'Replacement Migration', or why everyone's going to have to live in Korea.

A fable for our times from the United Nations.

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Corrections and comments welcome

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Abstract

This paper considers international migration in the context of population ageing. In many Western countries, the search for appropriate responses to manage future population ageing and population decline has directed attention to international migration. International migrants, mostly of young working age, it seems reasonable to believe, can supply population deficits created by low birth rates, protect European society and economy from the economic costs of elderly dependency, and provide a workforce to care for the elderly. Particular prominence has been given to this option through the publicity attendant upon a report from the UN Population Division on 'Replacement Migration, which has been widely misunderstood.

While immigration can prevent population decline, it is already well – known that it can only prevent population ageing at unprecedented, unsustainable and increasing levels of inflow, which would generate very rapid population growth and rapidly displace the original population from its majority position. This paper reviews these arguments in the context of the causes and inevitability of population ageing, with examples mostly based on UK data. It discusses the variety of options available in response to population ageing; through workforce, productivity, pensions reform and other means. It concludes that in the relatively benign demographic regime of the UK, future population ageing, in any case mostly unavoidable, can be managed without serious difficulty without recourse to increased immigration which is running (2001) at record levels. By itself, population stabilization, or even mild reduction, is probably to be welcomed in the UK.

Key index words migration, low fertility, age-structure, population ageing,

INTRODUCTION

The problem of population ageing

Population ageing - the relative growth of the numbers of the older population usually accompanied by the relative numerical decline of the younger population - is one of the most important social and demographic transformations ever to face human societies. In 1900 about 5% or less of Western populations were aged 65 and over, a proportion relatively unchanged for centuries. By the year 2000, the European average had trebled to 15%. If birth and death rates remain as they are in 2001, and ignoring migration, Western populations will eventually acquire stable population structures with between 22% and 35% of their populations aged 65 and over.

Problems arise from this transformation of age-structure because the ratio of older persons normally assumed to be dependent (conventionally over age 65) increases adversely in comparison with the numbers assumed to be active economically and in other ways (conventionally 15-64), upon whom they are held to depend. Expected increases in this 'burden of dependency' are highlighted statistically by the dependency ratio; that is the ratio of dependants to every 100 persons in the active population. In general, dependants also include children under age 15. That is the main focus of dependency in the youthful and rapidly growing populations of much of the third world. Here, however, we are concerned only with the aged dependency ratio (ADR); the ratio of the number of persons aged 65 and over to every 100 persons aged 15 – 64 , that is: ADR = (pop 65+ / pop 15-64)*100. These age-limits are somewhat arbitrary, and increasingly unrealistic under today's conditions, but serve at lease to permit demographic comparison of the potential burdens generated by the different age-structures of various populations over time and space. As we will see, other considerations may be more important.

Very often, the reciprocal of the aged dependency ratio is used, the 'potential support ratio' (PSR). That is the numbers of persons in the nominal active population to every nominal aged dependent: PSR = (pop 15-64) / (pop 65 and over). Values for both are given in Table 1. It must be remembered that both are demographic abstractions and may be a long way from the ratio of the number of actual dependants in relation to those economically active.

Table 1 Stable age-distributions at given levels of mortality and fertility

	TFR 1.55	TFR 1.78	TFR 2.07
Rate of Pop change (per 1000)	- 10.0	- 5.0	0.0
Mean age	46.8	43.9	40.9
% pop < 15 years	13.0	15.7	18.7
% pop 15-64	59.4	60.7	61.3
% pop _ 65	27.6	23.7	20.1
Overall dependency ratio	68.3	64.9	63.2
Aged dependency ratio	46.5	39.0	32.7
Potential Support Ratio	2.2	2.6	3.1

Note: TFR = Total Fertility Rate, the average family size implied by current fertility rates
Source: calculated from Coale and Demeny 1986, pp 79, 129.

Population ageing brings in its train a substantial decline of this potential support ratio, from about 10 in 1900 and all previous times to about 4 in most developed countries today to between 2 and 3 by the mid 21st century, depending mostly on the future trend of the birth-rate. Without further major change in birth or death rates, the latter range of potential support ratio would then become typical of the human species, as fewer children and longer lives become universal.

The causes of population ageing

Population ageing is a permanent, irreversible consequence of the achievement of low average family size and longer expectation of life in developed countries. The course of the 19th and 20th century demographic transition, unique and unrepeatable in the history of the human species, has

transformed average family size from 5 or 6 to 2 or (usually) less, and more than doubled expectation of life from 35 to 75 years in the developed world. The rest of the world is expected to have completed this transition by the end of the 21st century.

Initially, declines in the birth rate were the primary engine behind population ageing. Lower birth rates reduce the size of young cohorts and therefore the burden of youth dependency. They thereby increase the relative size of older cohorts relative to the total population without directly increasing their actual number ('ageing from the bottom', or 'ageing from the base' in Pressat's terminology). The initial effect of the fall in mortality from high levels is, however, to make the population younger, by improving the survival of infants and children, and of young mothers. Eventually, once high rates of survival have been achieved (say, an expectation of life of about 60 years), further reductions in death rate can at last make their intuitively expected effects of making the population older.

Today, 98% of babies can expect to live to at least 50, which is above the average age of the population. In those countries, death rate improvements are now inevitably and increasingly concentrated among the late middle aged, the old and the 'oldest-old' aged over 85. In most developed countries, death rates continue to fall at between 1-2% per year even, almost especially, among the very elderly – an unexpected and remarkable phenomenon (Kannisto et al 1994, Vaupel 1997). All this directly increases the number of elderly – 'ageing from the top' or 'ageing from the summit'.

In the West, birth rates first declined to below the 'replacement' TFR of 2.1 children on average (strictly 2.075 at current UK mortality rates) as early as the 1930s, a fact obscured by the unexpected intervention of the' baby boom ' of the 1950s and 1960s. Since the 1970s most western countries

have returned to lower birth rates in almost all cases below the replacement level – much as in the 1930s. It is not true, however, that the developed world has 'declining' birth rates in 2001. Birth rates, although low, are constant or even increasing slightly in some countries, partly because of the partial recuperation of fertility at older ages which has been postponed from younger ages continually since the 1970s.

Because of this relative stability, low fertility is giving way to low mortality as the primary force of population ageing. In those countries where birth rate decline happened first – notably France, almost all population ageing is now due to continued falls in the death rate (Calot and Sardon 1999). This will eventually be so in all countries as long as birth rates fall no further. The extent to which declines in the death rate can continue at their present rate is hotly disputed (Olshansky and Carnes 1996). Few projections dare to incorporate expectations of life beyond age 85, although on past experience, actuaries have been too conservative in this regard (Murphy 1995) .

Population age-structures and their associated dependency ratios respond to these changes in vital rates with a considerable time-lag. This is because of the time it takes for cohorts of a given size to mature through the age-structure. This phenomenon of 'demographic inertia' or 'momentum' explains why age-structures are often out of line with their vital rates; for example how countries with below-replacement fertility rates (all of Europe since the 1970s) can retain an excess of births over deaths for many years (most of Europe for the next decade at least). It takes about two generations – almost 60 years - for any stable population structure to emerge which is compatible with its own vital rates and which is then self-replicating.

In the latter part of the 20th century, developed countries enjoyed an unusually favourable age-structure compared with the youth burden of the earlier part of the transition and with the elderly

burden to come. The relative number of the dependent young declined through low birth rates from the 1880s. During part of the 20th century that combined with a relatively small elderly population inherited from an earlier demographic regime. That transiently favourable situation, typical of the latter half of the demographic transition, is now finally being lost. The populations of the third world (the majority which have begun fertility decline) will enjoy a similar phase to the middle of the 21st. . In these processes fertility always has a more powerful effect on age-structure than mortality, because all the population changes which it generates arise at age zero. Nonetheless mortality change will eventually become the driving force behind all further population ageing in developed countries, if birth rates have now ceased to decline.

Migration has nothing to do with any of this. In terms of its effects on age-structure, migration is the weak sister of population dynamics and has been relatively ignored as a demographic process. Its unfashionable status arises partly because of the multiplicity of its numerous definitions compared with the hard biological end-points of conventional demography, the confusion of its statistics, the poverty of its theory and the unseemly passions which often surround its discussion. Technical demographic theory concerned with stable populations and the rest has been based mostly on closed populations, which facilitate finite solutions. This is at least partly justified in empirical terms, as at the international levels net migration is usually at least an order of magnitude less than vital processes of fertility and mortality.

The inefficiency of its demographic effects, in terms of the changes in age-distribution achieved for a given change in population total, arises because the mean age of migrant populations, although usually ten years or more younger than the population average of modern developed countries, is not sufficiently young strongly to influence the average age except with very high rates of flow. Furthermore, of course, for a given effect on the age-structure the inflow must be continuous, as

immigrants themselves age and need to be replaced. This process unleashes population growth, so that increasing absolute numbers of immigrants must move to maintain the same impact on the age-structure.

By contrast, fertility has by far the most powerful effect upon age-structures of the three components of population change, because it adds (or subtracts) people only at exact age 0, at the bottom of the pyramid. The other two processes ‘add’ additional people at many points in the age structure , peaking at 30 in the case of net migration, Mortality reduction saves lives - adds people - mostly at older age. Any change in fertility, however, will take almost 20 years to have any impact on the size of the ‘active’ population; until that time it will increase overall dependency levels.

No solution

It is therefore important to realise that there can be no 'solution ' to population ageing and low potential support ratios without a resumption either of the high death rates and low birth rates of the pre-transitional regime, or at least of high birth rates alone. That would generate exceptional and unsustainable population growth, bringing its own nemesis. The consequences of population ageing may – given reasonable birth rates - be ameliorated or managed by non- demographic responses, but not 'solved'.

Immigration as demographic salvation?

However, in 2000 the prospect of demographic salvation from population ageing by migration was awakened among the credulous by a report from the United Nations Population Division (2000) on 'Replacement Migration". Coming at a time of intense debate about the desirability or otherwise of the current very high levels of immigration tot he Western world, this report informed the less fertile nations of the industrial world that they would have to think again about international migration. The

impression given was that substantial increases in immigration, some of them astronomical, were the only option in many cases to prevent declining population, declining workforce and declining 'potential support ratio'. These three claims for the demographic effects of migration are somewhat separate, and need to be examined in turn.

Typically these three aims require progressively higher numbers of immigrants. In each case there are three considerations: the overall numbers needed, averaged over a period of years; the variation in those numbers to give reasonably constant numbers of population or workforce from year to year, and the effect upon population growth and composition in each case. The general answer to these questions is already well known for many years, both in theory and from a number of empirical national and international studies. Earlier work (briefly reviewed in Feichtinger and Steinmann 1992, pp 275-276 and Espenshade 1986 pp 248 - 252) was more concerned with problems of over-population, and the effects of constant migration streams. For example Keyfitz (1971) showed that the effects on population growth of emigration were weak compared with the effects of fertility reduction, Pollard (1973) and others showed that constant migration into a population with below-replacement fertility always leads to a stationary population (i.e. one neither growing nor declining in numbers) as long as immigrant fertility eventually converges.

The final population may of course be much smaller than the original one, and with below-replacement fertility the original population would eventually die out, leaving no descendants. Any population with sub-replacement fertility attempting to maintain a given population size through immigration would accordingly, acquire a population of predominantly, eventually entirely, immigrant origin. Populations can only adopt this solution to stabilise the numbers at the risk of the loss of their original identity. It was later

shown that larger levels of migration were required to preserve a constant age-structure when population ageing began, even if fertility remained at replacement rate. Lesthaeghe (1988)

Does population decline matter?

The UN Report appears to assume that population decline is *ipso facto* undesirable and that declines in the potential support ratio are not only undesirable but avoidable. These notions reflect transatlantic rather than universal Western concerns. Population stabilisation or reduction may be contrary to the American dream but regarded with equanimity elsewhere. While the possibility is strongly opposed by most French opinion (Chesnais, 1995), the last official report in the UK (Population Panel 1973) welcomed the prospect of an end to growth. Official responses in Germany ((Höhn, 1990) have discussed the management of population decline and the Netherlands has in the past defined it as a policy aim in the long run, for example in the 1983 government response to the report of the Dutch Royal Commission on Population 1977 (Staatscommissie Bevolkingsvraagstuk 1977) . This report stated that 'termination of natural population growth is desirable and possible as a consequence of below replacement fertility as expected in the official population projections. However, government should not lose sight of reaching, in due time, a more or less stationary population situation which could imply that in the longer term government should promote fertility stabilising on a level guaranteeing the replacement of successive. The official response (Tweede Kamer der Staten Generaal 1983) concluded that 'Continuing population growth will have an adverse effect on the wellbeing of the nation, and therefore the perspective of growth coming to an end as a consequence of below-replacement fertility (as observed since 1972) is welcomed'. generations' (translated and summarised by van den Brekel and van de Kaa (199), pp 234 - 236. However in this and later submissions the notio

of a formal population policy was avoided. The official submission to the UNECE/UNFPA Regional Population Meeting in Budapest 1998, for example, just stated that 'in the longer run a stationary population is viewed as desirable' (Government of the Netherlands 1998 p 9).

On principle, therefore, immigration can stop any level of population decline, but the volume of migration in some cases would be very large and on a year to year basis, highly variable (Lesthaeghe 1988, Wattelar and Roumans 1988). For example, in the Russian Federation in 1999, deaths exceeded births by 930,000. In Germany, however, although 300,000 immigrants per year were then computed to maintain population size in the long run, given below-replacement fertility, immigration levels up to the late 1990s have been so high that German population has actually grown substantially, although not necessarily to the satisfaction of the Germans (natural decline in Germany in 1998 was 67,000, composed of a net decline of 154,000 persons of German nationality and an net addition of 86,000 births to mothers of foreign nationality). In the UK, however, with a higher rate of fertility, maintaining current population in the short run requires a reduction of immigration, which became the main component of population and household growth in the late 1990s. Until at least 2035 maintenance of population size merely requires the continuation of the status quo. Later developments in the UK are discussed below.

Workforce and potential support ratio

In general the volume of immigration required to preserve the size of the workforce from any future decline is more substantial and also more variable, for age structure reasons. A higher fraction of any ageing population of constant size consists of retired people (assuming constant working age-limits). Fluctuations of the population of working age, arising from previous changes in the birth rate, are

greater proportionately than the fluctuations in total population size, requiring higher volumes and greater variation of annual immigration levels.

Preventing the ageing of populations, in terms of preserving the current aged dependency ratio or potential support ratio, is even more difficult except with exceptional levels of immigration which would provoke very high and implausible levels of population growth. Immigration certainly tends to reduce average age and to improve potential support ratio. But because immigrants are not very much younger on average than the populations they are moving into - about ten years or so on average - the gearing required to change the average age is unfavourable. There is a low 'demographic advantage', to borrow a term from engineering. Large numbers are required for modest results. Then immigrants themselves age and need to be replaced by further immigrants. Immigrants to the West also tend to have higher birth rates than the natives, but these birth rates tend to converge. Under these circumstances, population replacement of the original population proceeds even faster.

Fundamentally, immigration cannot 'cure' population ageing because population ageing is not caused by a deficit of migration but by a reduction of fertility (and latterly an increase in survival).

The variety of empirical studies made on the age-structure effects of immigation are difficult to compare because their starting assumptions are different. But they all lead to similar conclusions. For example it was shown nearly 20 years ago that to preserve a potential support ratio of 3:1 in Belgium (slightly less than today's 3.5:1) by 2020, replacement fertility would be needed as well as some sharper peaks of migration; up to 180,000 / year, ten times the then current gross flow (Calot 1983). That policy would itself double population. To keep the proportion of the Dutch population (which has a 'favourable' projected age-structure) over age 65 at the present 14% of the population,

an additional 5 million immigrants would be needed up to 2032 given low fertility and 3 - million given higher fertility, over and above 1990 levels (Van Imhoff and Keilman 1996). Most examples of 'replacement migration' in the UN study required immigration so high (1.2 million per year for 50 years in the UK case) that population would be doubled in fifty years and then more than doubled again in fifty years and so on *ad infintum*.

On that basis, the UK population would exceed 100 million even by 2030, 200 million by 2070 and 300 million by 2090. Population size required to meet the workforce criterion is much more modest, as the UN Report itself notes. By 2050, the population size implied by the 'required' migration to keep UK working-age population constant at 1998 levels is only 63 million and remains about that level until the end of the century - less than in the GAD 1998 Principal Projection. This is because the UK is already experiencing a high level of migration, considerably more than it 'needs'. The UK also enjoys a relatively benign fertility regime, which ensures that projected declines in any sector of the population are small. Like all European countries, fertility is expected to rise somewhat.

The difficulty of correcting ageing through immigration, except though very high population growth, is underlined by a comparative analysis by the EU Commission. While it would 'only' take between 500,000 and a million additional immigrants per year to avert population decline in the EU in the earlier part of the next century, to preserve the current age-structure of the 15 EU countries would require 4.5 million (net) immigrants per year by 2007 and 7 million net per year by 2024 (European Commission, 1996, 1998). That would generate substantial population growth. The UN Report, which extended projections to the much more speculative horizon of 2050, showed spectacular increases in population size through immigration, sufficient to double the size of the EU by 2050. In the extreme case, preserving the current potential support ratio in Korea would require the entire population of the world to live there by 2050 (p 56). The sensational results from this adventurous

projection have been widely interpreted as policy requirements , not speculations from a hypothetical exercise (see UN 2000b) despite the cautions expressed in the report.

Ethnic replacement

These results have imply that , very high proportions of the populations concerned - eventually a majority - would be of immigrant origin. The UN report made some simple calculations to show the effect, assuming that immigrant fertility immediately declined to that of the host population and that no previous immigrant-origin population existed. Neither of these assumptions is correct, but the UN data provide a base-line. Fertility levels of immigrant populations are usually higher , sometimes much higher than those of Western host populations, although not always. In that case population replacement of host by immigrant populations will be accelerated. However, it is generally expected that immigrant populations will converge with those of the host population (Coleman 1994). Experience is short, and so far only a few populations of third-world origin have completed this process. Indeed in the case of Bangladeshis in the UK, the reported period fertility rate is higher than the average in Bangladesh.

In the long run the minority will become the majority in a country if there remains even one region where the increase of the proportion of the minority continues to increase through immigration and higher birth rates. (Steinmann & Jäger, 1997). Only a few long-term population projections explore these prospects in reality. In the US, for example, the replacement of the white non-Hispanic population from its majority position is officially projected to occur around 2050 (US Bureau of the Census 1992). In Germany, immigration of 500,000 per year with a domestic TFR of 1.4 produces a stable 25% of population born abroad, but with a growing but unspecified proportion of immigrant origin (Feichtiger and Steinmann 1992). In the UK no such projection has been made. The most recent official one dates from 1979 (Immigrant Statistics Unit 1979). No others more recent are

known except for a simple set with 1987 base projection. These, employing inappropriately low fertility and migration assumptions (the latter a sixth of current levels), showed an overall ethnic minority population of 10% of the national total by 2050 and rising (Coleman 1995b, pp 179-182). Persistent media speculations in the UK about a non-white majority in the UK within 100 years have received no academic or official endorsement, contrary to some reports. They appear to have been based on nothing more than a linear extrapolation of the current growth rates of the white and ethnic minority populations, emanating it would appear from political sources in London. New official projections, however, are being considered by ONS at the time of writing (Haskey 2000).

PROJECTIONS OF POPULATION AGEING, IMMIGRATION AND FERTILITY

To explore the effects on population ageing of demographic change, two approaches are possible. First is to follow the example of the UN PD, in setting 'targets' for constant population, workforce and potential support ratio and computing the level of net migratin required to meet those targets in specified years. Some of these requirements, as we have seen and as the UN acknowledged, required impossible levels of immigration to achieve. The alternative is to project a 'reasonable' range of assumptions for future fertility, mortality and migration and see what effects they have on the age structure and its statistical indicators. To explore both these avenues, a number of projections have been made by the Government Actuary's Department (GAD) over the unusual long range of 100 years, up to 2001 (Shaw 2001, Coleman 2000).

The UN projections differ somewhat from those made by GAD. Actual net immigration is seriously under-estimated, and is assumed to be 40,000 (not the current 185,000) declining to zero by 2025. the GAD assumes a constant 95,000. Consequently the initial population is

also under-estimated, while fertility is assumed by the UN to rise to somewhat higher levels (1.9) compared with GAD (1.8). The UN's zero migration option differs little from their baseline projection because the migration assumption is so low.

To preserve constant population, no further migration is required until 2020, as the population continues to grow through natural increase, and then net immigration rising to 120,000 (mean 48,000 per year). The preservation of the numbers of persons aged 15-64 requires no migration before 2010, and then migration peaking at 380,000 per year between 2025-2030 (mean 114,000 per year). This adds six million to the population. The constant support ratio scenario requires net immigration peaking at 1.8 million per year between 2025-2030 (mean 1.1 million per year). That more than doubles the population to 136 million. of whom 59% are post-1995 immigrants or their descendants, assuming equal birth rates (Table 2). The UN Population Division determined these annual 'requirements' by averaging the total required over time-periods to achieve given positions by 2050. More extreme results are obtained if this 'requirement' is calculated on a year-to-year basis. The annual 'required' inflow then becomes very volatile (Table 3). This is because the inflows 'required' are very much at the mercy of the size of successive birth cohorts; past fluctuations in fertility determine annual 'requirements' for immigrants (see Shaw 2001). The difficult stop-go immigration required to this end was first demonstrated over a decade ago (Blanchet 1989) and those conclusions have stood the test of time.

For example in order to maintain the potential support ratio, the necessary annual net inflow calculated on this basis reaches 1.5 million by 2025, falls to nearly half a million and rises to over 5 million per year at the end of the century. To maintain a constant workforce size requires annual net immigration peaking at 330,000 around 2025. It would be impossible to

Table 2 UN 'Replacement Migration' population projections for the UK, 1995 - 2050

	1995	2050
(1) Zero migration		
Population (millions)	58.3	55.6
% 65+	15.9	25.0
PSR	4.1	
Cumulative immigration 1995-2050 (million)		0.0
Mean annual immigration (thousand)		0.0
% population from post-1995 immigration		0.0
(2) Constant population target		
Population (millions)	58.3	58.8
% 65+	15.9	23.9
PSR	4.1	2.5
Cumulative immigration 1995-2050 (million)		2.6
Mean annual immigration (thousand)	0.0	47.9
% population from post-1995 immigration		5.5
(3) Constant age-group 15 - 64		
Population (millions)	58.3	64.4
% 65+	15.9	22.9
PSR	4.1	2.6
Cumulative immigration 1995-2050 (million)		6.2
Mean annual immigration (thousand)		113.6
% population from post-1995 immigration		13.6
(4) constant potential support ratio		
Population (millions)	58.3	136.1
% 65+	15.9	15.9
PSR	4.1	4.1
Cumulative immigration 1995-2050 (million)		59.8
Mean annual immigration (thousand)		1086.8
% population from post-1995 immigration		59.0

Source: UN (2000) pp 67-68, Table A.14 pp 130 - 131

control immigration in such a fine-tuned manner, and these figures take no account of economic trends and workforce participation, which determine the real support ratio and labour demand, or the fact that most immigration is of dependants, not of workers. Extension of the projection to 2100 shows , as expected, that the net immigration required to preserve the support ratio must go on increasing unevenly, and has reached nearly 6 million per year in 2100. The population sizes implied by these ‘requirements’ are also rather arresting, fluctuating considerably and reaching 303 million by 2100 (Table 4).

Table 3 Annual net migration 'required' to achieve given population, workforce and potential support ratio targets, at specified years UK 1998 – 2100 (1000s).

	1998	2000	2010	2020	2025	2030	2040	2050	2060	2070	2080	2100
Potential Support Ratios (PSR)												
PSR 3.0	175	99	95	95	932	629	-66	221	671	1232	-653	-32
PSR 3.5	175	99	95	939	1346	661	-74	679	2013	1206	-1260	1536
PSR 4.2 (1998)	175	99	1195	1063	1523	833	578	2651	2304	1331	974	5854
Workforce absolute size												
15-64 as in 1998	-115	-121	134	222	329	173	-11	172	226	120	38	170
Population absolute size												
1998 pop	-75	-60	-27	14	67	134	170	162	120	107	116	123

Source: unpublished tables from the UK Government Actuary's Department

Table 4 Population size 'required' to maintain population and workforce targets, UK 1998 – 2100 (1000s)

Target	1998	2000	2010	2020	2025	2030	2050	2060	2080	2100
Potential Support Ratios (PSR)										
PSR 3.0	59237	59750	61587	63470	64235	69139	77026	77957	100612	90799
PSR 3.5	59237	59750	61587	64948	70507	78761	89983	97276	142625	143923
PSR 4.2 (1998)	59237	59750	63371	76637	84383	94716	118902	152648	213207	303371
Workforce absolute size										
15-64 as in 1998	59237	59155	58578	60145	61492	63273	63093	63125	64723	63481

Source: unpublished tables from the UK Government Actuary's Department

VARIANT DEMOGRAPHIC SCENARIOS FOR THE UK

The other approach is to see what effect various 'reasonable ' variant assumptions might have on population size and age-structure, by comparison with the GAD's Principal Projection (Government Actuary 2000), and then to explore 'targets'. Details are published elsewhere (Shaw 2001, Coleman 2000). Outcomes for various indicators are shown in

Appendix table 1 for 2050 and in Appendix Table 2 for 2100. Summary trends are shown in Figure 1.

Short of the impossibly high levels of immigration 'required' to maintain the potential support ratio, no reasonable assumptions of future demographic change makes a radical difference to any of the indicators by 2050 (Table 5). Furthermore, because of the momentum of the present age-structure, changes in vital rates may take a long time to have significant effects. The range of the potential support ratio, for example, is from 2.25 to 3.12, far from the current 4.1 (the GAD principal projection gives 2.4). A selected range of outcomes is shown in Figure 1. Excluding the figure of 3.12, the 'best buy' but derived from an impossible 'no change' scenario, the effective range is from 2.25 to 2.75. Notional retirement age to conserve the existing potential support ratio varies from 70 to 74. The demographic aspects of population ageing and the decline of potential support ratios are thus inevitable; it is impossible for modern vital rates to preserve the age-structure created by former vital rates now irrevocably finished. While the numbers of contributors will remain almost constant from 2000 to 2061, the numbers of pensioners increase rapidly after 2020. Their numbers then cease to increase and even decline after 2040 to establish a new equilibrium (Government Actuary 1999 Figure 4.2) as the baby boom queue at last moves on from the benefit office to the Pearly Gates. Amelioration and management must come primarily from non-demographic channels.

Figure 1 Trend of Potential Support Ratio under various assumptions, UK 1998 - 2100

Evaluation of the 'preferred' route into the future might be achieved by considering a trade-off between protection of potential support ratio and population size. It is assumed that

higher PSRs are preferred and that further increase in population is undesirable (see Coleman 2000 for further discussion of the latter). Change in potential support ratio is intimately associated with the notional retirement age required to preserve the potential support ratio, which the GAD has also computed. A return to replacement fertility yields the highest potential support ratio of all (2.75) with a notional working age limit of 70.6 years required to keep that ratio at 4.2., with population growing to 72 million by 20250. The same fertility with zero net migration, however, produces a PSR of 2.53 but with 8.7 million fewer people.

Table 6 Comparison of scenarios at 2050 by order of potential support ratio.

Projection	Population values in 2050				
	Total population	Median age	Percent aged 65+	Support ratio	Working age limit
Actual 1998	59237	36.9	15.7	4.15	62.5
Constant 1998 vital rates	64187	42.7	20.4	3.12	68.3
TFR=2.07	71796	40.4	21.7	2.75	70.6
TFR=2.07, high e0	72649	40.9	22.4	2.64	71.5
185k constant migration	70630	43.4	23.2	2.61	71.1
TFR=2.07, zero migration	63059	41.6	23.2	2.53	72.1
GAD 1998 Principal Projection	64181	44.1	24.2	2.47	72.0
TFR=2.07, high e0, 0 migration	63874	42.2	24.0	2.42	73.0
TFR=1.7	61733	45.5	25.2	2.38	72.6
High e0	65028	44.6	25.1	2.37	72.8
Zero migration	56108	45.8	26.0	2.25	73.6

Note: Except where specified, all scenarios employ the same assumptions as the GAD Principal Projection: TFR rising to 1.8, constant migration of 95,000 per year, expectation of life rising to 79.7 and 83.9 years for males and females respectively by 2060.

The effects of changes in each of fertility, immigration and survival upon the potential support ratio, holding the other two variables constant, are presented below in simple tabular form. The most efficient process yields the biggest increase in support ratio for the smallest percentage increase, or increase produced in population size (Table 7, Figure 2).

Figure 2 Population size and potential support ratio, UK 2050, according to variant projecetions.

Net immigration 185,000 compared with zero net migration gives an additional population of 14.5 million with an improvement in potential support ratio of 0.36, or 0.025 per million population.

Replacement fertility (with constant 95,000 net immigration) increases population by 10 million for an increase in support ratio of 0.37. That represents a 'rate of improvement' of support ratio of 0.037 per million population, about 50% more efficient than that attained by the migration route (0.025). However, any increase in fertility brings an increase in child support costs. Even replacement TFR, of course, cannot restore a potential support ratio of 4.1. That would take a TFR of about 3; a TFR of 2.5 eventually generates potential support ratio of about 3.7 (Shaw 2001, Figure 8b). Increased fertility with constant zero migration to TFR=2.075.generates hardly any future population growth to 2100. Potential support ratio is just over 2.5 and the externalities of the high migration streams in other projections are permanently avoided.

Finally the effects of increased survival, at constant levels of fertility and migration, moves the potential support ratio sharply backwards with small increases in population size. The effect is to worsen potential support ratio by 0.119 for every million increase in population arising solely from longer survival.

Table 7
Absolute change in potential support ratio per million increase in population generated by:

Fertility	Immigration	Expectation of life
0.037	0.025	-0.119

Percentage change in potential support ratio per million increase in population:

1.545	1.102	-4.689

Percent change in potential support ratio from 10% increase in each variable:

7.075	0.597	-2.424

As expected from demographic theory, fertility emerges as by far the most efficient factor affecting potential support ratio. This is particularly marked in the comparison based upon the effect of a given percentage increase in the value of each independent variable. How impressive this is depends upon the degree to which it is feasible to envisage changes in each variable. From 1964 to 2000 UK TFR has varied from 2.94 to 1.66, an increase of 77% over the lower figure. Since 1980 it has varied between 1.7 and 1.84. Net immigration has varied from – 87,000 in the 1960s to +181,000 in the latest year 1999. During the 1980s and 1990s the figure has only exceeded 100,000 in the last few highly exceptional years. This may, of course, become the norm under current Government policy. A recent Home Office publication published in parallel with recent Ministerial announcements suggests that net immigration of non-EU nationals alone will rise to just under 180,000 by 2005 with an implied asymptote of just under 200,000 (Glover et al 2001, p 12) compared with the official Government Actuary's assumption of a fall to a constant 95,000 from all sources after 2002 (ONS 2000, page xi).

So far, past levels of migration, even on a scale sufficient to be controversial, have so far had modest effects on population structure as opposed to totals. For example in the UK net immigration has generated almost all the 3 million population growth since the mid-1970s (Coleman 1995, Courbage and Compton in press). This has led up to 1990 to a 2.3% excess

among males aged 40-49 in the UK but a deficit of 1.1% among males aged 0-9. In percentage terms, most differences have been trivial. (Murphy 1996).

POSSIBLE NON-DEMOGRAPHIC RESPONSES

No complete policy solution is possible; any amelioration of the situation must depend on a multiple response, which fall into four broad categories.

Demographic ageing and the implied consequent reduction of the ratio of production to consumption is a major challenge to all modern economies. Media speculation suggests that these demographic trends will be both sudden and serious, provoking much talk of 'demographic timebombs' and ill-considered advocacy of unlimited migration to counter it. In fact, in the UK 'demographic timebombs' only go off in the media, not in real life. We have already seen that immigration can only sustain the potential support ratio at the cost of unsustainable levels of population growth, and that a return to somewhat higher fertility would undoubtedly help the position it cannot restore it. A there is no 'solution' to lower support ratios; the question arises whether the process can at least be moderated in other ways? In financial and actuarial circles, attention in the UK tends to be focused in fairly optimistic terms, on fiscal, economic and workforce adjustments (Institute of Actuaries, in press). What matters is that the economy can manage the changed pattern of consumption and investment and still deliver acceptable economic growth . Most opinion suggests that it can, if birth rates remain reasonably favourable (see e.g. Weil 1997, Mirrlees 1997, Gillion 1999). This is not the appropriate place to discuss these options (see World Bank, 1994, Daykin and Lewis 1999). . Measures currently being pursued by UK government are reviewed elsewhere (Dunnell 2001). But in brief, favoured approaches include the following:

(1) Improving the real, as opposed to potential 'support ratio'

The actual UK workforce is only about 78% of the working age population, because of early retirement, tertiary education, and so on. Hence the real support ratio of taxpayers to pension recipients is already much lower than the abstraction of the 'potential support ratio' - about 3.2, not 4.1, and the support ratio of workers to all non workers over age 15 is today 1.67. There is much scope for increasing it.

(a) encouraging higher workforce participation through retraining of the unemployed, discouraging early retirement, reducing obstacles to internal labour mobility (Fuchs and Schmidt 2000), above all making it easier for women to combine work with childcare through a variety of measures in Europe, most developed in the Scandinavian countries. An increase of workforce participation rates to Danish levels would increase the EU workforce by 30 million. Return to the male workforce participation rates of 1971 and reasonable assumptions about extension of female participation up to age 65 when pensionable ages are unified in 2010 - 2020 increases the active population to 84% of the age-group and a real support ratio of all dependants over 15 falls from 1.67 today to 1.54 in 2051 (Coleman 2000 table 10).

(b) moving the average age of retirement upwards, a process facilitated by longer active life. This would involve moving pension entitlement age upwards and encouraging longer workforce participation by removing tax disincentives for working pensioners, removing employment barriers solely on grounds of age. Such steps are already in train in the US, Italy and Japan. The tables above showed the level of retirement age need completely to compensate for support ratio changes (essentially by changing the definition of support ratio). Most scenarios envisaged a retirement age rising to about 72. Complete compensation is not needed, of course, and we are not starting from a retirement age of 65. the calculations summarised in Table 6 above assume a current age of 62, in reality it is about 58. If maintaining the support ratio involves a longer working life of (72-65=7)

years, then maintaining the real support ratio means a movement of normal retirement from 58 to (58+7=65).

(2) Moderating the financial burden

(a) by later retirement and by resisting further increases in the value of state pension entitlement; linking it for example to prices, not wages. The UK has already done this.

(b) Encouraging alternative sources of old-age support through 'second and third pillar' occupational and private funded pension schemes, which may have the additional advantage of improving the savings rate for investment (World Bank, 1994, Daykin and Lewis 1999). Over 70% of the UK population is already covered by occupational or private schemes, in marked contrast to the continental countries. (European Federation, Stein 1997). However, pensions cannot escape demographic effects, because their value still depends on the output of the economy, in which the size of workforce plays an important role (Chand and Jaeger 1996, Johnson 1997).

(3) Responding to stationary or declining workforce by increasing capital investment to improve worker productivity - a generally desirable step , to improve Europe's poor international competitiveness, and one which would naturally follow from the pressure of higher wages arising from any labour shortage. Several calculations have suggested that productivity growth to cover all increased old-age dependency would amount to about 0.5% per year by 2020, compared with normal annual growth of up to 3% per year.

None of these by itself can offers a complete solution; none is available. For example, by 2025, additional productivity improvements for the EU would have to be about 0.8% per year if they were the sole means to meet the need for extra resources arising from population ageing; average age at retirement would have to rise from the present EU average of 60 to 66 (European Commission, 1996 pp 36-39). Many countries have already begun to implement several of these measures in

order to minimize problems and in the majority of European countries a multiple response appears to make them manageable. However, increased workforce participation is a 'one-off' response the effects of which would not last beyond about 2025. Furthermore, the extreme low-fertility countries, especially Italy, face in the long run an apparently unsustainable burden unless their birth rate increases considerably. The birth-rate there is certain to increase to some extent ,as part of the recuperation from delayed fertility. Analysis of recuperation of delayed births suggests recovery to near replacement rates in some countries e.g. the Netherlands.

Fertility prospects

The level of the birth rate has the most potent effect upon the level of population ageing and support ratios that populations must live with in future. A TFR of more than about 2 is not to be expected, and that level would not restore support ratios to previous levels or , in countries with previously lower fertility, avert a period of population decline. But relatively high fertility (say 1.7 or over) would greatly assist the management of ageing by the measures noted above . Demographic opinion is divided over how far very lower fertility is here to stay (Lesthaeghe 2000) or will recuperate from current postponement or respond to welfare measures, whether 'pronatalist' in intention or not. The relative buoyancy of birth rates in NW Europe and their apparent responsiveness to family-friendly policies suggests that it can. But before that can happen, underlying attitudes unfavourable to gender equity within the family and in society as a whole would have to change, a less predictable process (McDonald 2000).

Other migration issues

Europe has been receiving variable but large net immigration flows, both regular and illegal, for many years now (see OECD 2001): the concept of 'Fortress Europe' seems far from reality. Recent flows to most countries are not primarily driven by regular labour demand. Domestic

unemployment averages 9% and is up to 40% in the existing foreign populations themselves, while workforce participation rates of immigrants, especially females, are low. Demand for regular migrant labour nonetheless co-exists with unemployment, partly thanks to continental labour market rigidities. This has been satisfied in recent decades by the free movement of labour within the EU's 380 million population and by the variable work permit systems for recruitment abroad. These flows are declining in some countries, increasing in others. Much of the regular labour migration is of highly skilled professional or business migration, especially inter-company transfers. Exceptional demand in some sectors , notably IT, may justify exceptional new measures according to the UK and German governments, although projected demand for IT workers had already been halved in three months in the face of oncoming economic difficulties . Demand for illegal labour is strong in some sectors, exploited at low wages and with low levels of job protection in marginal areas of the economy. However, variable immigrant labour supply to meet specific skill shortages, welcomed by most countries, is a very different matter from the much more general proposition of immigration to meet demographic deficits.

As to the future, general increases in labour migration over and above present levels is not needed to satisfy quantitative workforce deficiencies (special skills excepted) for up to 2020 in much of Western Europe; Italy and other Southern countries are exceptions (Feld 2000); although there the demand co-exists with high structural levels of unemployment . Europe has substantial reserves of employable manpower which exceed any short-term demographic deficiencies. However their mobilisation will require structural readjustments and the effects of enhanced workforce participation to age 65 cannot extend much beyond 2025. High-level manpower movements will continue or grow as they have done for many years. While legal immigration of dependants, unavoidable immigration of asylum-seekers and illegal immigration will continue they do not appear to be relevant to Europe's foreseeable economic needs nor helpful to the coherence of its society.

More broadly, reliance upon the apparently easy option of importing labour from overseas, or to employ illegal immigrants for low wages and evade their training responsibilities, might risk exacerbating Europe's central economic problem, that of low productivity. Productivity levels in Europe are still substantially below those of their major competitors. There is no merit in perpetuating low-wage, low-output domestic enterprises which can only survive with marginal labour, and whose services or goods can be imported instead. That impedes the modernization and capitalisation of the economy.

CONCLUSION

There are no feasible migration solutions to the age-structure change and its effects on social security. It is not caused by a deficit in migration but by low fertility and increased expectation of life. In the long run, only approximately replacement level fertility can even moderate it, and even then not without some intervening demographic decline. Nothing will ever bring back the age-structure of previous centuries. Whatever the demographic response, changes in the balance between consumption and production are inevitable (Weil 1997). These problems appear to be manageable, though not finally soluble, in most European countries (Ermisch 1990) as long as permanent very low fertility can be avoided.. Europe has already weathered a trebling of the old age population, from 5% to 15% since 1900.

Europe has already experienced one episode of mass migration , which is still not ended. It has not prevented population ageing and while some of its aspects are judged to have been economically beneficial, overall it is less clear if it has had demonstrably favourable consequences either for the immigrants or for the host populations. Opinions still differ widely about the appropriate measures to

encourage the integration and possibly the assimilation of the growing populations of immigrants, foreigners and their children (Coleman 1992). Some such groups are now very successful, others remain marginalized, subject to high levels of discrimination, unemployment, poverty and, in the younger generation, disproportionate under-achievement and involvement in crime. Resolution of these problems might be an appropriate goal before any further resumption of mass immigration is contemplated.

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Appendix table 1

UK Variant projections based on 1998 GAD Principal Projection to 2050

Projection

Values 2050	1 Zero migratio	2 185k migratio	3 TFR 2.07	4 TFR 2.00	5 TFR 1.70	5b TFR 2.0 zero mig	5c TFR2.07 zero mig	6 High e0	7 TFR2.07 High e0	8 TFR2.0 High e0	11 Constant 1998	GAD Princip Project
Variable												
Population	56108	70630	71796	69527	61733	60976	63059	65028	72649	70378	64187	64181
Median age	45.8	43.4	40.4	41.3	45.5	42.7	41.6	44.6	40.9	41.8	42.7	44.1
Pop aged 65+	14608	16413	15556	15556	15556	14608	14608	16296	16296	16296	13121	15556
% 15-64	58.7	60.7	59.7	59.7	60.0	58.6	58.7	59.3	59.1	59.2	63.7	59.9
%65 and over	26.0	23.2	21.7	22.4	25.2	24	23.2	25.1	22.4	23.2	20.4	24.2
Support Ratio	2.25	2.61	2.75	2.67	2.38	2.45	2.53	2.37	2.64	2.56	3.12	2.47
Pop change	-240	81	147	91	-133	-103	-54	-11	209	144	-53	0.64
Pop growth %	-0.42	0.12	0.20	0.13	-0.21	-0.17	-0.09	-0.02	0.29	0.21	-0.08	-0.10
Net Migration	0	185	95	95	95	0	0	95	95	95	185	95
TFR	1.8	1.8	2.1	2.0	1.7	2.0	2.1	1.8	2.1	2.0	1.7	1.8
e0m	79.7	79.7	79.7	79.7	79.7	79.7	79.7	81.1	81.1	81.1	74.9	79.7
e0f	83.9	83.9	83.9	83.9	83.9	83.9	83.9	85.2	85.2	85.2	79.7	83.9
Upper limit of working age needed to obtain given potential support ratios												
Support ratio	*Upper limit of working age*											
4.09 (1995)	73.6	71.1	70.6	71.1	72.6	72.5	72.1	72.8	71.5	71.9	68.3	72.0
3.5	71.3	69.1	68.4	69.0	70.4	70.3	69.9	70.6	69.3	69.7	66.4	69.9
3.0	69.2	67.0	66.1	66.7	68.3	68.1	67.6	68.5	67.0	67.4	64.5	67.8
Difference at 2050 between GAD Principal Projection and successive projections												
pop. total	-8073	6449	7615	5346	-2448	-3205	-1122	847	8468	6197	6	0
pop total %	-12.58	10.05	11.86	8.33	-3.81	-4.99	-1.75	1.32	13.19	9.66	0.01	0.00
%65+	1.80	-1.00	-2.50	-1.80	1.00	-0.20	-1.00	0.90	-1.80	-1.00	-3.80	0.00
support ratio	-0.22	0.14	0.28	0.20	-0.09	-0.02	0.06	-0.10	0.17	0.09	0.65	0.00

Source: unpublished calculations by UK Government Actuary's Department, 8, 31 August 2000

Appendix table 2

Variant projections based on 1998 GAD Principal Projection: UK population 2100

Projection

Values 2100	1 Zero migratio	2 185k migratio	3 TFR 2.07	4 TFR 2.00	5 TFR 1.70	5b TFR 2.0 zero mig	5c TFR2.07 zero mig	6 High e0	7 TFR2.07 High e0	8 TFR2.0 High e0	11 Constant 1998	GAD Princip Project
Variable												
Population	44257	72625	81808	75130	53624	57204	62994	64519	86956	80080	61004	60052
Median age	45.7	43.5	40.1	41.2	45.4	42.3	41.1	46.8	42.6	43.7	42.6	44
Pop aged 65+	11702	17173	17219	16461	13815	13354	14055	18704	21784	20873	12671	14660
% 15-64	58.2	60.3	60.2	60.2	59.4	59.1	59.3	56.2	57.3	57.1	63.3	59.7
%65 and over	26.4	23.6	21	21.9	25.8	23.3	22.3	29	26.1	26.1	20.8	24.4
Support Ratio	2.2	2.55	2.86	2.75	2.31	2.53	2.66	1.94	2.29	2.19	3.05	2.45
Pop change	-212	39	219	124	-144	-60	16	4	327	223	-54	-71
Pop growth %	-0.47	0.05	0.27	0.17	-0.26	-0.1	0.03	0.01	0.38	0.28	-0.09	-0.12
Net Migration	0	185	95	95	95	0	0	95	95	95	185	95
TFR	1.800	1.800	2.070	2.000	1.700	2.000	2.075	1.800	2.070	2.000	1.700	1.800
e0m	80.1	80.1	80.1	80.1	80.1	80.1	80.1	86.5	86.5	86.5	74.9	80.1
e0f	84.2	84.2	84.2	84.2	84.2	84.2	84.2	90.4	90.4	90.4	79.7	84.2

Upper limit of working age needed to obtain given potential support ratios at 2050

Support ratio	*Upper limit of working age*											
4.1 (1995)	73.6	71.1	70.6	71.1	72.6	72.5	72.1	72.8	71.5	71.9	68.3	72.0
3.5	71.3	69.1	68.4	69.0	70.4	70.3	69.9	70.6	69.3	69.7	66.4	69.9
3.0	69.2	67.0	66.1	66.7	68.3	68.1	67.6	68.5	67.0	67.4	64.5	67.3

Difference at 2100 between GAD Principal Projection and successive projections

population	-15795	12573	21756	15078	-6428	-2848	2942	4467	26904	20028	952	0
pop total %	-26.30	20.94	36.23	25.11	-10.70	-4.74	4.90	7.44	44.80	33.35	1.59	0.00
%65+	2.00	-0.80	-3.40	-2.50	1.40	-1.10	-2.10	4.60	1.70	1.70	-3.60	0.00
support ratio	-0.25	0.10	0.41	0.30	-0.14	0.08	0.21	-0.51	-0.16	-0.26	0.60	0.00

Source: unpublished calculations by UK Government Actuary's Department, 22 and 31 August 2000

Figure caption:

Figure 1 Trend of Potential Support Ratio under various assumptions, UK 1998 - 2100

Figure 2 Population size and potential support ratio, UK 2050, according to various projections.

Short title for page headings:

Replacement migration