33 767
2050	4 945	4 888	8 124	9 717	35 615
		H. Potential support ratio in 2050, by age at entry into non-working-age population			
Age					
65	1.52	1.52	2.03	2.25	4.08
70	2.08	2.08	2.81	3.11	5.83
75	3.06	3.06	4.13	4.59	8.94
80	5.26	5.26	7.06	7.85	15.86

NOTE: The five scenarios are briefly as follows:

I - Corresponds to the medium variant of the official United Nations population projections (*World Population Prospects, 1998 Revision*);
II - This scenario amends the medium variant by assuming no migration after 1995;
III - This scenario keeps the total population figure constant at the highest level that it would reach in absence of migration after 1995.
IV - This scenario keeps the number of persons aged 15-64 constant at the highest level that it would reach in absence of migration after 1995.
V - This scenario keeps the ratio of persons aged 15-64 to persons aged 65 and above at the highest level that it would reach in absence of migration after 1995.

TABLE A.19. EUROPEAN UNION, *1998 REVISION*

EUROPEAN UNION

A. ESTIMATES

Indicator	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
Population (thousands)										
Total	296151	305088	315857	330279	340576	349313	355421	358732	365235	371937
Males	142059	146694	152085	159683	165057	169501	172616	174195	177802	181615
Females	154092	158394	163772	170595	175519	179812	182806	184537	187432	190322
Sex ratio (per 100 females)	92.2	92.6	92.9	93.6	94	94.3	94.4	94.4	94.9	95.4
Age distribution:										
Percentage aged 0-4	8.7	8.3	8.5	8.8	8.3	7.3	6.5	6.1	5.9	5.6
Percentage aged 5-14	15.8	15.9	16.1	15.7	16.4	16.5	15.2	13.4	12.3	11.8
Percentage aged 15-24	15.4	15.1	14.6	14.7	14.8	15	15.8	16.3	14.9	13.3
Percentage aged 60 or over	13.9	14.6	15.5	16.5	17.6	18.3	17.9	19	20.1	20.8
Percentage aged 65 or over	9.5	10	10.6	11.2	12.2	13.1	13.9	13.6	14.7	15.5
Percentage of women aged 15-49	50.1	48.7	46.7	45.6	45.8	45.7	46.8	48.1	48.4	48.4
Median age (years)	32	32.3	32.8	32.8	32.9	33.1	33.7	34.8	36.1	37.3
Population density (per sq km)	91	94	97	102	105	108	110	111	113	115

	1950-1955	1955-1960	1960-1965	1965-1970	1970-1975	1975-1980	1980-1985	1985-1990	1990-1995
Population change per year (thousands)	1787	2154	2884	2060	1747	1222	662	1301	1340
Births per year (thousands)	5390	5587	6037	5900	5166	4620	4423	4330	4165
Deaths per year (thousands)	3289	3340	3474	3636	3706	3742	3717	3704	3835
Population growth rate (percentage)	0.59	0.69	0.89	0.61	0.51	0.35	0.19	0.36	0.36
Crude birth rate (per 1,000 population)	17.9	18	18.7	17.6	15	13.1	12.4	12	11.3
Crude death rate (per 1,000 population)	10.9	10.8	10.8	10.8	10.7	10.6	10.4	10.2	10.4
Total fertility rate (per woman)	2.39	2.52	2.69	2.52	2.14	1.86	1.69	1.58	1.5
Gross reproduction rate (per woman)	1.16	1.22	1.31	1.23	1.04	0.9	0.82	0.77	0.73
Net reproduction rate (per woman)	1.07	1.13	1.23	1.16	1	0.87	0.8	0.75	0.72
Infant mortality rate (per 1,000 births)	48	39	32	26	21	15	11	9	7
Life expectancy at birth (years)									
Males	64.7	66.6	67.6	68.2	68.8	69.9	71.1	72.3	73.3
Females	69.2	71.7	73.2	74.2	75	76.5	77.7	78.9	79.7
Both sexes combined	67	69.2	70.4	71.2	71.9	73.2	74.4	75.7	76.5

B. MEDIUM-VARIANT PROJECTIONS

	1995	2000	2005	2010	2015	2020	2025	2030	2040	2050
Population (thousands)										
Total	371937	375276	376478	375694	373831	371125	367342	362201	348281	331307
Males	181615	183591	184472	184287	183509	182257	180401	177808	170702	162314
Females	190322	191685	192006	191407	190322	188868	186941	184394	177579	168993
Sex ratio (per 100 females)	95.4	95.8	96.1	96.3	96.4	96.5	96.5	96.4	96.1	96
Age distribution:										
Percentage aged 0-4	5.6	5.2	4.9	4.7	4.7	4.8	4.7	4.7	4.6	4.7
Percentage aged 5-14	11.8	11.4	10.8	10.2	9.7	9.6	9.7	9.7	9.6	9.7
Percentage aged 15-24	13.3	12.3	11.9	11.6	11	10.4	10	10	10.3	10.2
Percentage aged 60 or over	20.8	21.9	22.9	24.5	26.1	28.1	30.5	32.8	34.9	35.3
Percentage aged 65 or over	15.5	16.4	17.5	18.3	19.8	21.2	23	25.2	28.4	28.9
Percentage in school ages 6-11	7.1	6.8	6.4	6	5.8	5.7	5.8	5.8	5.7	5.8
Percentage in school ages 12-14	3.6	3.5	3.4	3.2	3	2.9	2.9	3	3	2.9
Percentage in school ages 15-17	3.7	3.6	3.5	3.4	3.1	3	2.9	3	3	3
Percentage in school ages 18-23	8.1	7.4	7.2	7.1	6.7	6.3	6.1	6	6.2	6.2
Percentage of women aged 15-49	48.4	47.5	46.5	45.1	42.7	40.3	38.5	37.5	36.4	36.1
Median age (years)	37.3	38.9	40.7	42.6	44.2	45.5	46.4	47.1	48.1	47.9
Population density (per sq km)	115	116	116	116	115	114	113	112	107	102

	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030	2030-2040	2040-2050
Population change per year (thousands)	668	240	-157	-373	-541	-757	-1028	-1392	-1697
Births per year (thousands)	3892	3686	3555	3539	3548	3482	3384	3250	3167
Deaths per year (thousands)	3799	3916	4057	4219	4363	4488	4622	4852	5074
Net migration per year (thousands)	574	470	346	308	274	250	210	210	210
Population growth rate (percentage)	0.18	0.06	-0.04	-0.1	-0.15	-0.2	-0.28	-0.39	-0.5
Crude birth rate (per 1,000 population)	10.4	9.8	9.5	9.4	9.5	9.4	9.3	9.1	9.3
Crude death rate (per 1,000 population)	10.2	10.4	10.8	11.3	11.7	12.2	12.7	13.6	14.9
Net migration rate (per 1,000 population)	1.5	1.3	0.9	0.8	0.7	0.7	0.6	0.6	0.6
Total fertility rate (per woman)	1.44	1.45	1.5	1.57	1.64	1.69	1.74	1.78	1.8
Gross reproduction rate (per woman)	0.7	0.71	0.73	0.76	0.8	0.82	0.85	0.86	0.87
Net reproduction rate (per woman)	0.69	0.7	0.72	0.75	0.79	0.82	0.84	0.86	0.87
Infant mortality rate (per 1,000 births)	6	6	6	6	5	5	5	5	5
Mortality under age 5 (per 1,000 births)	7.6	7.1	6.8	6.6	6.3	6	5.9	5.6	5.3
Life expectancy at birth (years)									
Males	74.3	75.1	75.7	76.2	76.8	77.3	77.7	78.4	79.2
Females	80.7	81.3	81.8	82.3	82.7	83.2	83.6	84.2	85
Both sexes combined	77.6	78.2	78.8	79.3	79.7	80.2	80.7	81.3	82

Source: United Nations Population Division, *World Population Prospects: The 1998 Revision.*

TABLE A.19 (*continued*)

EUROPEAN UNION

C. HIGH-VARIANT PROJECTIONS

	1995	2000	2005	2010	2015	2020	2025	2030	2040	2050
Population (thousands)										
Total	371937	376210	379928	382168	383515	384340	384866	384837	383622	381264
Males	181615	184071	186244	187613	188483	189044	189399	189429	188840	187941
Females	190322	192139	193684	194555	195032	195296	195467	195408	194782	193323
Age distribution:										
Percentage aged 0-4	5.6	5.4	5.5	5.4	5.4	5.5	5.6	5.7	5.9	6.1
Percentage aged 5-14	11.8	11.4	11	10.9	10.9	10.9	11	11.2	11.6	12.1
Percentage aged 15-24	13.3	12.2	11.8	11.4	11	11	11	11	11.4	11.8
Percentage aged 60 or over	20.8	21.8	22.7	24.1	25.5	27.1	29.1	30.9	31.7	30.6
Percentage aged 65 or over	15.5	16.4	17.3	18	19.3	20.5	21.9	23.7	25.8	25.1
Percentage of women aged 15-49	48.4	47.4	46.1	44.3	41.9	39.8	38.4	37.8	37.5	38.5
Median age (years)	37.3	38.8	40.5	42	43.3	44.2	44.6	44.6	43.9	42.5

	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030	2030-2040	2040-2050
Population change per year (thousands)	855	744	448	269	165	105	-6	-121	-236
Population growth rate (percentage)	0.23	0.2	0.12	0.07	0.04	0.03	0	-0.03	-0.06
Crude birth rate (per 1,000 population)	10.9	11.1	10.9	10.9	11.1	11.3	11.5	11.8	12.2
Crude death rate (per 1,000 population)	10.2	10.4	10.7	11	11.4	11.7	12	12.7	13.3
Net migration rate (per 1,000 population)	1.5	1.2	0.9	0.8	0.7	0.7	0.5	0.5	0.5
Total fertility rate (per woman)	1.51	1.65	1.75	1.86	1.96	2.06	2.12	2.18	2.2
Gross reproduction rate (per woman)	0.73	0.8	0.85	0.9	0.95	1	1.03	1.06	1.07
Net reproduction rate (per woman)	0.72	0.79	0.84	0.89	0.94	0.99	1.02	1.05	1.06

D. LOW-VARIANT PROJECTIONS

	1995	2000	2005	2010	2015	2020	2025	2030	2040	2050
Population (thousands)										
Total	371937	374518	374056	371434	367102	361188	353666	344232	320436	292104
Males	181615	183201	183227	182099	180053	177155	173380	168583	156411	142204
Females	190322	191317	190829	189335	187049	184033	180286	175649	164025	149900
Age distribution:										
Percentage aged 0-4	5.6	5	4.5	4.3	4.1	4	3.8	3.6	3.4	3.4
Percentage aged 5-14	11.8	11.5	10.7	9.6	9	8.7	8.5	8.2	7.6	7.3
Percentage aged 15-24	13.3	12.3	12	11.7	11	10	9.4	9.2	9	8.5
Percentage aged 60 or over	20.8	21.9	23	24.8	26.6	28.8	31.7	34.5	37.9	40
Percentage aged 65 or over	15.5	16.4	17.6	18.6	20.1	21.8	23.8	26.5	30.9	32.7
Percentage of women aged 15-49	48.4	47.6	46.8	45.5	43.2	40.7	38.8	37.5	35.4	33.6
Median age (years)	37.3	39	40.9	42.9	44.8	46.4	47.8	49.1	51.3	52.9

	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030	2030-2040	2040-2050
Population change per year (thousands)	516	-92	-524	-866	-1183	-1504	-1887	-2380	-2833
Population growth rate (percentage)	0.14	-0.02	-0.14	-0.23	-0.32	-0.42	-0.54	-0.72	-0.93
Crude birth rate (per 1,000 population)	10	9	8.5	8.2	8	7.6	7.2	6.8	6.6
Crude death rate (per 1,000 population)	10.2	10.5	10.9	11.4	12	12.5	13.2	14.6	16.5
Net migration rate (per 1,000 population)	1.5	1.3	0.9	0.8	0.8	0.7	0.6	0.6	0.7
Total fertility rate (per woman)	1.38	1.32	1.34	1.35	1.35	1.36	1.36	1.37	1.37
Gross reproduction rate (per woman)	0.67	0.64	0.65	0.66	0.66	0.66	0.66	0.66	0.67
Net reproduction rate (per woman)	0.66	0.63	0.64	0.65	0.65	0.65	0.66	0.66	0.66

E. CONSTANT-VARIANT PROJECTIONS

	1995	2000	2005	2010	2015	2020	2025	2030	2040	2050
Population (thousands)										
Total	371937	376119	378012	377362	374839	370817	365477	358609	340395	317555

	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030	2030-2040	2040-2050
Population growth rate (percentage)	0.22	0.1	-0.03	-0.13	-0.22	-0.29	-0.38	-0.52	-0.69
Crude birth rate (per 1,000 population)	10.9	10.1	9.5	9.1	8.8	8.6	8.4	8.1	7.8
Crude death rate (per 1,000 population)	10.2	10.4	10.7	11.2	11.7	12.2	12.8	13.9	15.4

Source: United Nations Population Division, *World Population Prospects: The 1998 Revision.*

TABLE A.20. EUROPEAN UNION, REPLACEMENT MIGRATION SCENARIOS

EUROPEAN UNION

Scenario	I	II	III	IV	V
Period	Medium variant	Medium variant with zero migration	Constant total population	Constant age group 15-64	Constant ratio 15-64/65 years or older
		A. Average annual net migration (thousands)			
1995-2000	574	0	0	46	5 302
2000-2005	470	0	263	396	6 171
2005-2010	346	0	521	545	5 095
2010-2015	308	0	663	1 596	9 012
2015-2020	274	0	742	1 938	9 557
2020-2025	250	0	869	2 424	12 947
2025-2030	210	0	1 032	2 814	18 312
2030-2035	210	0	1 216	2 407	20 346
2035-2040	210	0	1 351	1 593	18 724
2040-2045	210	0	1 416	1 063	16 483
2045-2050	210	0	1 418	1 097	18 153
Grand total 1995-2050	16 361	0	47 456	79 605	700 506
		B. Total population (thousands)			
1995	371 937	371 937	371 937	371 937	371 937
2000	375 276	372 440	372 440	372 680	400 089
2005	376 478	371 065	372 440	373 390	433 063
2010	375 694	368 232	372 440	373 590	461 257
2015	373 831	364 428	372 440	378 554	510 650
2020	371 125	359 936	372 440	385 344	565 699
2025	367 342	354 500	372 440	394 551	641 056
2030	362 201	347 891	372 440	405 592	748 324
2035	355 783	339 947	372 440	414 173	871 833
2040	348 281	330 878	372 440	418 003	992 383
2045	340 013	321 049	372 440	418 422	1 104 897
2050	331 307	310 839	372 440	418 509	1 228 341
		C. Age group 15-64 (thousands)			
1995	249 382	249 382	249 382	249 382	249 382
2000	251 299	249 213	249 213	249 382	268 773
2005	251 625	247 737	248 709	249 382	291 712
2010	250 909	245 587	248 563	249 382	311 918
2015	245 947	239 387	245 055	249 382	344 093
2020	239 216	231 427	240 285	249 382	379 072
2025	230 090	221 083	233 826	249 382	426 112
2030	218 698	208 594	226 054	249 382	492 818
2035	207 975	196 861	219 920	249 382	570 480
2040	199 716	187 775	217 056	249 382	647 667
2045	193 479	180 834	216 656	249 382	721 736
2050	187 851	174 470	216 929	249 382	803 974
		D. Potential support ratio 15-64/65 or older			
1995	4.31	4.31	4.31	4.31	4.31
2000	4.08	4.06	4.06	4.06	4.31
2005	3.83	3.80	3.81	3.82	4.31
2010	3.64	3.60	3.64	3.65	4.31
2015	3.33	3.28	3.34	3.39	4.31
2020	3.04	2.98	3.07	3.17	4.31
2025	2.73	2.66	2.78	2.94	4.31
2030	2.39	2.32	2.48	2.69	4.31
2035	2.14	2.07	2.26	2.51	4.31
2040	2.02	1.94	2.18	2.43	4.31
2045	1.97	1.90	2.18	2.41	4.31
2050	1.96	1.89	2.21	2.41	4.31

TABLE A.20 (*continued*)

EUROPEAN UNION

Scenario	I	II	III	IV	V
Period	Medium variant	Medium variant with zero migration	Constant total population	Constant age group 15-64	Constant ratio 15-64/65 years or older
		E. Age group 65 or older (thousands)			
1995	57 815	57 815	57 815	57 815	57 815
2000	61 596	61 349	61 349	61 357	62 310
2005	65 725	65 179	65 227	65 263	67 628
2010	68 903	68 186	68 348	68 400	72 312
2015	73 844	72 975	73 311	73 547	79 772
2020	78 599	77 580	78 147	78 683	87 881
2025	84 326	83 096	83 973	84 964	98 786
2030	91 378	89 889	91 199	92 808	114 250
2035	97 012	95 173	97 123	99 413	132 255
2040	99 073	96 772	99 665	102 672	150 149
2045	98 024	95 184	99 381	103 268	167 321
2050	95 600	92 240	98 067	103 280	186 386
		F. Percentage in age group 65 or older			
1995	15.5	15.5	15.5	15.5	15.5
2000	16.4	16.5	16.5	16.5	15.6
2005	17.5	17.6	17.5	17.5	15.6
2010	18.3	18.5	18.4	18.3	15.7
2015	19.8	20.0	19.7	19.4	15.6
2020	21.2	21.6	21.0	20.4	15.5
2025	23.0	23.4	22.5	21.5	15.4
2030	25.2	25.8	24.5	22.9	15.3
2035	27.3	28.0	26.1	24.0	15.2
2040	28.4	29.2	26.8	24.6	15.1
2045	28.8	29.6	26.7	24.7	15.1
2050	28.9	29.7	26.3	24.7	15.2
		G. Age group 0-14 (thousands)			
1995	64 740	64 740	64 740	64 740	64 740
2000	62 380	61 879	61 879	61 941	69 006
2005	59 127	58 149	58 504	58 745	73 723
2010	55 882	54 459	55 529	55 808	77 027
2015	54 040	52 066	54 074	55 625	86 785
2020	53 310	50 929	54 008	57 278	98 747
2025	52 926	50 320	54 641	60 204	116 157
2030	52 125	49 409	55 187	63 402	141 256
2035	50 796	47 913	55 397	65 378	169 098
2040	49 492	46 331	55 719	65 949	194 567
2045	48 510	45 031	56 403	65 772	215 841
2050	47 856	44 130	57 445	65 846	237 981
		H. Potential support ratio in 2050 by age at entry into non-working-age population			
Age					
65	1.96	1.89	2.21	2.41	4.31
70	2.77	2.66	3.12	3.43	6.34
75	4.12	3.94	4.62	5.09	9.87
80	6.81	6.50	7.61	8.37	17.14

NOTE: The five scenarios are briefly as follows:

I - Corresponds to the medium variant of the official United Nations population projections (*World Population Prospects 1998 Revision*);
II - This scenario amends the medium variant by assuming no migration after 1995;
III - This scenario keeps the total population figure constant at the highest level that it would reach in absence of migration after 1995.
IV - This scenario keeps the number of persons aged 15-64 constant at the highest level that it would reach in absence of migration after 1995.
V - This scenario keeps the ratio of persons aged 15-64 to persons aged 65 and above at the highest level that it would reach in absence of migration after 1995.