# Who's afraid of low support ratios? a UK response to the UN Population Division report on 'Replacement Migration'

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Paper prepared for the United Nations 'Expert Group' meeting held in New York, October 2000, to discuss the report on 'Replacement Migration' presented by the United Nations Population Division.

SHORTER REVISED DRAFT December 20 2000

*Corrections and comments welcome*

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.INTRODUCTION
Purpose of the paper

In March 2000 the United Nations Population Division (UNPD) presented a comprehensive analysis of the levels of net immigration which would be technically 'required' if an attempt were made to check the eventual population decline, fall in size of workforce and population ageing envisaged in some population projections, up to 2050. This comprehensive analysis, the first to be made on a common methodology on a fully international basis to address this otherwise familiar issue, has attracted unusual attention and provoked much comment in the media.

This paper is a response to the UNPD report from the viewpoint of the UK. It begins by reviewing the demographic prospects for the UK during the half century 2000 - 2100 using projections made by the UK Government Actuary's Department (GAD), in comparison with the results presented by the UN Population Division. Variant GAD projections are presented to explore further the implications of possible future UK demographic trends, and also to test the migration and fertility levels 'required' to achieve various demographic targets.

It then considers the ability of economies and societies, especially that of the UK, to respond to population ageing and to the possibility of a reduction in population size. The variety of options available; through workforce, productivity, pensions reform and other means, as well as demographic responses, and the likely outcome of events are discussed. It is concluded that in the relatively benign demographic regime of the UK, future population ageing, in any case mostly unavoidable, can be managed without serious difficulty, given suitable albeit somewhat painful adjustments to workforce participation, retirement age and pensions funding. By itself, population stabilization, or even mild reduction, is probably to be welcomed in the UK, while current levels of immigration are judged to be too high

General comments on the UN PD Report

Before comparing details, a general comment about the UN Report and its ramifications may be appropriate. The Report represents an imaginative systematic exploration of one aspect of a fundamental problem which affects, to varying degrees, all developed societies. Its uniform technical treatment of the migration aspect of population ageing is welcome. Because of this systematic approach, and because of the prestige attaching to the UN Population Division, the report has been widely read and cited. Its statistics will be a definitive benchmark for years to come. In the UK it has featured in almost every major national newspaper and journal, and is cited on wireless and television whenever issues of migration, ageing or labour shortage are discussed. Along with the asylum crisis and the new UK government's wish to re-think immigration policy, the Report may claim to have raised consciousness about the whole issue.

This massive publicity, however gratifying it may be to the authors of the report, may have had some unfortunate and doubtless unintended consequences. In the UK media at any rate, the almost universal impression conveyed to the public is that the UN has stated the following: (a) that population, workforce numbers and support ratios must be kept at their present levels and therefore (b) that the projected levels of immigration must be encouraged by the countries concerned. This interpretation of the report has provoked the most comprehensive public misinformation on any demographic-related topic that this author can

recall. Some of this is due to the familiar problems of communicating technical information to the media. In the UK various pressure groups and some official bodies such as the Commission for Racial Equality have added these arguments to their repertoire of propositions to support immigration and oppose its restriction. For these purposes the UN report has been timely, as in recent years the UK has experienced a crisis of asylum-claiming which has made it, in terms of absolute numbers, the most favoured destination in Europe. In several recent months claims have exceeded even the number made to Germany. UK pressure groups and commentators in the media are now able to cite the Report as evidence that asylum-claimants and illegal immigrants should be welcomed irrespective of their merit of their claims as they now represent demographic salvation. Despite widespread public anxiety on immigration (British Social Trends 2000), there are no pressure groups in the UK devoted to its critical evaluation, an asymmetry apparently general in the Western world (Freeman, 1994).

The strategy and some of the phrasing of the Report and of its press release may have contributed, unintentionally, to misunderstandings on this politically sensitive issue. Its concentration on immigration as the 'solution', one already well known in demographic circles to be impractical at least in respect of the support ratio, gave the impression that other approaches, possibly more promising, were of little consequence. Alternatives (pensions, retirement and workforce reform, productivity, more substantial changes in fertility) were noted but not evaluated in detail. The political, social and economic costs of large-scale immigration received no mention. The Report's concentration on the demographic abstraction of the 'potential support ratio' without considering equally or more important non-demographic components of real dependency levels in real societies, has been criticised as 'demographism' (Tarmann 2000).

Further, the repetition of imperative terms such as 'needed' and 'required' have given the impression to the unreflective that the avoidance of population stability or decline was absolutely necessary and that population ageing was not only intolerable but also avoidable. The demographic targets, parameters in a hypothetical scenario, have been widely interpreted by the media as policy prescriptions. Readers were presented with unqualified statements such as 'some immigration is needed to prevent population decline in all countries and regions examined in the report' and 'population decline is inevitable in the absence of replacement migration' and would 'force Governments to reassess many..policies', as though none had already done so.

The notions that population decline is unacceptable and that population ageing is avoidable reflect transatlantic rather than universal Western concerns. Population 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), official reports in the UK (Population Panel 1973) have 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 Dutch Royal Commission on Population 1977.

Population projections, always wrong in detail, are unusually frail when made over the adventurous time-span of 50 years, which allows many components of potential error to accumulate. And yet health warnings about the uncertainty of speculative pronouncements at this range, discussed *inter alia* by Lee (2000) were effectively absent, and no mention was made of their past record. This is not to say that the general outlines of the UN projections

are wrong. Overall totals have often been quite well projected, although over much shorter time-spans than 50 years) and the record has improved. However, past UN projections for Europe and North America have 'relatively large' errors in the age structure at young and old ages even at the modest range of ten years (Keilman 1997, 1998, p 31). Probably all demographers would agree that fertility is unlikely to return to levels above a two-child average, that mortality will continue to fall, that substantial population ageing is inevitable and the demographic component of workforce will cease to grow in most countries. Beyond that there is no reason to suppose that the next century will not bring at least as many unexpected surprises as the last.

Neither was any mention made of the well-known tendency of synthetic cohort measures such as the TFR to under-state contemporary fertility levels, or the possibility of feedbacks from public policy affecting the very low level of fertility in some countries. Feedbacks and limiting factors in population projection have already been suggested (mostly in the context of growth, not decline) as a way of making 'intelligent' population projections which avoid extreme conclusions (Cohen 1998, Sanderson 1998, Ahlburg, Lutz and Vaupel 1998). However the UN PD may have implicitly allowed for this in marking up fertility over time in its projections.

In the nature of things journalists will concentrate on press releases and headlines rather than strain their limited attention-span by consulting in detail the scientific comments in the body of reports. It was unfortunate that the Press Release was presented before the report was available. In the natural sciences, this practice is condemned. It should be avoided in the social sciences as well.

## DIFFERENCES BETWEEN THE UN AND OFFICIAL UK PROJECTIONS

The UK Government Actuary's Department (GAD) makes regular long-range projections in order to evaluate the financial and demographic prospects of the UK state pension scheme (Government Actuary 1999). Along with the US, it is one of the few governments to require such projections (Lee 2000). In response to the UN report, the GAD has undertaken additional long-range projections (Shaw, in press), on a wide variety of assumptions. Some are presented here by courtesy of the GAD.

The UN and GAD projections differ in important ways. The GAD starting population is higher, primarliy becuase the UN under-estimated net immigration to the UK in the late 1990s. Different assumptions about fertility, mortality and migration lead to further divergence. The final UN TFR in 2050 is 5% higher than that of GAD: 1.9 instead of 1.8. Expectation of life at birth by the end of the UN projection is lower for men by 0.5 years, and higher for women by 0.5 years even though it begins somewhat lower for both sexes. Either fertility estimate is defensible. Both mortality projections, however, seem too low. The pace of reduction of mortality, especially that of the oldest-old (Kannisto, et al. 1994) suggests that much greater progress may be made, although this is not universally agreed (Olshansky et al 1998).

The most striking divergence is in the migration assumptions. The UN assumes net immigration of 40,000 per year declining to zero between 2020 and 2025, compared with a GAD projection of 175,000 between 1998 and 2000 dropping to a permanent 95,000 per year thereafter. The UN projection is behind the times. It resembles the level and trend of official UK estimates and projection typical of the early 1990s (OPCS 1993), when it was set at

50,000 per year declining to zero by 2015-6. Since then the reality of growing net immigration has obliged successive GAD revisions to set immigration at 65,000 per year, no longer declining to zero (Government Actuary 1998) followed by the most recent elevation to a permanent 95,000 in the 1998 projections (Government Actuary 2000).

Even the recent GAD projection beyond 2000 considerably under-states the current flow of 185,000 (ONS 1998). The projection invites us to accept a large drop in immigration, to net 95,000 per year, on grounds which may be questionable. The evidence suggests a weakening effectiveness of the traditional UK policy aim of minimising immigration (Coleman 1997). Furthermore the new government since 1997 has relaxed some controls, permitting an acceleration of flows for purposes of marriage, expanded entitlements to entry. It is considering increasing immigration further as a matter of policy, on labour force and demographic pretexts (Roche 2000). Its measures to curb asylum flows have been rewarded with record inflows: the UK became the favoured European asylum destination in 2000. There seem to be no grounds for supposing a halving of net inflows to 95,000. Further increases over the current 185,000 are more likely once cyclical downturns are taken into account.

The total population in 2050 projected by the GAD is 7 million - 13% higher - than the UN medium variant projection, mostly because of the difference in migration assumptions. The population aged 65 and over is 11% higher. The age-burden of the population projected by the GAD is accordingly slightly lower, with a slightly higher potential support ratio.

This substantial increase in population arising from the difference in migration assumptions does not generate commensurate changes in age-structure, however.. The potential support ratio improves by 0.15 ( 6.5%). The upper limit of working age required in 2050 to maintain the 1995 support ratio of 4.09 falls by 0.3 years, a small advantage for an extra 7 million people. That illustrates the familiar general proposition that even substantial increases in immigration have little impact on population ageing.

## VARIANT RUNS BASED ON THE 1998 GAD PRINCIPAL PROJECTION

We now turn to investigate a range of projections based on various different plausible assumptions imposed on the 1998 GAD Principal Projection The projections have all been continued to 2100l. While even more precarious than a fifty-year projection, this shows the long-term stable or quasi-stable distributions to which the assumptions would give rise, including the effects of continued improvement in survival, and long term implications for population size. The projections to 2100 also show the mildly favourable effects of age-structure and dependency of the final disappearance of the baby boom cohorts which cause a once-for-all worsening of dependency from the 2020s.

### 1 Zero net migration

This projection assumes zero net migration at all ages, not just net migration overall (The UN zero migration variant does the same). This is quite a strong assumption. It produces the lowest final population total of all (by 2050 8.01 million - 12.6% - less than GAD 98 Principal Projection, 3 million less than the 2000 figure, and 44.3 million in 2100. The proportions over age 64 and the support ratio are the least 'favourable' of any of the projections considered so far, with the 'required' limit of working age at the highest level. These results resemble those of previous (e.g. 1996, 1994 GAD) UK projections which assumed lower migration declining eventually to zero.

2 Constant migration at 185,000

This assumes that migration will continue at the 1998 level of 185,000 net intake per year; that is 9.25 million net immigrants over the next 50 years. Equal numbers of male and female immigrants are assumed. Not surprisingly this projection generates substantial population growth to 70.6 million in 2050 (72.6 in 2100), 6.45 million more (10.1%) than in the GAD 1998 Principal Projection. The migration effect increases the UK population by 14.5 million people (25.9%) compared with the zero migration projection in 2050 and 11.4 million over the actual 1998 population of 59.2 million (19.2%). Like all the other projections, that assumes unrealistically that immigrants immediately acquire the fertility and mortality patterns of the host population.

Table 1 Summary of variant GAD projections to 2050

## UK Variant projections based on 1998 GAD Principal Projection to 2050
## UK population at 2050

Projections no 9 and 10 are deleted to save space (see text)

*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 p.a. | -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

This considerable increase in population does not have commensurate effects upon the age-structure (Table 1, Table 2). Median age falls to 43.4 by 2050 compared with 44.1 in the GAD 98 and 45.8 in the zero migration projection. The potential support ratio rises to 2.61 and the 'required ' upper limit of working age falls to 71.1. This level of migration not only exceeds the UN scenario 'requirements' for constant total population (on average 48,000 net immigrants per year) but is also comfortably ahead of the numbers calculated by the UN to provide a constant age-group aged 15 - 64 (on average 114,000 per year (UN Table IV. 18 p 69).

Table 2 Summary of variant GAD projections at 2100

## 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

### 3. Replacement fertility (TFR = 2.075)

In this projection fertility is raised by 22% to 2.075, the 'replacement' TFR, while net immigration and expectation of life remain at the GAD Principal Projection levels. Total population increases to 1.4 million more than the high immigration variant (to 71.8 million by 2050) and to considerably more (81.8 million) by 2100. By 2050 this projection produces the lowest proportion of population aged 65 and over (21.7%), the lowest median age (40.4) and the highest potential support ratio (2.75 and rising) of any of the variant projections other than the 'constant values' projection noted below.

4. High fertility (TFR = 2.0)
This scenario is the same as the official GAD - based high fertility variant, representing an increase in TFR over the GAD Principal Projection of 0.2 or 11%. Its effects approach those of the previous scenario.

5 Low fertility TFR = 1.7.
This scenario assumes that fertility remains at its present 1.7 instead of increasing to 1.8 as expected in the GAD Principal Projection, remaining therefore 0.1 or 5.6% less Population declines by 2.45 million (-3.8%) with potential support ratio down to 2.38. Population aged 65 and over rises to 25.2%.

5b Zero net migration with TFR = 2.0. 5c Zero net migration and TFR = 2.075
Identical to projection nos 4 and 3 respectively but with zero migration. In 5c the increase of fertility to replacement rate (2.075) adds 3 million to population growth, which reaches a peak of 63 million in 2050 despite the absence of net migration - about the same as the GAD Principal Projection. However median age is reduced considerably to 41.6 and the potential support ratio is slightly more favourable (2.53). This projection ends the century with a population of 63 million growing at a negligible rate (mortality ceased to improve in 2060).

6 Lower mortality e0m = 81.1, e0f = 85.2
Here the expectation of life at birth is allowed to rise from the official GAD figure of 79.7 and 83.9 by 2060 (very pessimistic, in this author's view) to the slightly higher figure of 81.1 and 85.2 (only slightly less pessimistic). TFR remains at 1.8 and net immigration at 95,000. This amelioration of mortality is at the rate projected by Tuljapurkar, Li, & Boe, (2000). Population increases by 0.85 million. Because the benefit in survival accrues to the older population, potential support ratio falls slightly to 2.37 compared with the 2.47 of the GAD 98 Principal Variant. By 2100 the application of this conservative assumption leads to the arresting conclusion that e0m will reach 86.5 and e0f 90.4 years. 29% of the population of 64.5 million would be aged 65 and over with a support ratio of 1.9, and population growth would be almost exactly zero.

7 Replacement fertility (TFR = 2.075) and lower mortality
This projection combines the replacement fertility of projection 3 with the increased survival of projection 6. This produces the most substantial population growth of any scenario (72.6 million by 2050, 87.0 million by 2100). By 2050 it yields a low median age (40.9) and a high potential support ratio (2.64), comparable with the replacement fertility projection. By 2100 the population is older and bigger.

8 TFR = 2.0 with lower mortality.
This simulation represents a more moderate version of the previous one, with a less favourable potential support ratio, and a surprisingly large fall in the projected 2100 population (down by 7 million to 80 million). In the opinion of this author, an outcome of the kind represented by projection 7 or 8, apart from the migration assumption, may be the most realistic in the long run.

11 Constant fertility, mortality and immigration
Here vital rates are left exactly as they are in 1998, as a kind of benchmark. This generates almost exactly the same population total as the GAD 98 Principal Projection by 2050, but with a somewhat different age-structure. TFR , immigration and expectation of life at birth

for both sexes remains at today's level, about six years below the eventual figure projected for 2050. This depresses population growth. But by preventing an important component of growth in the older population, together with the effects of high immigration, it keeps the proportion aged over 65 to the lowest of any scenario (20.4%). The support ratio is kept to its highest level (3.12), with an upper limit of 'required' working age at 68.3, almost three years below that in any other projection This underlines the important effects of mortality upon age structures in the 21st century (Calot & Sardon, 1999).

Finally, it is instructive to look at some projections where the fertility assumptions go beyond the realm of credibility. (not shown here in detail, see Shaw in press, Figure 8) . For example, with TFR = 2.5 (the level in 1970 (check) support ratio recovers to about 3.7, although at the cost of continuing population growth, while even 1 million net immigrants per year cannot prevent it declining constantly to 3 and below.

IMMIGRATION / FERTILITY 'REQUIREMENTS'

The alternative approach (as in the UN PD Report) is to approach the question from the other direction; to determine the levels of migration or fertility (or other changes) required to achieve certain demographic targets. However the UN PD determined these annual 'requirements' by averaging the 50-year total. Very different results are obtained if this 'requirement' is calculated on a year-to-year basis. The annual required inflow then becomes very volatile (Table 3) as earlier demographers have shown.

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. 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. It would be impossible to 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. Most immigration is non-economic anyway, just as much if not more in the US and Canada as in Europe; 'planned ' migration envisaged here would have to compete with unplanned family and asylum migration. Migration while easy to start is particularly difficult to stop if coming from a poor country. The difficult stop-go immigration required to this end was first demonstrated over a decade ago (Blanchet 1989, Wattelaar and Roumans 1990), and their conclusions have stood the test of time.

The most exciting projection is, of course, the incredible in pursuit of the implausible; that is the population size implied by the migration 'required' to maintain the potential support ratio. On this requirement, 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 workforce 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. Maintaining the workforce achieved by later years requires somewhat larger population size, but never exceeding 68 million.

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

| | 1998 | 2000 | 2010 | 2020 | 2025 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 | 2100 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Potential Support Ratios | | | | | | | | | | | | |
| SR 3.0 | 175 | 99 | 95 | 95 | 932 | 629 | -66 | 221 | 671 | 1232 | -653 | -32 |
| SR 3.5 | 175 | 99 | 95 | 939 | 1346 | 661 | -74 | 679 | 2013 | 1206 | -1260 | 1536 |
| SR 4.22 | 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 |

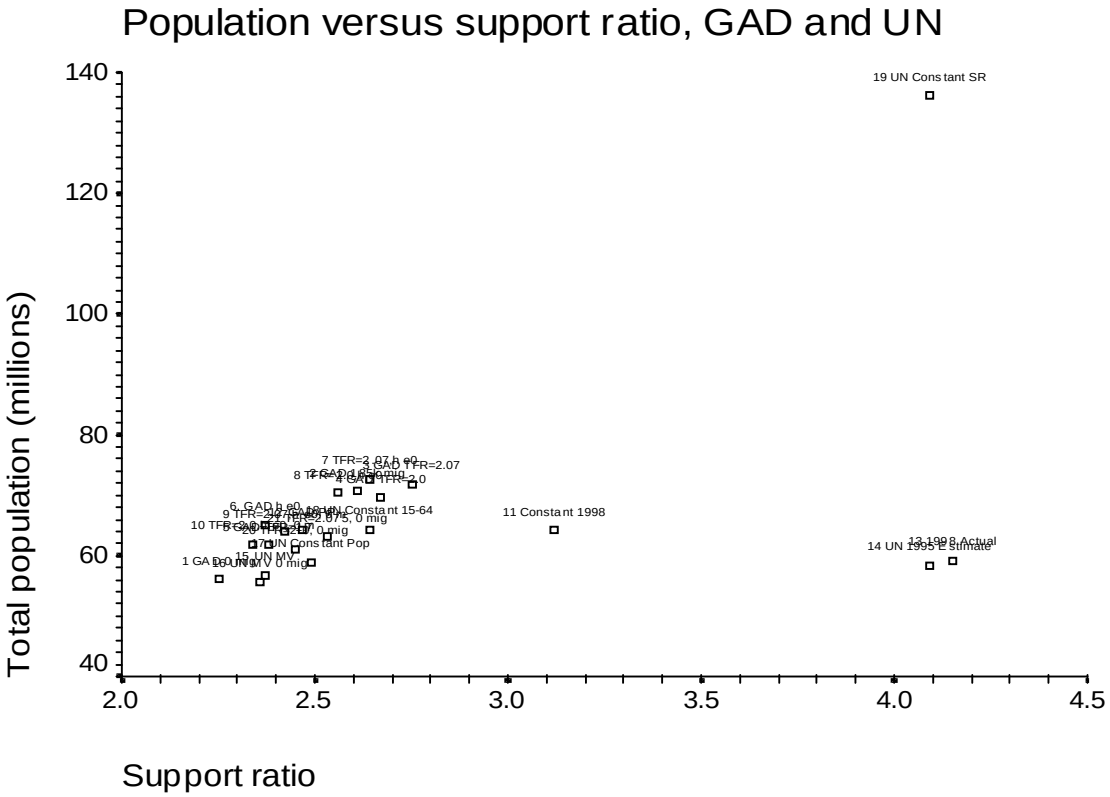
Source: unpublished tables from the UK Government Actuary's Department

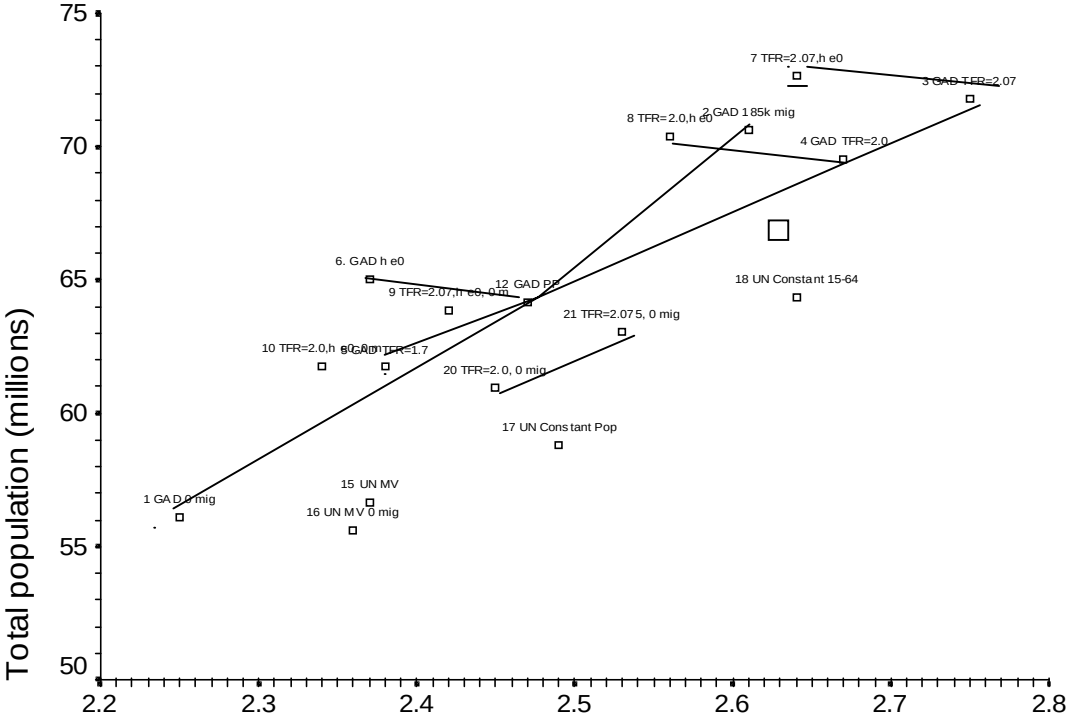
Table 4 Population size 'required' to maintain population and workforce targets, UK 1998 – 2100 (1000s)

| Target | 1998 | 2000 | 2010 | 2020 | 2025 | 2030 | 2050 | 2060 | 2080 | 2100 |
|---|---|---|---|---|---|---|---|---|---|---|
| Potential Support Ratios | | | | | | | | | | |
| SR 3.0 | 59237 | 59750 | 61587 | 63470 | 64235 | 69139 | 77026 | 77957 | 100612 | 90799 |
| SR 3.5 | 59237 | 59750 | 61587 | 64948 | 70507 | 78761 | 89983 | 97276 | 142625 | 143923 |
| SR 4.22 | 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 |

## EVALUATING RESULTS

The first conclusion is that, short of the impossibly high levels of immigration 'required' to maintain the potential support ratio, no reasonable assumptions of future demographic change makes a very radical difference to any of the indicators by 2050 (Table 5, Figure 2a, b). Furthermore, because of the momentum of the present age-structure, changes in vital rates may take a long time to have significant effects; stable population structures take time. Potential support ratio, for example, ranges from 2.25 to 3.12, all very far from the current 4.1. Excluding the figure of 3.12, 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 inevitable; it is impossible for modern vital rates to preserve the age-structure created by former vital rates now irrevocably finished. This situation will have to be lived with for as long as the species survives. 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. But in the UK case the demographic problems of ageing are relatively benign compared with many other countries. Amelioration and management must come primarily from non-demographic channels noted below in Part 2. Figures 2a, 2b below plot the population size against potential support ratio for the various simulations described above by the year 2050.


Population versus support ratio, GAD and UN
Total population (millions)
Support ratio
140
120
100
80
60
40
2.0
2.5
3.0
3.5
4.0
4.5
19 UN Constant SR
11 Constant 1998
14 UN 1995 Estimate
7 TFR=2.07,h e0
3 GAD TFR=2.07
6. GAD h e0
17 UN Constant Pop
15 UN MV
1 GAD 0 mig
16 UN MV 0 mig


Total population (millions)
Support ratio
75
70
65
60
55
50
2.2
2.3
2.4
2.5
2.6
2.7
2.8
7 TFR=2.07,h e0
3 GAD TFR=2.07
2 GAD 185k mig
8 TFR=2.0,h e0
4 GAD TFR=2.0
6. GAD h e0
9 TFR=2.07,h e0, 0 mig
12 GAD PP
18 UN Constant 15-64
21 TFR=2.075, 0 mig
10 TFR=2.0,h e0, 0 mig
5 GAD TFR=1.7
20 TFR=2.0, 0 mig
17 UN Constant Pop
15 UN MV
1 GAD 0 mig
16 UN MV 0 mig

The 'constant support ratio' projection with very high (1 million plus) annual immigration dictates the scale of Figure 2a, with double the population of any other projection. The next 'best buy' in terms of 'potential support ratio' is No 11 (3.12), where vital rates and immigration are left at their current 1998 level. The distance between that projection and the current potential support ratio (4.1) shows how much of today's potential support ratio is owed to the inheritance of the vital rates of the past, preserved in today's age-structure but lost forever by 2050. Most of the additional 5 million population in that scenario is the result of the continuation of immigration at today's high annual level of 185,000. That constant-values scenario is hardly an option unless governments act to suppress the improvement of survival and birth rates. Figure 2b shows the range of scenarios based on the more 'reasonable' assumptions. These occupy a small elliptical demographic space in Figure 2a but a change of scale in Figure 2b shows that this space is actually substantial: a range of population total from 56 to 73 million (a range of 17 million or 30% of the lower figure), and a smaller range of support ratio, from 2.25 to 2.75 or 22%.

The projections fall naturally into three loose clusters along this narrow range of potential support ratio. The first, with the lowest population growth (down to around 56 million) and lowest support ratios between 2.25 and 2.35, include the two zero migration scenarios. The UN Medium Variant for the UK is close in population size to the UN zero migration variant because the assumed level of migration in the MV is so low.

Higher replacement fertility, and lower mortality, lifts the zero migration projections to a higher level of population (between 60 and 65 million) and potential support ratios from about 2.35 to 2.55 (GAD 9) in a middle cluster, all close to the GAD 12 Principal Projection. Increased survival combined with 95k migration (GAD 6) predictably slightly worsens the support ratio.

A third cluster of variants generates considerably higher population growth, by 4 - 8 million people more than the GAD Principal Projection, to between 70 and 74 million. These are all the higher TFR variants (TFR = 2.0 or

## Table 5 Comparison of GAD scenarios at 2050 by order of support ratio.

| No. | Projection | Population values in 2050 | | | | |
|---|---|---|---|---|---|---|
| | | Total population | Median age | Percent aged 65+ | Support ratio | Working age limit |
| 13 | 1998 actual | 59237 | 36.9 | 15.7 | 4.15 | 62.5 |
| 11 | Constant 1998 | 64187 | 42.7 | 20.4 | 3.12 | 68.3 |
| 3 | GAD TFR=2.07 | 71796 | 40.4 | 21.7 | 2.75 | 70.6 |
| 4 | GAD TFR=2.0 | 69527 | 41.3 | 22.4 | 2.67 | 71.1 |
| 7 | TFR=2.07, high e0 | 72649 | 40.9 | 22.4 | 2.64 | 71.5 |
| 2 | GAD 185k migration | 70630 | 43.4 | 23.2 | 2.61 | 71.1 |
| 8 | TFR2.0, high e0 | 70378 | 41.8 | 23.2 | 2.56 | 71.9 |
| 5c | GAD TFR=2.07, 0 migration | 63059 | 41.6 | 23.2 | 2.53 | 72.1 |
| 21 | TFR=2.075. 0 migration | 63100 | 41.6 | 23.2 | 2.53 | 72.1 |
| 12 | GAD 1998 Principal Projection | 64181 | 44.1 | 24.2 | 2.47 | 72.0 |
| 5b | GAD TFR=2.0, 0 migration | 60976 | 42.7 | 24.0 | 2.45 | 75.5 |
| 20 | TFR=2.0, 0 migration | 61000 | 42.7 | 24.0 | 2.45 | 75.5 |
| 9 | TFR2.07, high e0, 0 migration | 63874 | 42.2 | 24.0 | 2.42 | 73.0 |
| 5 | GAD TFR=1.7 | 61733 | 45.5 | 25.2 | 2.38 | 72.6 |
| 6 | GAD high e0 | 65028 | 44.6 | 25.1 | 2.37 | 72.8 |
| 10 | TFR=2.0, high e0,0 migration | 61790 | 43.2 | 24.8 | 2.34 | 73.4 |
| 1 | GAD zero migration | 56108 | 45.8 | 26.0 | 2.25 | 73.6 |

## Comparison with GAD Principal Projection

| | Total population | Median age | Percent aged 65+ | Support ratio | Working age limit |
|---|---|---|---|---|---|
| GAD 1998 PP | 64181 | 44.1 | 24.2 | 2.47 | 72.0 |
| Fertility effect | | | | | |
| 2.07 | 7615 | -3.7 | -2.5 | 0.28 | -1.4 |
| 2.00 | 5346 | -2.8 | -1.8 | 0.20 | -0.9 |
| 1.70 | -2448 | 1.4 | 1.0 | -0.09 | 0.6 |
| As GAD 1998 = 100 | | | | | |
| Fertility effect (GAD 95k migration) | | | | | |
| 2.07 | 111.9 | 91.6 | 89.7 | 111.3 | 98.1 |
| 2.00 | 108.3 | 93.7 | 92.6 | 108.1 | 98.8 |
| 1.70 | 96.2 | 103.2 | 104.1 | 96.4 | 100.8 |
| Fertility effect (zero migration) | | | | | |
| 2.07 | 98.3 | 94.3 | 95.9 | 102.4 | 100.1 |
| 2.00 | 95.0 | 96.8 | 99.2 | 99.2 | 104.9 |
| 1.70 | | | | | |
| Migration effect (GAD fertility trends) | | | | | |
| Zero | 87.4 | 103.9 | 107.4 | 91.1 | 102.2 |
| 185 | 110.0 | 98.4 | 95.9 | 105.7 | 98.8 |
| Ageing effect (GAD fertility and migration) | | | | | |
| no change | 92.3 | 96.8 | 84.3 | 126.3 | 94.9 |
| higher e0 | 101.3 | 101.1 | 103.7 | 96.0 | 101.1 |

Source: see table 1.

2.07), some in combination with higher survival, all with standard 95k immigration, plus the standard GAD variant with the high current migration level of 185k. The GAD 3 projection with replacement fertility (and standard 95k immigration) gives the highest potential support ratio (2.75).

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 first shows the effects in percentage change of the support ratio, of given percentage changes in each variable. It may not intuitively obvious what the equivalence is between a given % increase in fertility and the same % increase in immigration, etc. So the effects are also compared through the change in support ratio generated per million increase in population size caused by change in each variable. The most efficient process yields the biggest increase in support ratio for the smallest percentage increase, or increase produced in population size.

In Figure 2b, the diagonal from GAD 1 through GAD 12 to GAD 2 shows the effect given constant fertility of net immigration increasing from 0 to 95k to 185k. From lowest to highest that gives an additional population of 14.5 million with an improvement in potential support ratio of 0.36, or 0.025 per million population.

The effect of increased fertility with constant 95k net immigration is shown in the more favourable slope from GAD 5 through GAD 12 to GAD 4 and GAD 3, and also from 20 to 21; a population increase of 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. A similar slope is given by the line with constant zero migration but increasing fertility, from 1 GAD with zero migration (TFR = 1.8) through 20 GAD with TFR = 2.0 and finally 21 with TFR=2.075. In projection 21 the population is not quite stable but there is 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. Examples are the transition from no 3 to no 7 and its parallel no 4 to no 8 and 6 to 12. The effect is to worsen potential support ratio by 0.119 for every million increase in population arising solely from longer survival.

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 |

These coefficients are derived from the actual data in the scenarios. Equivalent comparisons do not produce exactly the same results. Somewhat different values would be obtained if truly stable populations were being compared. That said, 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. In the last 20 years it has varied between 1.7 and 1.84. Net immigration has varied from – 87,000 in the 1960s to +185,000 in the latest year 1998. During the 1980s and 1990s the figure has only exceeded 100,000 in the last few highly exceptional years (which may, of course, become the norm).

So far the effective demographic effects of actual immigration have been more modest than those of fertility. The effects measured in terms of population growth need to be interpreted in terms of the ease with which each variable can influence growth. Further increases in survival have substantial effects on age-structure but more modest effects on population size. Astonishing improvements in survival would be needed for a UK population increase of more than a two or three million, while this would be easy to obtain with feasible changes in fertility or immigration.

POSSIBLE POLICY RESPONSES

The actual policies proposed in response to population ageing by UK Government are authoritatively presented elsewhere in Karen Dunnell's paper and need no review here. A few general alternatives will briefly be listed. No complete policy solution is possible; any amelioration of the situation must depend on a multiple response, which fall into four broad categories.

Microeconomics and social policy

Financial and fiscal arrangement for pensions, savings and old-age health care. Population ageing has undermined the original demographic underpinnings of public sector Pay As You Go (PAYG) schemes. These are unfunded pensions whereby money is removed from workers by taxation and given to retired persons as pensions, with (usually) defined benefits. The UK National Insurance 'Fund', for example, is not a fund in the form of an investment of cumulated contributions, as in funded pensions, merely a header tank, into which workers' National Insurance (tax) contributions flow and from which pensions are drained off continuously. Such schemes were conceived in a world when support ratios were 10 or more and must now survive when such ratios are falling to three or less. Either pension promises must be denied or taxation substantially increased, from about 15 % to about 40-50% of pay according to various projections.

This problem could be seen coming a long way off. Far sighted governments had already begun to revise, or encourage alternatives to, the more baroque PAYG commitments before liability became too great, although not always very successfully. For example the UK's unfunded State Earnings Related Pension Scheme (SERPS) introduced in 1978 promised greatly to increase public liability for pensions (Kay, 1988). The then government, committed to private sector alternatives and deregulation, wished to eliminate SERPS altogether. This proved impossible although tempting tax reliefs were offered to encourage contracting out in favour of private funded pensions. In the event this proved expensive and provoked an over hasty expansion into private sector alternatives, some of which were mis-sold or mismanaged. SERPS is to be discontinued in 2002 and replaced by the new State Second Pension (SSP) intended for low to moderate earners. The general aim of the present government, however, is to increase the proportion of pensions provided by the state from today's 60% to 40%. From April 2001 'stakeholder' pensions will open, intended to give additional funded pensions entitlement even to the poorest, through a change in the rules to make it much easier for all those in employment to contribute to an independent pension..

The adoption by the UK government of the linkage of state flat-rate pensions to prices, not earnings, through the Social Security Administration Act 1992 has had a powerful downward effect upon pensions costs (Table 6). This reduction in the rate of increase in the real value of state pensions has attracted much criticism and pressure from trades unions and pensioners groups for restoration of the earnings link. But it means that the UK is the only major country whose working population is not expected to bear a substantial increase in the burden of state contributions on the working age-population over the next several decades (Eatwell, 2000) p 57).

Table 6 Proportion of GDP taken by state pensions, with corresponding increases

in contributions paid by workers, 1984 – 2040 selected countries

| | 1984 | 2000 | 2020 | 2040 |
|---|---|---|---|---|
| Germany | | | | |
| Pensions as % GDP | 13.7 | 16.4 | 21.6 | 31.1 |
| Burden (1980=100) | 100 | 106 | 124 | 154 |
| Japan | | | | |
| Pensions as % GDP | 6.0 | 9.4 | 14.0 | 15.7 |
| Burden (1980=100) | 100 | 115 | 142 | 154 |
| Netherlands | | | | |
| Pensions as % GDP | 12.1 | 13.4 | 19.6 | 28.5 |
| Burden (1980=100) | 100 | 100 | 114 | 139 |
| United Kingdom | | | | |
| Pensions as % GDP | 7.7 | 7.5 | 8.6 | 11.2 |
| Burden (1980=100) | 100 | 93 | 101 | 111 |
| United States | | | | |
| Pensions as % GDP | 8.1 | 8.2 | 11.3 | 14.6 |
| Burden (1980=100) | 100 | 96 | 117 | 131 |

Note: Burden' is the real value of pensions per head of the working age population 15 - 64, 1980 = 100
That is, an estimate of the increase in transfer costs which the average worker can expect.
Source: OECD (1988) Ageing Populations: The Social Policy Implications. in Eatwell (2000) p 58

Authoritative reviews, (e.g. OECD, 1988, UNECE, 1999a, Daykin & Lewis, 1999) point out that any amelioration of the problem should be found within the parameters of the existing system. None even mentioned immigration. No specific pension reform provided a panacea; a multiple response was needed. Although the impact of population ageing may be less evident in a funded system, payment of any pensions to the elderly inevitably involves a transfer of resources from the wealth-creating part of the economy. The value of investments must be affected by changes in the balance of buyers and sellers. .

A move to funded schemes is, however, assumed to benefit the economy by generating new productive investment, if it does not replace other investment. That may encourage faster sustainable growth, low inflation and low unemployment, all of which will make pensions more affordable, although the reality of this response has been questioned (Chand and Jaeger 1996, Eatwell 1997). The World Bank (1994) has suggested a three-pillar system. Continuing flat rate Social Security blanket pensions to protect the poorest, a funded second pillar of occupational pensions and a third funded private pension system; a view which enjoys widespread support but with different views as the appropriate relative size of each pillar.

Among European countries, the UK is far ahead in reform, having a much higher ratio of funded occupation and private schemes invested in the stock exchange and government securities compared with its European neighbours, where PAYG earnings-related state pensions are the norm. The implied debt of these schemes exceeds the GDP of many European countries (Social Security Committee, 1996). However, the UK's advantage may be lost if such indebtedness is pooled on any future junction with the Euro (Stein, 1997).

Macroeconomic responses

Higher productivity (output per worker), competitiveness and economic growth would go a long way to resolving the higher costs of an economy with an ageing population, with their

relatively higher levels of additional consumption by the elderly. To begin with, lower labour force growth reduces the burden of providing capital for new workers and raises the consumption (standard of living) level associated with any given capital stock. The positive effect is more powerful than the costs of ageing, up to a workforce decline rate of 0.5% per year, according to Weil (1997, pp 984 - 985). Most calculations assumes that population ageing will increase consumption adjusted for needs (taking into account reduced child dependency) by an extra 0.5% of GDP per year, thus trimming one quarter from a (modest) assumed economic growth rate of 2% (Weil, 1997). Properly managed through reform of work practices and higher capital investment, population ageing and its supposed relative worker shortages may provide a needed stimulus to higher productivity in Europe, where the position is weak compared with its competitors (the US, Japan and some Asian industrial economies). However, if this requires a higher capital / labour ratio than previously, one of the advantages noted above is lost. A relative shortage of workers could force entrepreneurs into the unwelcome task of reforming work practices and investing in more modern processes, which would raise real wages for a non-growing or smaller but more productive workforce.

Enterprises which cannot do this, or cannot afford to pay market-clearing rates for the work in question; garment trades, ancient foundries, fruit picking and other low skill activities, can be abandoned or their activities moved offshore and substituted by third world imports. 'Cheap immigrant labour ' is a temptation to permit under-capitalised low-productivity enterprises to survive beyond their sell-by date, preserving an obsolete economy and reducing national competitiveness (US Dept of Labor, 1989). The situation may be reached where unprofitable industries with permanently resident immigrant workforces can only survive with public subsidy, as is the case with coal-mines in Germany. The enhancement of international competitiveness, quite apart from any response to supposed labour shortages and the costs of an ageing population, requires capital investment to increase productivity. This will move developed economies further from labour -intensive to capital-intensive activities. In various European countries, additional annual productivity growth peaking at 0.5 - 0.8% would be adequate by itself to cope with the extra burden of old-age dependency (European Commission, 1996). This is similar to the estimate by Weil (1997).

Workforce measures

Other major adjustments within the demographic system are possible, to increase the size of the active population. First by mobilising the inactive population of existing working age (i.e. increase workforce participation rates), which increases the numerator of the support ratio. Second by expanding the boundaries of working age itself by encouraging later retirement. This takes into account the prolongation of expectation of life. If it can be achieved this is a particularly effective move as it simultaneously increases the numerator of the support ratio and reduces its denominator.

Workforce participation rates cannot increase forever, of course, and by themselves provide a once-for-all, but potentially enduring advantage up to about 2020 (Lesthaeghe 2000). In Europe since the second world war, changes in workforce participation, particularly by women, have often a more powerful effect on labour force than demographic change, including immigration (Eurostat, 1988). Europe has considerable unused reserves of population of working age (European Commission, 1991). Unemployment is high, hidden unemployment is often equivalent in magnitude, workforce participation rates low. In some Southern countries employment too much concentrated in protected public-sector

bureaucratic activities which impede, rather than promote economic growth. Many of these problems are linked to excessively high level of 'social protection', including state-funded pensions, which raise labour costs and thus unemployment, at present about 9% in continental Europe.

In the UK, growth in the workforce has only been projected officially to 2011 (Armitage & Scott, 1998), so it is not possible to incorporate official workforce projections into the population scenarios beyond 2011. By that year, the labour force in Great Britain (excluding Northern Ireland) is expected to grow from 28.0 million to 28.6 million. Demographic growth accounts for 55% of the increase, the rest is the result of contrasting trends in male and female economic activity. In recent decades, as elsewhere in Europe, male activity rates have fallen through early retirement, those of women have increased. Activity rates as a percentage of males age 16- -64 are projected to fall from 84.4% to 81.7%, those of women from age 16 - 59 to rise from 73.1% to 75.4%. Early retirement of men has had a powerful erosive effect on the UK workforce. In the 1980s it was encouraged to make way for young workers in the baby boom cohorts then suffering high unemployment. More recently the rise of 'incapacity' early retirement in the UK has provided a convenient way of removing older workers on dubious medical grounds, whose redundancy is then paid at public expense. By the early 1990s this became the fastest growing form of welfare transfer in the UK, increasing from £4.6 billion in 1990-91 to £7.4 billion in 1997-8 (peaking at £8 billion in 1994 - 1995; GAD 1999 t 12.2), a rate of increase of disability hitherto unknown to medical science.

The Government Actuary (1999), in his projections of active population in relation to pension entitlement, assumes that the activity rates achieved by 2011 will remain constant to 2051. They include about a million further individuals who continue working beyond retirement age. Their addition increases the workforce total from 28.96 million in 2001 to 29.77 million by 2011. Projecting UK workforce beyond 2011 is complicated by the switch of female pension entitlement from age 60 to age 65 by 2021. It is not clear how female economic activity will respond. Nonetheless preservation of the 2011 rate for 40 years is quite a conservative assumption. The decline in male activity rates has slowed in the UK and current UK government policy, described in Karen Dunnell's paper, aims to reverse this decline. Female participation rates have been increasing for some time and there is no reason to suppose that they will cease to rise after 2011, quite apart from the imponderable effects of the increase in formal retirement age. UK rates, although relatively high by EU standards, still have some way to go before they match those of some rich European countries (Table 7). What is the realistic scope for further increase? For example, taken over the population of nominal working age from 16 to 64, the UK ranked 8th overall in OECD economies in 1999. These comparisons are not altogether straightforward, not the

Table 7 Labour Force Activity Rates (percent) - the OECD's top ten in 1999

| Country | Overall activity rate | Male activity rate | Female activity rate | % females in workforce |
|---|---|---|---|---|
| Iceland | 89.8 | 94.3 | 85.2 | 38.4 |
| Switzerland | 84.9 | 92.2 | 77.3 | 39.7 |
| Norway | 82.0 | 86.5 | 77.3 | 45.7 |
| Denmark | 81.1 | 85.6 | 76.5 | 40.2 |
| Sweden | 79.5 | 82.5 | 76.4 | 47.8 |

| | | | | |
|---|---|---|---|---|
| USA | 79.5 | 86.7 | 72.6 | 45.7 |
| Japan | 78.1 | 92.4 | 63.7 | |
| UK | 77.6 | 85.7 | 69.4 | 43.3 |
| Canada | 76.4 | 83.4 | 70.4 | 45.0 |
| Netherlands* | 73.5 | 83.7 | 63.1 | 39.7 |

Note: Netherlands data refer to 1998. % females in workforce refer to 1996
These activity rates are relative to the population aged 16 – 64. Activity rates include persons in employment plus the unemployed seeking work.
Sources: OECD, UN 1997; Trends in Europe and North America 1996/1997. Table 4.1 p 94

least because proportions of women working part-time differ internationally (the latter is high in the UK), and these data do not include persons aged over 65 who are in the workforce. The table above suggests that there is some scope for further increase in UK workforce participation rates, which could rise by about another 7 points before they reach the level of Switzerland. Norway or Denmark might be a more realistic 'target' and here the UK male workforce participation rates are already their equal. There is more scope for increase in female workforce participation rates, where moreover. By 2051 the potential support ratio falls from 4.1 to 2.47, as noted in the earlier section. If the 1998 UK workforce participation rates still apply in 2051, the proportion of population aged 15-64 economically active falls to 75.1.

What really matters, however, is the support ratio between those receiving benefits and those working and paying taxes. Table 8 presents two ways of calculating this, under various hypotheses for the future. Column 2 shows the ratio of actual workforce on these hypotheses to formally-defined old age dependents in receipt of retirement pensions assuming a uniform retirement age of 65. Column 3 shows the ratio of the actual workforce to all dependents over age 15, that is, the population aged over 15 which is not economically active, not just that over age 65. Naturally the ratios in column 3 are even less favourable than those in column 2. However, with different hypotheses about workforce participation, they 'improve' much more. In column 2, the number of dependents is fixed, determined demographically by the population aged 65 and over. In column three, as the workforce increases the dependent population, although always larger, decreases in proportion. This latter dependant population gives a better idea of the dependency burden. A large part of the under-65 dependent population is, of course, those who have retired early before age 65. However it also includes those who never work at all ages, and young people who have not yet entered the workforce.

In 1998 the support ratio for old-age pensioners was 3.19 and at constant workforce participation rates will fall to 1.86 in 2051. The 'actual' support ratio for all non-working dependants over age 15 begins at an even lower level, namely 1.67 and falls to just 1.19 at constant participation rates by 2051. Can any plausible increases in workforce participation, within a retirement age of 65, restore the balance to anything like the starting point of 1.67? this is the only important goal, because that determines the balance between production and consumption. Here 'plausible' is taken to mean rates actually achieved in developed societies.

For Europe in general, a calculation made in 1990 showed that if the whole EU would develop employment participation rates equivalent to those of Denmark than over 30 million persons would be added to the labour force (Coleman, 1992). That is considerably more than the shortfall in labour force projected for the next twenty years. What would Danish labour

force participation rates of 1999 do for the UK workforce in 2051? A modest improvement is evident, arising from improvements in female rates only – those of men are about the same; at some ages actually lower in Denmark. Given the social similarities between UK and Denmark, and the current drift of government policy, that dos not seem at all far-fetched. Would it be possible to go a stage further, and imagine British men with Japanese rates (up to age 64 only)? Japanese male workforce participation is much lower than in UK at the youngest ages, but higher in older ages. That, combined with Danish female rates, brings the support ratios up to 2.00 and 1.36 respectively. Even the high Scandinavian rates may well increase futher. The low variant of the Swedish labour force projections to age 64 from 1998 to 2015, for example, shows a fall of 0.3%, while the high variant indicates an increase of 6.9% (Hultin 1999).

It must not be forgotten that between 2011 and 2021 UK 'official' female retirement age increases from 60 to 65. The effect of this is assumed here to bring female workforce participation rates in age-groups over age 55 (based on the official projection to 2011) up to the same proportion of male rates that obtained at age 55-59 in 1998. Finally that projected female rate is combined with the actual male rates which obtained in Great Britain in 1971, before the really substantial increase of early retirement. That restores the actual support ratios to 2.09 and 1.54 respectively. The latter figure is 92% of the actual support ratio on which we are surviving at present. It must of course be unrealistic to imagine the exact re-invention of 1971 male rates not the least because of the rise of tertiary education, presumably irreversible, also necessary to maintain a productive workforce. But these scenarios, however crude, do suggest that considerable amelioration of the changes from today's real (as opposed to potential) situation may be achieved within the workforce even within the retirement age of 65.

Note that these ratios are computed on a different basis from the less favourable ratios in column 4 of Table 9. These exclude the unemployed and persons working whose pay is too low for them to make National Insurance contributions. The relative change is more important here than the absolute values. The bottom line reminds us that even with 100% of the population of working age in work, the actual 2051 support ratios cannot be better than the 2051 potential support ratio of 2.47. That cannot equal the actual 1998 support ratio of contributors to pensioners of 3.19 without workforce participation rates of up to 120%, an idea for which British workers may as yet be unprepared.

It is also important to remember that the reversal of early retirement trends, and the increase of female participation rates envisaged above may require important improvements in conditions of work. While working hours for manual workers may have declined, those of many in business and the professions have increased and in some cases become more stressful. This needs to be countered if some causes of early retirement are to be addressd, combined perhaps with schemes for gradual withdrawal from work rather than abrupt total retirement. Further increases in female workforce participation, including return to work after children, would be greatly assisted by a more flexible work regime, even though this would impose costs on employers. Under-used options, some already facilitated by the UK tax system, include child-care vouchers as an employee benefit, workplace nurseries, career breaks, flexible working and teleworking (Jenkins 2000). Thee measures are already commonplace in Scandinavian workforce particpation rates and higher fertility. Mothers' work, contrary to some suppositions, does not appear to damage the well-being of children, any more than it depresses fertility (Bianchi 2000).

Table 8 Future support ratios and % of population of working age economically active, on various hypotheses.

| Scenario | Potential SR | Actual SR to 65+ | Actual SR to non-workers | % pop 15-64 active |
|---|---|---|---|---|
| UK 1998 1998 wpr | 4.15 | 3.19 | 1.67 | 76.9 |
| UK 2051 1998 wpr | 2.47 | 1.86 | 1.19 | 75.1 |
| UK 2051 D99m+D99f | 2.47 | 1.94 | 1.27 | 78.7 |
| UK 2051 J99m+D99f | 2.47 | 2.00 | 1.36 | 80.9 |
| UK 2051 J99m+UK21f | 2.47 | 2.03 | 1.49 | 82.1 |
| UK 2051 GB71m+GB21f | 2.47 | 2.09 | 1.54 | 84.2 |
| UK 2051 100% working | 2.47 | 2.47 | 2.47 | 100.0 |

Notes:
Potential SR = potential support ratio (population 15-64 / population 65+)
Actual SR to 65+ = Actual support ratio of actual working population / population 65+
Actual SR to non-workers = Actual support ratio of actual working population / non-working population aged over 15.
1998 wpr = actual workforce participation rates for males and females in 1998
D99m, D99f. Workforce participation rates for Danish males and females, 1999
J99m Workforce participation rates for Japanese males 1999
UK21f Hypothetical workforce participation rates, UK females after equalisation of statutory retirement age to 65. Assumes participation rates in same proportion to those of men in 1998 among women aged 55 – 59 and above.
GB71m Actual workforce participation rates of men in Great Britain 1971
Because of differences in age-group boundaries etc, these calculations are only approximate.

Reserves of labour and 'hidden unemployment'
Where are the reserves of economically inactive or unemployed labour to be found, who may join the active workforce? Over and above the total of registered unemployed is a substantial population of 'hidden unemployed' : discouraged workers who are not seeking work , people taking extra courses of study, people on makeweight state employment schemes , people who have taken early retirement. In Germany this was estimated to comprise 2.6 million people in 1998, compared with 4.3 million registered unemployed. An equivalent estimate for the UK for 1996 was 7.2% of the potential labour force. Added to registered unemployment that yielded a 'broad unemployment' figure of 12.9% for the UK in 1996, 15.6% for the Netherlands and 15.0 % in Germany (Fuchs & Schmidt, 2000, table 2). This does not include persons outside the labour force altogether but who are of working age.

In most European countries, unemployment rates among foreigners are between 50% and 100% higher than in the native population, and workforce participation rates in the population of working age generally lower. In some, but not all European countries, this dismal situation applies to the children of immigrants as well as to the immigrants themselves (OECD 1999). In the UK in 1998, for example, unemployment rates of Pakistani / Bangladeshi men was 18%, three times that of white men (6%), and was 14% for men from all ethnic minority groups. These 'ethnic minority' populations of non - European origin are by no means all immigrants; the population embraces the descendants of post-war immigrants (this is also true of many foreigners in European countries, especially Germany). Perhaps two-thirds of the ethnic minority population of working age is immigrant. Workforce participation rates are also low; 76% of men aged 16 -64 are economically active

compared with 80% of the white population in that age group. Among women, only 30% of Pakistani and 20% of Bangladeshi women are economically active compared with 74% of white women (Sly et al. 1999, Table 1). These unfavourable unemployment and activity rates, arising from the non-economic nature of most mass migration after the 1970s, and from weak workforce skills, makes the suggestion of the resumption of mass migration to cure labour shortage look a little eccentric. But in theory they comprise a substantial reserve of labour, the mobilisation of which is a social as well as a labour-market priority. Foreign workers entering under work permit schemes for specified jobs are seldom unemployed, at least to begin with, but form only a relatively small part of the total foreign population in many European countries today.

When projections take into account both demographic change and future workforce participation rate change, both the projected and the potential labour supply situation can look more favourable. Eurostat variant projections combined with workforce participation rate projections showed that except in the case of Italy, the workforce in most western countries will either remain constant or grow substantially at least until 2020. According to these calculations aggregate net inflows of labour will not be necessary before then, if at all (Feld 2000). In the case of the UK, only a combination of a low TFR of 1.5, immigration of +21,000 per year and low workforce participation, leads to a decline (about 5%) in the active population by 2020. Other combinations yield workforce growth up to 13% (1.4 million) up to 2020.

Redefining the length of active life and retirement

Increasingly, population ageing arises from longer life expectation. Can this, in part, bring its brings its own salvation , in that a proportion of the extra years are years of active life, able for work as well as active retirement?. Later retirement would simultaneously increase the numerator and decrease the denominator of the support ratio equation. The UN and GAD variant projections computed the maximum age of retirement required in order to preserve, without any other changes, the UK 'support ratio' at the current level of 4.1. These estimates are purely demographic, determining solely the increase from age 65 as the upper boundary of the nominally active population, and the lower boundary of the ‘aged dependent ‘ population, for the calculation of the potential support ratio. This calculation yields a narrow range of maximum retirement ages around age 70 – 75, with average about 72. That is between 5 - 9 years older than the current demographic boundary between active and dependent, which is also the standard age of retirement in most countries (65 years; 60 in Italy, 66 in Denmark). Is this matched to any degree by the shifting backwards of the onset of real old age?

At face value, this increase' in required ' retirement age is about the same order of magnitude as the increase in expectation of life at birth in the post-war period, when pension entitlement age was the same as it is now. In 1950-52 expectation of life in England and Wales was 66.4 years for males and 71.5 for females - in the case of males just less than retirement age. There has therefore been a gain of 8.4 years for males and 8.3 years for females by 1997, rather more than the projected increases in retirement age in most scenarios. Much of this improvement in mortality, of course, has arisen from a reduction of infant and child deaths. A fairer picture might be given by comparing expectations of life at age 15. Here the gain is more modest; from 54.4 and 59.0 years respectively in 1950-52 to 60.5 and 65.4 in 1997, that is a gain of over six years for each sex.

Healthy life expectation, however, has not increased *pro rata* with expectation of life. In the UK, period rates of chronic illness in the population 55-64 have not improved in the last decade even though this age-group has experienced the biggest fall in mortality in the last decade (Dunnell & Dix, 2000). Since 1981 expectation of life at birth has increased by 3.3 years for males and 2.6 for females. Of these additional years, 2 years in the case of each sex are 'healthy' additional years, 1.3 and 0.6 are unhealthy (Kelly et al., 2000). Calculations for longer periods of time are difficult to make because surveys did not then ask appropriate questions. But if these ratios are applied to the total gains since 1950-2, we have 6 years of additional healthy life for each sex since 1951.

Of course the original expectation of life, at any age, would not all have consisted of years of healthy life either, but for reasons explained above we do not know if expectation of healthy and unhealthy life have had parallel tracks over any length of time. These are not bad gains, although different studies give different results. Methods using cohort data, however, appear to capture more substantial advances in expectation of active life. For the US population, for example, these new methods give almost double the expectation of active life at some ages compared with traditional methods. For males in the 1990s, this amounted to 13.7 years of active life out of a total of 15.7 from the completed-cohort estimates compared with 7.4 active years out of 15.1 for the period estimates (Manton and Land, 2000, table 4).

A broader view of dependency

An official, and more refined projection of dependency on various definitions is given in the first three columns of Table 9. Column 2 shows the conventional potential support ratio on purely demographic grounds, familiar from previous tables. Column 3 gives the potential support ratio corrected for the fact that female pension entitlement age in the UK, still 60, will rise to 65 from 2010 - 2020, following the Pensions Act 1995. That reduces the numbers of pensioners, *ceteris paribus*, by 2.2 million during the 2020s and transfers them , at least nominally, to the active population. Not all women will work until 65, of course, but state pensions will not be paid out until that age, so the revision benefits the future solvency of the National Insurance Fund. Column 4 is a refinement over previous attempts to construct a more realistic support ratio. It assumes constant 2011 projected workforce participation rates but also takes into account the fact that not all employed workers actually contribute to the support of the elderly through National Insurance contributions. This is because many on low wages are paid less than the earnings threshhold below which contributions are not imposed (in 2000 £66.75 per week; see Government Actuary 1999 Appendix for details). Because of these deductions the support ratio becomes even less favourable than that based on constant 2011 workforce participation rates.

Table 9 Pensioner Support Ratios, UK 2000 - 2060.

| | 2 | | 3 | | 4 | | 5 | | 6 |
|---|---|---|---|---|---|---|---|---|---|
| Year | Demographic support ratio population 15 - 64 to 65 and over | 2000 as 100 | Pensioner Support Ratio (female pension age rising 2010 - 2020 to 65 | 2000 as 100 | Support Ratio of employed contributors to pension recipients | 2000 as 100 | Total Demographic support ratio pop 15 - 64 to 65+ and 0-14 | 2000 as 100 | 5 Weighted for support needs 2000 as 100 |
| 2000 | 4.2 | 100 | 3.4 | 100 | 1.8 | 100 | 1.89 | 100 | 100 |
| 2010 | 4.1 | 97 | 3.2 | 94 | 1.7 | 94 | 1.99 | 105 | 108 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2020 | 3.4 | 81 | 3.3 | 97 | 1.8 | 100 | 1.80 | 95 | 101 |
| 2030 | 2.7 | 65 | 2.7 | 79 | 1.4 | 78 | 1.58 | 83 | 91 |
| 2040 | 2.4 | 58 | 2.4 | 71 | 1.3 | 72 | 1.48 | 78 | 87 |
| 2050 | 2.5 | 59 | 2.5 | 74 | 1.4 | 78 | 1.50 | 79 | 88 |
| 2060 | 2.4 | 57 | 2.4 | 71 | 1.3 | 72 | 1.30 | 69 | 74 |

Column 2 GAD 1998 based Principal Projection
Column 3 Takes into account change in pension entitlement age for females to 65 from 2010 - 20
Column 4 takes into account workforce participation rates, the earnings threshhold
below which contributions are not made, and pension recipients overseas
Earnings threshholds for National Insurance contributions are assumed to rise with prices, not earnings.
Weighted total support ratio computed by weighting youth burden by 0.33 and aged burden by 0.67
Sources: ONS 2000, Government Actuary 1999 table 4.3, 4.4 and GAD unpublished tables

The aged, however, are not the only dependents. The overall dependency ratio in any population, and therefore its reciprocal, the support ratio, always includes youthful dependents, conventionally all those under 15. It is a demographic commonplace that stationary populations with different age-structures have similar overall dependency (support) ratios, which only differ in their composition, with the elderly predominating in those with low fertility. The ratio worsens as population grow or decline. As the proportion of elderly increases with an ageing population, that of the young declines, as column 4 shows. Perfect compensation is not on offer, however, as elderly dependents are generally assumed to cost about three times youthful ones. The final column 5 weights total support ratio accordingly. The net result is a slight amelioration of the future burden (see also Table 11).

The real retirement age and the real support ratio

The pattern of early retirement noted above mean that a realistic assessment of support ratio trends cannot assume a real retirement age of 65; it is already considerably lower. As noted above, the actual 'support ratio' of real taxpayers to real pension recipients is thereby already much less favourable than the 'demographic ' support. The economy has already been dealing with a ratio of 1.8: rather than 4.1:1 without notable distress. In this respect we have already seen the future, and it still works. Indeed it should be noted that the UK has already managed considerable population ageing and hardly noticed it. In 1901, the potential support ratio in England and Wales was 7.47, with only 4.7% of the population aged 65 and over. To maintain that potential support ratio today would require the UK population to have grown to 116 million today and growing at an impressive rate.

Comprehensive statistics on the actual age of withdrawal from work do not seem to be available. But a simple calculation based on the unweighted distributions at retirement age of members of 26 occupational pension schemes in 1998 (IDS 1999, Table 2) shows that their mean age at retirement was 56.7 and the median age 54.4. That is almost ten years before the 'official' retirement age. If that figure is representative then it puts a somewhat different complexion upon the figures of '72' noted above for future retirement age in the 'replacement' scenarios. If actual mean age of retirement now is about 56, then a simple calculation suggests that the actual age of retirement needed in future to preserve the present support ratio would be 55.5 + (72-65) = 62.5. In other words, preservation of the support ratio, even if solely the 'responsibility' of an upwards move in retirement age, would require men to retire only 2.5 years before they are officially expected to, instead of 9.5 years earlier as at present. This rough estimate, however, must exaggerate the advantage from this

consideration. Men with occupational pension schemes for whom these data are available can afford to retire before men (mostly manual workers) dependent mostly or entirely on the state pension. Furthermore, workforce participation into older life may well not be prolonged at very high rates. However, a very simple calculation of the mean age at retirement based on the distribution of male participation rates for 1998 yields a mean age of retirement of 57.8, which is not far off the previous estimate.

Who's afraid of low support ratios?

At the end of the day, the important consideration is not the simple figures of the potential support ratios themselves but what they imply, in a given national demographic, workforce and economic situation, for the relative costs of projected increases in dependency. These can be regarded as the fraction of each year's total national economic activity devoted to supplying the goods and services consumed by the retired, provided both by contributions (from labour) and returns on assets (from capital; Thompson, 2000 p.70). Are these projected costs, on the taxes of workers or on national GDP, sustainable in the light of reasonable expectations of economic growth or can they be made so by reasonable adjustments? That is all that matters. If so, there is no need to worry unduly about demographic abstractions such as support ratios. If not, but only if not, then more radical alternatives may need to be considered. The observations below provide only a very modest answer to the question because they refer only to one component of this cost. Nonetheless the answer does not seem to be too terrifying.

Effects of income growth on pension costs

Future prospects are highly sensitive to purely fiscal and economic change Much depends on economic growth, the prospects for which now seem more favourable than for a long time. With faster economic growth, employment rates and incomes rise, the more people will be drawn into National Insurance (NI) contribution or other taxes as their incomes cross the progressive NI threshholds. As a component of economic growth, unemployment or its reverse is particularly important, as higher unemployment raises the burden of old age pensioners upon those currently employed. Economic growth is another way of describing the real rate of return on investments and therefore on the growth of pension funds. If real returns are just 2% p.a., then payments of 10% of salary over a career of 40 years are needed to fund a pension of 35% of final salary. With returns of 6%, well within previous experience, the same pension could be provided with just 5% of salary (European Federation for Retirement Provision, 1999).

In the 1980s it was assumed that the non-accelerating inflation rate of unemployment (NAIRU) otherwise known as the 'natural level of unemployment' was inexorably increasing to 5 or even 8% as a result of welfare and technical changes (UNECE 1991), thus making the future pensions problem worse. Recent analyses suggest a radical change in macroeconomic relationships which may permit the coexistence, previously thought impossible, of economic growth of between 3% - 4%, continued low inflation (2-3%) and low unemployment (4%). Furthermore, with higher economic growth, the relative cost of state PAYG pensions pegged to prices, not wages, will decline in the UK, although at the cost of the relative but not the absolute income of recipients.

Looking at the UK case, the ratios in column 3 and 4 of Table 10 would lead, *ceteris paribus*, to a 40% increase in the rate of National Insurance contributions over 50 years (from today's 10% to employees to 14%, at the highest rate of contributions. Employers pay 12.5% in addition, which would then become 16.5%). This is a serious but not catastrophic increase in that form of tax (that of course is only the impact on state pensions, not funded ones). It would raise the UK tax 'wedge' from today's 32% to 36% (the current rate for production workers in France is 48%, in Germany 52%). However the ratios in column 4 assume that earnings limits for NI contributions are increased in line with prices. If earnings limits at which payment of NI is triggered were increased in line with earnings (which, given 1.5% economic growth assumed, would be a higher limit) then the number of contributors is reduced by 2.2 million by 2060 and the position is correspondingly worse. These considerations apply specifically to state pension funding and only more generally to other aspects of old-age support.

The choice between indexing to prices or earnings has significant consequences (Table 11). Assuming 2% economic growth, the overall contribution rate would rise by 2061 to 27.6% from 20% if pensions rose with earnings, but actually fall to 14% if indexed to prices. By the same token, National Insurance Fund expenditure would rise from 5.5% of GDP to 7.7% , or alternatively fall to 3.7%. Even if pensions were raised in line with earnings, however, thereby taking a higher proportion of workers' incomes, 60 years economic growth would still yield a substantial increase in real incomes. Even with the modest real growth rate forecast of 1.5% p.a., they would reach 2.4 times current real levels (Government Actuary 1999 p 13). SERPS, over and above the state flat -rate pension, complicates the story but in essence it remains the same (see Government Actuary 1999 for more details). Expenditure on SERPS is 9% of NI expenditure at present.

Finally on the issue of tax, the black economy is a substantial burden on support ratios, as many workers thereby evade contributing to state pensions schemes but will no doubt claim a pension or equivalent welfare. Estimates of the proportion of GDP represented by the black economy range from 5% to over 30% in various European countries Rockwooll Foundation). If true, any regularisation of the black economy could bring substantial benefits to real support ratios. Paradoxically, the black economy is encouraged, inter alia, by high social protection costs on regular labour, in part to help pay for state pension schemes.

Table 11 Effect on contributions of earnings versus prices indexation, UK 2000 and 2061

| | Earnings | Prices |
|---|---|---|
| Joint employee / employer contribution rate % earnings | | |
| 1999 - 2000 | 20.0 | 20.0 |
| 2060- - 2061 | 27.6 | 14.0 |
| National Insurance fund expenditure as % GDP | | |
| 1999 - 2000 | 5.5 | 5.5 |
| 2060 - 2061 | 7.7 | 3.7 |

| | | |
|---|---|---|
| Pensions as % earnings | | |
| Basic flat rate | | |
| 1999 - 2000 | 15 | 15 |
| 2060 - 2061 | 15 | 6 |
| SERPS | | |
| 1999 - 2000 | 17 | 17 |
| 2060 - 2061 | 17 | 11 |
| GDP per pensioner (1999 - 2000 = 100) | | |
| 1999 - 2000 | 100.0 | 100.0 |
| 2060 - 2061 | 105.1 | 50.2 |

Source: Government Actuary (1999)
Note: Figures with no decimals estimated from graph. Projections assume real income growth of 1.5% per year

All of these are susceptible to policy changes. The fortuitous intervention of the European Court for example, obliged the UK government to equalise its pension entitlement age for men and women. Welfare considerations suggested equalisation at 60. Demographic imperatives argued otherwise (Department of Social Security, 1991). Retirement age for both sexes will be fixed at 65 from 2010 - 2015, occasioning at least a notional marked improvement in UK dependency ratio trends, as noted above. Under the UK's 'Foresight' programme launched in 1993 (Department of Trade and Industry, 2000), as Karen Dunnell describes in her paper, steps are also in hand to discourage unjustified disability-based early retirement and to encourage later working. Tax reliefs are being removed from private pensions taken before age 55, the tax system will make working beyond age 65 easier, legislation is being introduced, on US lines, to make age alone inadequate grounds for not hiring, or dismissing, labour. Both employers and government are likely to discourage favourable early retirement terms in occupational pension schemes (e.g. through the use of 'defined contribution', not 'defined benefit' schemes). Access to ill-health early retirement is likely to be subject to more stringent criteria. ‘Phased retirement' will beencouraged whereby the pensioner continues in part-time work, a response currently discouraged by 'final salary' pension schemes where pension is determined by the last level of salary, not the maximum ever reached (IDS, 1999).

Some countries have already started to move their retirement age back from the original fixed limits; to 67 in the US and to 65 in Italy and Japan. The UK has not yet considered such action. Costs of ill -health among the elderly have not received the same attention as pensions. Some calculations, taking into account the reduction of child dependency costs , come to quite modest conclusions about the additional real expenditure, at least for the UK (Ermisch, 1990). 60% of the health expenditure on an individual is concentrated in the 12 months before death. 60% of health expenditure therefore depends on the annual number of deaths, which is projected to increase by 17.5% in the EU by 2025 (European Commission, 1996) p. 43.

A multiphasic response

No one factor can ameliorate the situation by itself except with considerable discomfort. We therefore need to address simultaneously as many of these contributing factors as possible. Given the powerful effects of economic growth, pensions reform and workforce change on the viability of systems, we may be in danger of missing the point by concentrating too much

on the outer demographic structure rather than on the fiscal, economic and workforce structures within it. What matters is whether an affordable system can be developed, not what the 'potential support ratios' are.

The European Commission's Annual Review of the demographic situation in Europe in 1995 (European Commission, 1996) recognized the contribution of migration to further population increase but noted that recent immigration, at that time declining, had not been primarily related to economic needs and that the proportion of foreigners in the workforce had been constant for some time. It dismissed the notion that immigration could be an adequate compensation for population ageing, as it would require between 8 and 14 times even the then current high level of net immigration (7 million per year by 2024). Productivity growth required to meet the additional demands on the economy created from pensions would between 0.1% and 0.3% annually up to 2005, increasing to 0.5% per year by 2025. Such an additional diversion to pensions costs would, for example, reduce a real annual GDP growth rate from (say) 3% to 2.5%. While formal retirement age is 65 in most EU states, actual retirement age is about 60. Preservation of that status quo would require actual retirement age to rise by between 5 and 6 years, to between 65 and 66 depending on which of the EU scenarios were to be chosen. (The UN scenarios' 'requirement' of retirement deferred to 72 or more assume, presumably, actual retirement at 65). On that basis, managing the additional costs of state pensions simply requires people to stop work when they are 'expected' to, at some time in the future - a conclusion similar to that reached above in respect of the UK. For the UK itself, the scenarios indicate that an annual increase in work productivity rising to 0.8% by 2025 would be needed to cover additional costs of pensions transfers, in the absence of any other measures.

No multivariate model illustrating the simultaneous effects of parallel changes in the support system has yet been developed for the UK and time has not sufficed to prepare one. But some for other countries may be approximately applicable, given the relatively favourable UK demographic and pensions position. The scenarios shown below in Table 12 do not quite match the approaches taken so far. They incorporate total dependency, including the falling costs due to the fall in the proportion of dependent children, and only extend to 2035. The assumptions on retirement age and participation rates are that all the countries concerned will eventually adopt retirement ages and participation rates already observed in some other countries today (not unlike the procedure dopted in an earlier section): in Japan for the former and Norway for the latter. A 10% reduction in replacement rates is also assumed.

The incorporation of all dependency (all those not working of all ages, including children) into the equation somewhat ameliorates the expectation of future dependency and future costs, to an increase of 10 percentage points instead of a doubling. A similar conclusion has been reached for the UK ( Ermisch 1990). However the weighting of the elderly used in this example is only twice that of a young dependent, not the three times usually assumed. Either option by itself makes a substantial and comparable effect on the otherwise expected worsening of dependency and contribution rates (Table 12). Both together restore the position to almost the 1995 level and in the case of France, Germany and Italy to an even more favourable position, further enhanced by a 10% reduction in replacement rates (Gillion, 1999). Note, however, that improvements in workforce participation rates cannot have further enhancing effect once they have reached their maximum level.

Table 12 Total dependency and contribution rates under

different scenarios, selected countries 1995 and 2035

| | Japan | France | Germany | Norway | Italy |
|---|---|---|---|---|---|
| **Total Dependency ratio** | | | | | |
| 1995 base level | 46.0 | 55.6 | 50.8 | 48.2 | 59.9 |
| 2035 projection | | | | | |
| No change | 55.8 | 63.3 | 61.5 | 56.5 | 69.9 |
| Older retirement for men | 55.8 | 57.3 | 54.8 | 52.8 | 62.0 |
| Increased female participation | 52.8 | 59.1 | 57.4 | 56.5 | 60.4 |
| Both | 52.8 | **53.2** | **50.7** | 52.8 | **52.5** |
| Both plus lower replacement rate | 52.8 | **53.2** | **50.7** | 52.8 | **52.5** |
| | | | | | |
| **Contribution rates in 2035** | | | | | |
| 1995 base level | 33.8 | 42.9 | 38.3 | 35.8 | 47.2 |
| 2035 projection | | | | | |
| No change | 43.1 | 50.8 | 48.9 | 43.8 | 58.2 |
| Older retirement for men | 43.1 | 44.6 | 42.1 | 40.2 | 49.5 |
| Increased female participation | 40.2 | 46.5 | 44.7 | 43.8 | 47.8 |
| Both | 40.2 | **40.5** | **38.2** | 40.2 | **39.9** |
| Both plus lower replacement rate | 37.7 | **38.0** | **35.7** | 37.7 | **37.4** |

Note: Retirement age is that of Japan
Women's workforce participation rates are those of Norway
Dependency is an OVERALL measure here, including non-elderly dependants of all ages.
Contribution rates relate to all age-groups needing support
For dependency ratios and contribution rates count children as 0.5 adult ,pensioner as 3/4
Figures in bold indicate a more favourable outcome than the 1995 base level
Source; Gillion (2000) Table 2.A.2

Demographic measures

The most 'strategic' responses involve the number of people themselves. The migration option, the subject of the UN report, need not be mentioned further, The much more powerful, if delayed effects of fertility upon age-structure were discussed above and do not need repeating. Turning on immigration, to increase current large flows even further, would be easy. Turning it off again is quite a different matter.

How changeable is the birth rate likely to be? If it does not increase spontaneously, is it susceptible to public policy measures? There is little consensus on either of these points., despite an extensive literature. There appear to be no limits to low fertility in the predominantly economic models which attempt to explain its variation (Golini, 1998). Much of the reduction in period measures of fertility, it is well known, is due to the postponement of births. But in most populations the recovery of fertility rates at older ages has so far been insufficient to compensate for the decline in earlier ages, pointing to a fall in completed cohort fertility to below replacement level (Lesthaeghe 2000, Frejka and Calot 2000). Most researchers seem pessimistic about a return of fertility to replacement rates in European countries. Nonetheless, spontaneous recovery of fertility to levels closer to replacement might arise from a number of processes. The delay in childbearing has not yet ended in any country and we cannot foretell likely responses when it does. There may be general population-level tendencies to equilibrium. Enhanced welfare arrangements or other measures which improve the status of women may remove obstacles to childbearing (Lutz, 2000). Biological and behaviour - genetic models may provide other reasons why fertility should not drop to very low levels (Foster, 2000; Morgan and King in press).

The prospect of higher birth-rates is underpinned by the consistent finding, after 30 years of surveys , that European women wish on average to have about 2 children (although seldom much more). Furthermore, like investments, actual birth rates can go up as well as down. Several Scandinavian countries have experienced rising birth rates since the 1980s, although that of Sweden took a sharp downturn in the mid-1990s. The TFR in Denmark is off its peak but in Norway in continues at over 1.8 (1.84 in 1999). In Ireland, TFR has remained at about 1.9 after falling below replacement level. Of the 15 EU countries plus Norway and Switzerland, 13 out of 17 had a higher TFR in 1999 than in 1998, although the increases were mostly tiny (data from Eurostat 2000 table 3). More recent French data suggests a more substantial increase to 1.9 in Q1 2000. Outside Europe, Australia, Canada, New Zealand and the US, none of which had ever seen low birth rates, increased their fertility from the 1980s. New Zealand and the United States continue at about replacement level. Although ethnic minority fertility is higher than average in those countries, contrary to some views the non-minority population also continue to have higher birth rates than almost any European countries. In the US (1999) TFR in all groups increased further from 1998 to 1999, from 2.059 overall to 2.075 (Curtin and Martin, 2000 p 4). Coincidentally the latter figure is exactly the replacement rate for the UK. In some populations richer and better educated women now have more children than average; female workforce participation is no longer an impediment to the third child, at least in Scandinavia. For whatever reason, most national and international projections, including the GAD Principal Projection and the UN Medium Variant, expect a modest recovery in fertility although stopping short of replacement level.

If the birth rate does not increase spontaneously, is it responsive to public policy measures? Opinion here is strongly divided. Public policy effects upon the birth rate can be intended or

(more usually in the West) unintended (Gauthier, 1996) . Few western countries explicitly attempt to increase their birth rate although many are concerned that it is too low. Most governments favour welfare policies for the family (welfare payments, workplace and housing policies etc) for welfare reasons only. While these might incidentally make it easier for women to have the number of children they say they want, most governments still shy away from overtly 'pronatalist' measures or rhetoric. Evaluations of the effects of welfare policies face great difficulties from the great variety of forms of assistance from which families can benefit, within which direct family allowances may only play a modest role (Hantrais 1997). However, as modern states spend between 30% and 60% of national income, policy measures of various sorts must affect the rationality of most household decisions. Some studies have found evidence only for a weak effect of welfare and fiscal changes on family size and the pattern of family formation (Gauthier and Hatzius 1997) Others report somewhat stronger effects. . In the early 1980s French pronatalist measures were estimated to add about 0.3 to the TFR (Calot & Chesnais, 1983). The Swedish case in particular is claimed to be an example of precise, if temporary, response of marriage and birth rates and intervals to changes in relative financial advantage, including the fertility downturn following more recent retrenchment and raised unemployment (Hoem, 2000).

Family subsidies of various kinds, state childcare, preferential access to housing in the absence of an open housing market and other measures in the former Communist countries of Eastern Europe attempted simultaneously to promote female workforce participation and the birth rate. Although their attempts are often dismissed as having had no more than a transient effect in detail, they appear to have maintained East-block fertility at close to replacement until their withdrawal during the post 1990 transition period (David, 1982, UNECE, 1999b). However these policies operated in a system of universally early marriage, limited access to modern contraception and few social outlets as alternatives to family life. Within Western Europe, the low level of fertility in the (paradoxically ) familist Southern European countries, and also in Japan, seems unlikely to be reversed without a broader shift in personal and political culture. Societies with high gender inequality will continue to suffer lower birth rates (McDonald 2000).

In this situation the example of UK is somewhat anomalous. The UK has relatively modest family support programmes but nonetheless maintains a relatively high birth rate. Annoyed French colleagues have attributed this to an excess of careless, unplanned early childbearing, encouraged perhaps by specifically (unhelpful) British attitudes towards sex education and perverse incentives in the welfare system. UK ASFRs in the 15-19 age-group are certainly anomalously high, four times the EU average and large enough to distort the UK ASFR profile compared with that of most other European countries (Chandola, Coleman and Hiorns 1999). Paradoxically the only UK policy aimed at fertility is a specific target to reduce the teenage conception rate by half by 2010, on welfare grounds (Social Exclusion Unit, 1999). If this were eventually successful in reducing teenage fertility to the EU average, it would bring the UK TFR closer to 1.6 than its current 1.7, which other things being equal would not help with the problem in hand.

Conclusions

There is no 'solution' to the problem of population ageing and cannot be one short of high rates of population growth or mass age-specific euthanasia. The answers to the two questions posed in the subtitle of the UN Report (can immigration solve problems of population decline and population ageing) are quite simple. They are respectively:
1. yes, if you really think you want to, and
2. no, except at rates of immigration so high that they would generate economically and environmentally unsustainable population growth rates and permanently and radically change the cultural and ethnic composition of the host population: 'replacement migration', indeed.
These answers are already well known to demographers. Older populations and their problems will be a permanent feature of developed societies for the whole future of the species, the very long-term existence of which is henceforth absolutely dependent upon the preservation of a TFR very close to 2.

In the broadest view, to paraphrase Weil (1997, pp 1009 - 1010) the costs of population ageing arise largely from the inevitable passing of the transient benefits of reduced fertility which were enjoyed during the 20th century. In the early years of demographic transition, this falling birth rate created a demographically unstable half-century of favourable dependency ratios. Now that these advantages have passed, resources once needed for dependent children must be transferred to the elderly as a new long-term quasi-stable population system is established. In the UK and elsewhere, this system has similar nominal dependency ratio to the previous one but different, less favourable composition. Change in the real support ratio is proportional to the difference between the average age of consumption (Ac) and the average age of production (Ay). Maximum real support ratio arises when the two averages are the same., assuming an equal weighting of needs. Western populations have moved from a position where Ac was lower than Ay, to the reverse case, perhaps by 4 years, not a large number because consumption is highest at the beginning and the end of life (Weil 1997 p 981). The delivery channels of support will also be different. Families, which made and still make the greatest provision for children, will see the burden of transfers eased. A higher proportion of transfers to the elderly will pass through the state. Hence those populations which also have a tradition of family care for the elderly will suffer most, as noted above.

Specific technical conclusions need only be re-stated briefly. The UN projections differ from those produced by the UK government Actuary's Department in several ways. Estimates for current UK population, and in particular of net immigration, are well below current UK levels. Current UK immigration is today so high (*pro rata* similar to that to the US) that it exceeds the UN 'requirement's for population growth and workforce growth. GAD future immigration assumptions themselves are also out of line with current trends. The projections made by the GAD on a variety of plausible assumptions yield a relatively restricted range of future UK population and age-structures. Potential support ratios are around 2.5, a 'required' maximum formal retirement age around 72, median age about 42 (Table 7). These results underline the conclusion that substantial population ageing will be impossible to avoid. No plausible demographic change makes a big difference. None of these seem to this author to be obviously catastrophic.

As expected from theory, higher fertility is a more 'efficient' way of protecting potential support ratio than is immigration. Increases in fertility with reduction of immigration would

tend to minimise future population growth while producing a more favourable potential support ratio. Welfare measures, justified on welfare grounds, which might have the effect of encouraging future fertility because they would respond to unmet need for children, helping women to have the number of children that, on average, they say they want. UK government welfare and workforce policy seems to be moving in this direction, although no doubt without any demographic intent. Look after the interests of women and the population will look after itself. Large scale migration is an undesirable alternative not just because it is an inefficient means of reducing population ageing but because it is also likely to present the host society with serious and avoidable cultural, social and political difficulties and economic costs (Coleman 1994, 1997).

In the longer term, longer survival will increasingly determine all future population ageing . Although estimates of gains in active life differ, there are grounds for hoping that increases in active life will make an extension of working life reasonable, as well as to some extent necessary. That aspect of population ageing brings, in part, its own solution, by pushing back the real, as opposed to nominal, boundaries of old age.

Potential support ratios on fixed boundaries remain a demographic abstraction. What matters is not demographic abstractions but whether the future costs of dependency are sustainable in the economic and social environment of the future. Fiscal and workforce reforms within the demographic system offer much more flexible and promising ways of adapting to population ageing and some of the measures are desirable in their own right. In the view of this writer, although not of HM Government, the issue at the moment is how to prevent unwelcome population increase and high immigration, rather than worrying about the consequences of population decline.

In the UK situation, ‘demographic time-bombs’ only go off in the media, not in real life. Labour market, retirement and pension reforms, some already under way, together with future expectations of even modest economic growth and productivity, together offer the prospect of a reasonably effective and affordable management of this burden, although definitely not a ‘solution’. Consideration of real support ratios needs to take into account the diminution of dependency from the youthful population, the successful negotiation of substantial population ageing already since the beginning of the century, and the reality of actual retirement ages substantially below ‘official’ retirement age’.

It would greatly improve public, and governmental, appreciation of the problems of ageing which face modern societies if the UN Population Division will, as a result of the Expert Group meeting, choose to diversify its approach on population ageing. It should move away from a concentration on what was already known to be an unsuitable demographic and social expedient in the form of mass migration, and address a broader repertoire of more realistic responses.

Acknowledgements
The projections in this paper were entirely the work of Mr Chris Shaw and Mr Adam Michaels of the UK Government Actuary's Department, without whose generous expert help this paper could not have been written. These projections will be developed further for publication in the journal Population Trends No 103 under their authorship later in 2001. The corrections, data and other help from Dr Walter Eltis, Ms Monica Hultin, Mr Chris Shaw, are gratefully acknowledged. The interpretations placed here upon the results, all other opinions and all errors and omissions, are the responsibility of the author alone.

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