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WHO'S AFRAID OF LOW SUPPORT RATIOS? A UK RESPONSE TO THE UN POPULATION DIVISION REPORT ON 'REPLACEMENT MIGRATION'*

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

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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. 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 an (unofficial) UK point of view. It begins by reviewing the demographic prospects for the UK during the half century 2000 - 2050 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 stabilisation, or even mild reduction, is probably to be welcomed in the UK, while current levels of immigration are judged to be too high. This analysis, however, is still far from complete. Only selected parts are presented in this preliminary version.

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 and adventurous systematic exploration of one aspect of a fundamental problem which affects, to varying degrees, all developed societies. Because of the prestige attaching to the UN Population Division and to the UN in general, and because of its uniquely comprehensive uniform technical treatment of the migration issue, the report has been widely read and cited and doubtless its statistics will continue to be regarded as a definitive benchmark for years to come. In the UK it has been the subject of articles and comment in almost every major national daily and weekly newspaper and journal, and is almost invariably 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 in differentiation to that of its predecessor, 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 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 are required 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. To this end the UN report has been timely, as in recent years the UK has experienced a crisis of asylum claiming which has made it the most favoured destination in Europe, claims just exceeding even the number made to Germany. Now, according to the pressure groups and many commentators in the media, claimants should be welcomed irrespective of their merit of their claims as they now represent demographic salvation. Despite widespread public anxiety on immigration, 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 to misunderstandings on this politically sensitive issue. Its concentration on immigration as the 'solution', one already known to be impractical at least in respect of the support ratio, gave the impression that other approaches, possibly more promising and practical, were of little consequence. Alternatives (pensions, retirement and workforce reform, productivity, more substantial changes in fertility) were noted but not evaluated in any detail. The political, social and economic costs of the large-scale immigration discussed by the Report received no mention. Such 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 imperatives 'needed' and 'required' have been widely interpreted as 'must' and gave 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 targets, parameters in a hypothetical scenario, have been widely interpreted by the media as policy prescriptions.

The imperative language of ‘needed’ and ‘required’ throughout the report has led to the implicit assumption that population decline is unacceptable and that population ageing is avoidable. These 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 (1973, described below) have welcomed the prospect of an end to growth. Official responses in Germany ((H÷hn, 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. 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 (Keilman 1997). 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.

No mention was made of the well-known tendency of synthetic cohort measures such as the TFR to under-state contemporary fertility levels or of the possibility of feedbacks from public policy affecting the very low level of fertility in some countries. Such feedbacks in population projection have already been considered by IIASA in other contexts as a way of making 'intelligent' population projections which avoid extreme conclusions. 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 the press release and the headlines rather than strain their attention-spans by consulting in detail the balanced and scientific comments in the body of the Report. It was unfortunate that the Press Release was presented before the report was available. In the natural sciences, this practice is strongly condemned. It should probably be avoided in the social sciences as well.

COMPARING POPULATION PROJECTIONS

Comparing the GAD with the UNPD baseline projections

National statistical offices also prepare population projections. In particular, the UK Government Actuary's Department (GAD) makes regular long-range projections in order to evaluate the financial and demographic prospects of UK state pension system (Government Actuary 1999). The UK government, along with that of the US (Lee 2000), is one of the few to undertake such projections. In response to the UN Report, the GAD has undertaken additional longer range projections (to 100 years) on a wider variety of assumptions, some of which are presented here by courtesy of the GAD (all interpretation being that of the author alone). Before considering the implications of the UNPD projections we should begin by seeing if the UNPD Medium Variant projections for the UK match the Principal Projection made on a regular basis by the (GAD). The basic data for these independent projections by the UN PD and the UK Government Actuary are given in Appendix Table 1 (UN) and Appendix table 2 (GAD) and are summarised below in Table 1. In fact the base projections are substantially different. The GAD projected total population ends up at 7 million - 13% higher - in 2050 than the UN medium variant projection. The population aged 65 and over is 11% higher at the same time. As a consequence, the age-burden of the GAD projected population is slightly lower, with a smaller percent aged 65 and over (97), a slightly lower median age and a

slightly higher support ratio. These differences are modest with respect to the ageing process but need clarification before we continue.

Comparison of baseline assumptions

Wherein lies the difference? Table 2 shows the assumptions on vital rates and migration which underpin the projections. The starting populations are different. Partly this is due to the fact that the UN projections use a 1995 population estimate of 58.308 million for the UK, while the GAD uses the latest available estimate 59.237 million for 1998. The difference in starting year, however, is not the only reason for the disparity. The GAD population estimate for 1995 is also different from the UN estimate (58.612 million) but only by 300,000. To facilitate comparison, GAD has calculated a base population for 1998 calculated which is consistent with the 1995 UN population and the UN projection to 2000 (this cannot be

Table 1 Outline comparison of UN and GAD Principal Projections

		1995/98	2000	2005	2010	2015	2020	2025	2030	2040	2050
Population (1000s)	UN	58308	58830	59143	59331	59566	59845	59961	59619	58289	56667
	GAD	59237	59750	60681	61587	62537	63470	64235	64710	64818	64181
	GAD/UN	102	102	103	104	105	106	107	109	111	113
Median age	UN	36.9	38.2	39.7	41.2	42.1	42.7	43.1	43.6	44.8	44.5
	GAD	36.9	37.4	38.9	40.3	41.4	41.7	42.3	43.0	44.1	44.1
	GAD/UN	100	98	98	98	98	98	98	99	99	99
Population 65+	UN	9256	9433	9675	10162	11140	11859	12724	13757	14545	14107
	GAD	9292	9311	9543	10052	11224	12038	13066	14487	15902	15556
	GAD/UN	100	99	99	99	101	102	103	105	109	110
Percent 65+	UN	15.9	16.0	16.4	17.1	18.7	19.8	21.2	23.1	25.0	24.9
	GAD	15.7	15.6	15.7	16.3	17.9	19.0	20.3	22.4	24.5	24.2
	GAD/UN	99	97	96	95	96	96	96	97	98	97
Support ratio	UN	4.09	4.06	4.03	3.86	3.47	3.21	2.92	2.61	2.37	2.37
15-64 / 65+	GAD	4.15	4.20	4.21	4.07	3.63	3.39	3.10	2.74	2.43	2.47
	GAD/UN	102	103	104	105	105	106	106	105	103	104

		to 2000	2000-05	2005-10	2010-15	2015-20	2020-25	2025-30	2030-40	2040-50
Population growth	UN	0.18	0.11	0.06	0.08	0.09	0.04	-0.11	-0.23	-0.28
% per year	GAD	0.43	0.31	0.30	0.31	0.30	0.24	0.15	0.02	-0.10
	GAD/UN									

Sources: Government Actuary (2000), UN (2000)

obtained directly from the UN, which only produces projections in five year age-groups at five-year age intervals). However the implied UN estimate for 1998 is no less than 0.6 million below the ONS / GAD 1998 estimate, thanks primarily to its under-estimation of current real levels of immigration. In both the 1995 and 1998, the domestic version may be assumed to be correct.

Table 2 Comparison of assumptions behind UN PD and GAD Projections

		to 2000	2000-05	2005-10	2010-15	2015-20	2020-25	2025-30	2030-40	2040-50
Net migration	UN	0	40	40	40	40	40	0	0	0
(1000s / yr)	GAD	175	99	95	95	95	95	95	95	95
TFR	UN	1.72	1.72	1.76	1.83	1.90	1.90	1.90	1.90	1.90
	GAD	1.72	1.77	1.79	1.80	1.80	1.80	1.80	1.80	1.80
e0m	UN	74.5	75.3	75.8	76.3	76.8	77.3	77.8	78.4	79.2
	GAD	75.1	75.8	76.8	77.6	78.2	78.7	79.0	79.4	79.7
e0f	UN	79.8	80.6	81.1	81.6	82.1	82.6	83.0	83.6	84.4
	GAD	79.9	80.4	81.1	81.8	82.4	82.9	83.2	83.6	83.9

Sources: UN PD 2000, GAD 2000

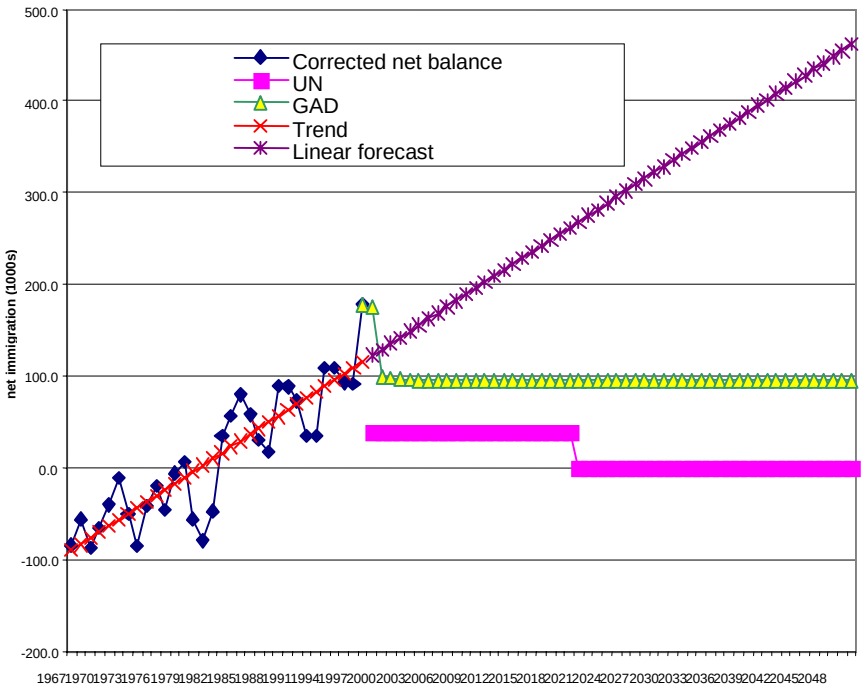
Different assumptions about fertility, mortality and migration lead to further divergence. The final UN TFR in 2050 is 5% higher than that of GAD: 1.9 instead of 1.8. Expectation of life at birth by the end of the projection is also a shade higher in the UN projection, by 0.3 years for men, although lower for women by 0.8 years even though it begins marginally 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. Here the UN assumption is for 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, although no-one can know what will happen next in migration.. But the evidence suggests a weakening effectiveness of the traditional UK policy aim of minimising immigration. While subject to an approximately five-year periodicity, the net immigration trend is still strongly upwards. The previous government claimed to follow a policy of minimising immigration for permanent settlement subject to asylum, family and labour force needs. Since the late 1980s, however, this policy was demonstrably failing to achieve its aim (Coleman 1997). The government which replaced it in 1997 does not share the same aims. It has relaxed some controls, permitting an acceleration of flows for purposes of marriage, expanded entitlements to entry, and is considering increasing immigration further as a matter of policy, on labour force and demographic pretexts. Its measures to

curb asylum flows have been rewarded with record inflows: the UK became the favoured European asylum destination in 2000.

Two new legal developments in the pipeline seem almost certain to increase flows further. In 1999 the Home Secretary, in response to representations from pressure groups and the UK Commission for Racial Equality (CRE), extended legislation on 'indirect' discrimination to the immigration control process. In this legislation departure from simple statistical ethnic representation in outcomes is prone to be interpreted as *prima facie* discriminatory. Most persons currently removed or excluded from the UK are ethnically distinct. Secondly, the 'human rights' concept will be incorporated into English law in October 2000; this is likely to open up many new opportunities for asylum claimants. There seem few grounds, therefore, for supposing a halving of net inflows to 95,000. Further increases are more likely once cyclical downturns are taken into account.

Net immigration to the UK. Actual trends and implauible projections 1967 - 2050



The actual trend of net immigration to the UK is shown alongside the UN and GAD assumptions in Figure 1. The linear trend line fitted in Figure 1 is of course very simple and fits the experience of mid 1980s onwards rather than the earlier period. The linear trend is very simple-minded and cannot, presumably, continue. However, large inflows can occur. Around 1990 net immigration to Germany rose to about 1,000,000, admittedly under uniquely German circumstances, a figure as unplanned, unexpected and incredible to the Germans as a figure of 100,000 is to the British. By 1997, however, net immigration to Germany was negative.

Further complications arise through differences in assumptions about the age-structure of vital rates and immigration. The age-profile of the TFR and of mortality are not likely to differ substantially between UN and GAD. This is not so of immigration. More or less youthful age-profiles of immigration will have a greater or lesser effect upon fertility and a greater or lesser effect upon the average age and dependency ratios of the population which they are joining. In the GAD projections, the age-structure of migration is taken from empirical evidence about age derived from the International Passenger Survey. This gives an age-profile of immigration strongly peaked around age 35. The mean age of migrants is different from the mean age of the UK population into which they are moving, and the age-distribution markedly so, with many fewer children and older people. In the UN PD's 1998 Revision Medium variant the age and sex distribution of immigrants was taken to be that of the country itself in 1995 contrary to what is implied on page 201 of the UN Analytical Report.

However in the UN's Replacement Migration variant scenarios themselves, the distribution of immigrants by age and sex is somewhat more realistic (Table III.1 and Figure III.1 of the UN Report, p. 17) , being based on the migration experience of Australia, Canada and the US.. This is a better choice, although not entirely suitable for European countries which do not regard themselves as 'counties of immigration'. That apart, this change of assumption about migrants age-profiles introduces an element of discontinuity between the UN's baseline projections and its variants, evident in some of the graphs which follow. More important, it means that immigration is not only higher in the case of the GAD Principal Scenario than in the UN Medium Variant (Government Actuary, 2000), but also more demographically potent in its growth-rate and age-structure. The effects of the different age profiles used in the variants will be more modest.

Reconciling the UN and GAD basic models.

Can we obtain the UN results through judicious adjustment of parameters in the GAD model, and thereby evaluate the relative importance of the differences in assumptions noted above? The five runs summarised in Table 3 move gradually from the UN Medium Variant to the 1998 GAD Principal Projection, changing one component at a time in cumulative fashion. to save space only the beginning and end are described. Table 3 gives the basic indicators for each projection at 2050, together with estimates of the upper limit to working age needed to obtain given support ratios at 2050.

The starting point is a replication by GAD of the UN Medium variant. This is not straightforward. To facilitate comparison, it uses a base population for 1998 calculated by GAD to be consistent with the 1995 UN population and the UN projection to 2000. Because the UN works with five-year age-groups and five year intervals, GAD with one-year age-groups and one-year intervals, there is not single correct solution to estimating this 1998 UN population. But the error is relatively small. The projection then uses the UN estimates for fertility and mortality and migration. The age-specific rates for fertility and mortality are not provided by the UN, only the Total Fertility Rate, sex ratio at birth and the expectation of life and birth by sex, for each 5 -year interval. An age-specific migration profile is available from the UN as described above, and is used in this

projection. While the overall mortality indicators used are those of the UN, the age-specific profiles of each within those parameter limits are those employed by the GAD. This produces a fairly close facsimile to the UN Projection. For example the total population differs by only 422,000 by 2050 with relatively trivial differences in support ratio and age-structure - small errors by the usual standards of projection (see Table 3). The final projection in this series is the official 1998 - based GAD projection itself. Here the final replacement of the last of the UN's assumptions (on migration) is made. That increases net immigration to 95,000 per year throughout the 52 year period, instead of the 40,000 per year, falling to zero in 2025, assumed by the UN. That is the only difference between this projection and the GAD 5 projection. As this assumption generates a total net inflow of 5 million net immigration by 2050 instead of the 1 million under the UN's assumptions, the results is a substantial difference in population of 7.1 million (12.4%) by 2050. The difference between this and the 5 million net immigration total is accounted for by the additional births generated by this additional population. Immigrant fertility rates in these projections are assumed to be those of the national average (which includes a component of immigrant fertility, of course); there is no separate calculation of the immigrant - descended proportion of the population. As immigrants typically have higher fertility than the host population, which take some time to converge with that of the local population and may never do so, a more accurate projection should include the growing proportion of population which will be immigrant or of immigrant descent.

Table 3 Analysis of the differences between GAD and UN projections of UK population at 2050

	Projection						
Values 2050 variable	UN Variant	GAD 0 GAD of UN	GAD 1 GAD 0 GAD mig	GAD 3 GAD 2 GAD 98	GAD 4 GAD 3 GAD e0	GAD 5 GAD 4 GAD	GAD 1998 Principal Projection
Population	56667	57089	58394	59465	59386	58727	64181
Median age	44.5	44.5	44.3	44.3	44.5	45.6	44.1
Pop 65+	14107	14424	14412	14706	15000	15000	15556
% 15-64	59	58.5	59	59	58.8	59.1	59.9
%65 +	24.9	25.3	24.7	24.7	25.1	25.5	24.2
Support Ratio	2.37	2.32	2.39	2.39	2.34	2.31	2.47
Pop change pa.	-162	-161	-136	-140	-167	-217	0.64
Pop growth %	-0.29	-0.28	-0.23	-0.23	-0.28	-0.36	-0.10
Net Migration	**0**	**0**	**0**	**0**	**0**	**0**	*95*
TFR	**1.9**	**1.9**	**1.9**	**1.9**	**1.9**	*1.8*	*1.8*
e0m	**79.2**	**79.2**	**79.2**	**79.2**	*80.0*	*80.0*	*79.7*
e0f	**84.4**	**84.4**	**84.4**	**84.4**	*84.1*	*84.1*	*83.9*
Upper limit of working age needed to obtain given potential support ratio							
Support	*Upper limit of working*						
4.09 (1995)	72.3	72.9	72.4	72.6	72.9	73.1	72.0
3.5	n/a	70.9	70.3	70.4	70.7	70.9	69.9
3.0	n/a	68.8	68.2	68.3	68.6	68.8	67.8
Difference at 2050 between GAD 0 and successive projections							
pop. total		1305	2376	2297	1638	7092	
pop total		2.29	4.16	4.02	2.87	12.42	
%65+		-0.6	-0.6	-0.2	0.2	-1.1	
support		0.07	0.07	0.02	-0.01	0.15	

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

Note: Source data in bold from United Nations Medium Variant. Those in italics from GAD 98 Principal Projection

This substantial increase in population does not generate commensurate changes in age-structure, however. The total population aged 65 and over, compared with the GAD 0 projection, only falls by 1.1 percentage points. The support ratio improves by 0.15, which is 6.5%. The upper limit of working age required in 2050 to maintain the 1995 support ratio of 4.09 varies little between these projections (it is 72.3 in the UN Medium Variant). The lower TFR of the GAD Principal Projection of 1998 increases it to 73.1; the high GAD migration projection reduces it to 72.0, all other projections are within this narrow range. This seems a small advantage in the context of the substantial increase of 7 million population implied by this comparison of projections, a five-fold increase in net migration over the 50 year period. It illustrates the familiar general proposition that even substantial increases in immigration have little impact on population ageing, a proposition which we will encounter again later.

VARIANT RUNS

We now turn to investigate a range of projections based on various different plausible assumptions imposed on the 1998 GAD Principal Projection. It was seen above that this differs considerably from the UN Medium Variant. In respect of its starting figures and initial migration assumptions, and its basis on one-year rates and intervals, the GAD projection must be considered to be more accurate. Eleven variants are presented here. Most comment will be made on the results up to 2050, in line with the UN projections. But the projections have all been continued to 2100 as well. While even more precarious than a fifty-year projection, this is helpful as it 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 some very 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, as in practice, immigration flows have tended to be slightly younger than emigrant flows and we saw above in GAD 1 that differences in migration age-structure profile can make a difference even if the net overall figures remain the same. This projection 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. But the differences are not great. These are results similar to those obtained in previous (e.g. 1996, 1994 GAD) projections which assumed lower migration declining eventually to zero (an assumption not abandoned until the 1996 –based projections). The GAD zero migration variant produces a slightly higher population at 2050 than the equivalent UN zero migration variant (by 0.5 million) despite the higher long-term TFR assumed by the UN. This is partly because, as explained earlier, the GAD starting population is considerably higher (by 0.6 million) than that of the UN and the GAD TFRs are higher than those of the UN until 2010.

2 Constant migration at 185,000

The constant migration projection assumes that migration will continue at the current level of 185,000 net intake per year; that is 9.25 million net immigrants over the next 50 years. The latest figures for the midyear 1998 - 1999 from the Office for National Statistics (ONS) estimate net immigration to have been 188,000 (ONS 2000). Equal numbers of male and female immigrants are assumed, somewhat at variance with the assumption for the first three years of the 1998 GAD projection, because of male dominance among asylum seekers. Not surprisingly this projection generates substantial population growth, bringing the population total to 70.6 million in 2050 (72.6 in 2100), 6.45 million more (10.1%) than in the GAD 1998 projection which assumes migration of

95,000 per year. The migration effect increases the UK population by 14.5 million people or 25.9% over the zero migration projection in 2050 and 11.4 million over the actual 1998 population of 59.2 million or by 19.2%. That, like all the other projections, assumes as does the UN that immigrants immediately acquire the fertility and mortality patterns of the host population.

As with the previous migration contrast, this considerable increase in population does not have commensurate effects upon the age-structure (Table 4a, Table 4b). Median age falls to 43.4 by 2050 compared with 44.1 in the GAD 98 and 45.8 in the zero migration projection. Proportion aged 65 and over falls to 23.2%, one percentage point below the GAD Principal Projection The support ratio rises to 2.61 and the 'required ' upper limit of working age falls to 71.1 by 2050. The continuation of this (less than current) level of migration not only exceeds the UN scenario 'requirements' for constant total population (on average 48,000 net immigrants per year). But it 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) although it is still well below the average 1.087 million per year 'required' to preserve a constant support ratio (UN Table IV. 18 p 69).

Table 4a 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 variable	1 Zero	2 185k	3 TFR Replace	4 TFR High	5 TFR Low	5b TFR 0 mig	5c TFR 0 mig	6 High	7 TFR High e0	8 TFR High e0	11 1998	GAD Princip
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	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 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

Table 4b Summary of variant GAD projections at 2100

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

	Projection											
	1	2	3	4	5	5b	5c	6	7	8	11	GAD 98
Values 2100	Zero mig Mig	185k migmig	TFR2.07 2.07	TFR 2.0	TFR 1.7	TFR 2.0 0 mig	TFR2.07 2.07 0 mig	High e0	TFR2.07 2.07 High e0	TFR 2.0 High e0	1998 fixed	Princip Project
variable												Projectio
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 p.a.	-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 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 total	-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 to 2.075, the 'replacement' TFR while net immigration and expectation of life remain at the GAD Principal Projection levels. This brings total population to nearly the same as the constant immigration variant (71.8 million) by 2050 and to considerably more (81.8 million) by 2100. A stationary population is not reached because expectation of life ceases to increase only after 2060, and immigration continues at 95,000 per year (by 2100 the last assumption may have become unrealistically high, as the push factors behind migration may have diminished by then). By 2050 this projection produces the lowest proportion of population aged 65 and over (21.7%) and the highest 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%. This small increase produces almost the same population growth as the doubling of net immigration represented by the previous scenario (to 69.5 million) with a considerably lower median age(the lowest in the series) of 41.3 The population aged 65 and over falls to its lowest proportion except for scenario 5 (22.4%) with a support ratio of 2.67 and the same upper limit to working age of the high migration scenario (71.1). This scenario, it should not be forgotten, still includes net immigration, very high by historical standards, of 95,000 per year. A later projection will investigate the effects of the same TFR without migration. (Triangular diagram needed to show effects of fertility, mortality and migration)

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. Not surprisingly this leads to a reduced population growth of 2.45 million or 3.8% less, with support ratio down to 2,38 thanks to a population aged 65 and over risen to 25.2%. The difference between TFR 1.7 and 2.0 by 2050 is 7.8 million. The difference in the support ratio between zero migration and 185,000 immigrants is slightly higher (0.36) as that between TFRs of 1.7 and 2.0 (0.29).

5b TFR = 2.0 but zero net migration and 5c TFR = 2.075 with zero net migration
Identical to projection no 4 but with zero migration. Population by 2050 is substantially reduced by almost 9 million by comparison with the same projection with 95k immigration,, rising only slightly above the current level (to 61 million from 59) median age rises by 1,4 years as the percent over 64 rises by 1.4 points and the support ratio falls by 0.22. An increase to replacement rate fertility (2.075) drives up population growth to 64 million - about the same as the GAD Principal Projection but with considerably reduced median age (41.6) and slightly more favourable support ratio (2.53). This projection ends the century with a population of 63 million growing at a tiny rate; expectation of life, on this projection, had by then ceased to increase.

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 (very pessimistic, in this author's view) to the slightly higher figure of 81.1 and 85.2 (only slightly less pessimistic). This amelioration, which corresponds to that projected recently in the model advanced by (Tuljapurkar, Li, & Boe, 2000) increases population growth by 0.85 million. Much of the benefit is felt by the 65 plus population, thus depressing support ratio slightly to 2.37 compared with the 2.47 of the GAD 98 Principal Variant. This very slight increase in survival, projected by statistical modelling rather than more demographic or medical analysis, is one of the most pessimistic in the G7 group of countries presented by Tuljapurkar et al.. It only adds 1.3 years to the official projections, which have been conservative for some years (Murphy, 1995). However by 2100 the application of this model leads to the arresting conclusion that e0m will reach 86.5 and e0f 90.4 years. By this time 29% of the population of 64.5 million will be aged 65 and over with a support ratio of 1.9, and population growth will be almost exactly zero.

7 Replacement fertility 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 (72.6 million by 2050, 87.0 million by 2100) and in 2050 a low median age (40.9) and proportion aged 65 plus, and a high support ratio (2.64) comparable with the replacement fertility projection. By 2100, however, continued prolongation of expectation of life causes increasing divergence from projection no 3 towards an older and bigger population. In this scenario population stability cannot be reached because of the assumption of constant immigration, and increase of e0 will prevent a stable age-structure emerging.

8 TFR = 2.0 with lower mortality.
This simulation represents a more moderate version of the previous one. The lower TFR brings somewhat less favourable proportions of elderly and 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.

9, 10 Replacement fertility, and TFR = 2.0, with lower mortality. Both of these projections envisage much more modest population growth; in the replacement case just a further 4 million by 2050 to 63.9 million, reaching 67.3 million by 2100. This goes hand in hand with less favourable age-structures - in the case of the replacement scenario, the proportion aged 65 and over rises to 24% and the support ratio falls to 2.4; further prolongation of life by 21000 increases these further to 2.1 and 26.6%. However these are only marginally different from the results in 2100 of projection 7 where immigration remains at 95,000 per year. The important factor here is the increase in expectation of life; the effects of 95,000 immigrants upon the age structure are minimal. The immigrants do, however, succeed in adding 19.7 million (32%) to the population size over the century.

11 Constant fertility, mortality and immigration

This curious projection generates almost exactly the same population total as the GAD 98 Principal Projection by 2050, but with a somewhat different age-structure. TFR remains at 1.7 and immigration remains at today's actual level 185.000 (unlike most previous projections), and the expectation of life at birth for both sexes remains at today's level, about six years below the eventual figure projected for 2025. 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). The population growth effects of the high fertility are, of course, cancelled out by the deflationary effects of the relatively low TFR. This underlines the important effects of mortality upon age structures in the 21st century. As Calot & Sardon, 1999 have shown for France (admittedly an extreme case) the population ageing effects of low fertility are more or less played out and what will be important for the future are the effects of progressively increasing survival. As this nowadays affects almost solely the population aged 60 or over, it has powerful effects upon ageing (and also on its amelioration insofar as morbidity tends to decrease also).

IMMIGRATION / FERTILITY 'REQUIREMENTS'

The projections above took various assumptions, more or less reasonable, to explore the long and very long term implications for population growth, median age, potential support ratio and other relevant variables. The alternative, prominent in the UN PD Report, is to approach the issue from the other direction; that is, to determine the levels of migration or fertility (or other changes) required to achieve certain demographic targets deemed, for the purpose of argument, to be 'desirable'. So far, only the migration route has been explored. Fertility results will be presented in a later version of this paper. This partial duplication of the UN scenarios is undertaken here because the GAD projections give different results, as noted above, and in order to explore the consequences of other assumptions. The basic data are presented in terms of the annual immigration needed to secure these targets and the population size incurred by their achievement (Figures 2a-d).

Annual net migration is treated in a somewhat different fashion from the UN PD scenarios. There, the annual total was averaged from a gross total. Here, annual net migration is computed yearly as that required to maintain potential support ratio, or workforce size, on a year to year basis. It is evident from Table 5 that the flows required are very volatile. For the support ratio, the net inflow 'needed' reaches 1.5 million by 2025, falls to nearly half a million and rises to over 5 million at the end of the century. Maintaining workforce size is easier, of course, annual net immigration peaking at 330,000 around 2025. The volatile nature of the 'required ' immigration is perhaps its most striking characteristic. Potential support ratios are very much at the mercy of the size of successive birth cohorts. That helps to explain the fluctuations of 1.5 million in net migrants for the support ratio, and the nearly 350,00 'required' to preserve the workforce. 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 is easy to start but particularly difficult to stop if coming from a poor country. The difficult stop-go of immigration required to this end was first explored by Blanchet (1989) and Wattelaar and Moors (1988), 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. The former are similar to the UN findings. 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 in 2050 and remains about that level until the end of the century - less than in the GAD 1998 Principal Projection. This outcome arises from the relatively high level of migration already experienced by the UK, which is already receiving more migration than it 'needs', and by the generally benign UK demographic regime, where expected 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. This paper does not yet incorporate any analysis of the fertility level required to maintain the support ratio.

Table 5 Annual net migration ‘required’ to achieve given population, workforce and support ratio targets, 1998 - 2100

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 6 Population size 'required' to maintain population and workforce targets, UK 1998 – 2100

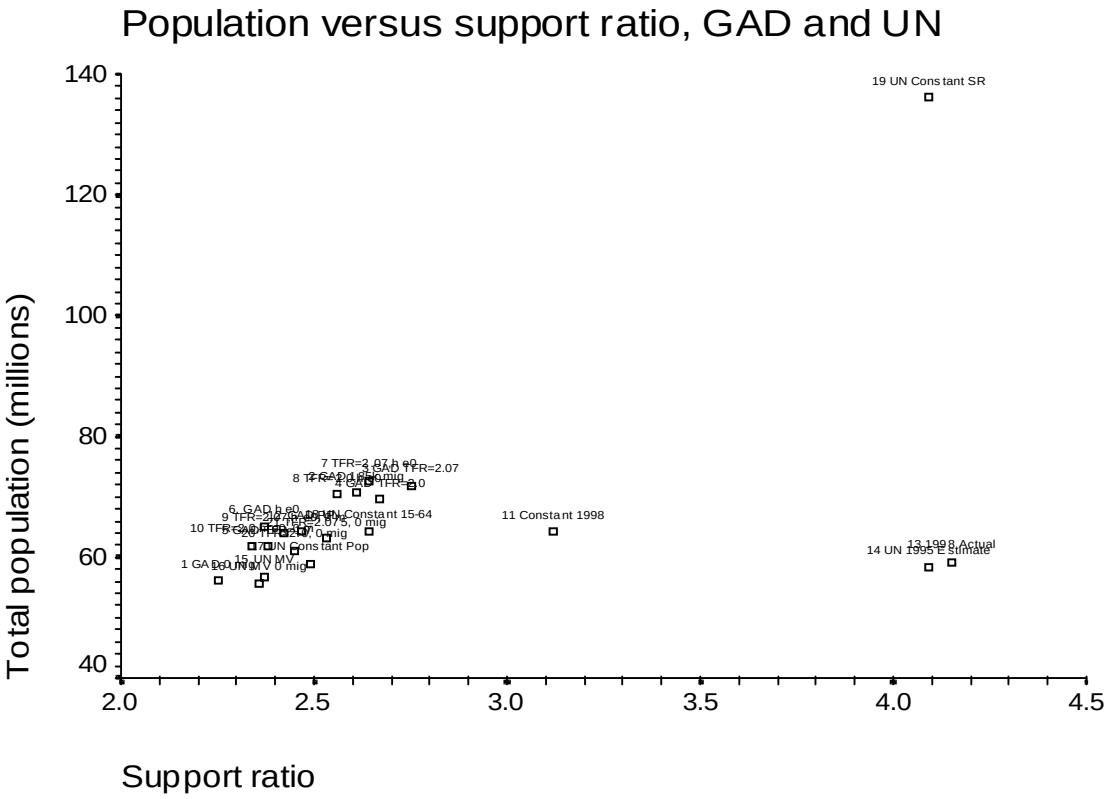
Target	1998	2000	2010	2020	2025	2030	2050	2060	2080	2100
Support ratios										
SR 3.0	59237	59750	61587	63470	64235	69139	77026	77957	100612	90799
SR 3.5	59237	59750	61587	64948	70507	78761	89983	97276	142625	143923
SR 4.22	59237	59750	63371	76637	84383	94716	118902	152648	213207	303371
Workforce absolute size										
15-64 as in 1998	59237	59155	58578	60145	61492	63273	63093	63125	64723	63481

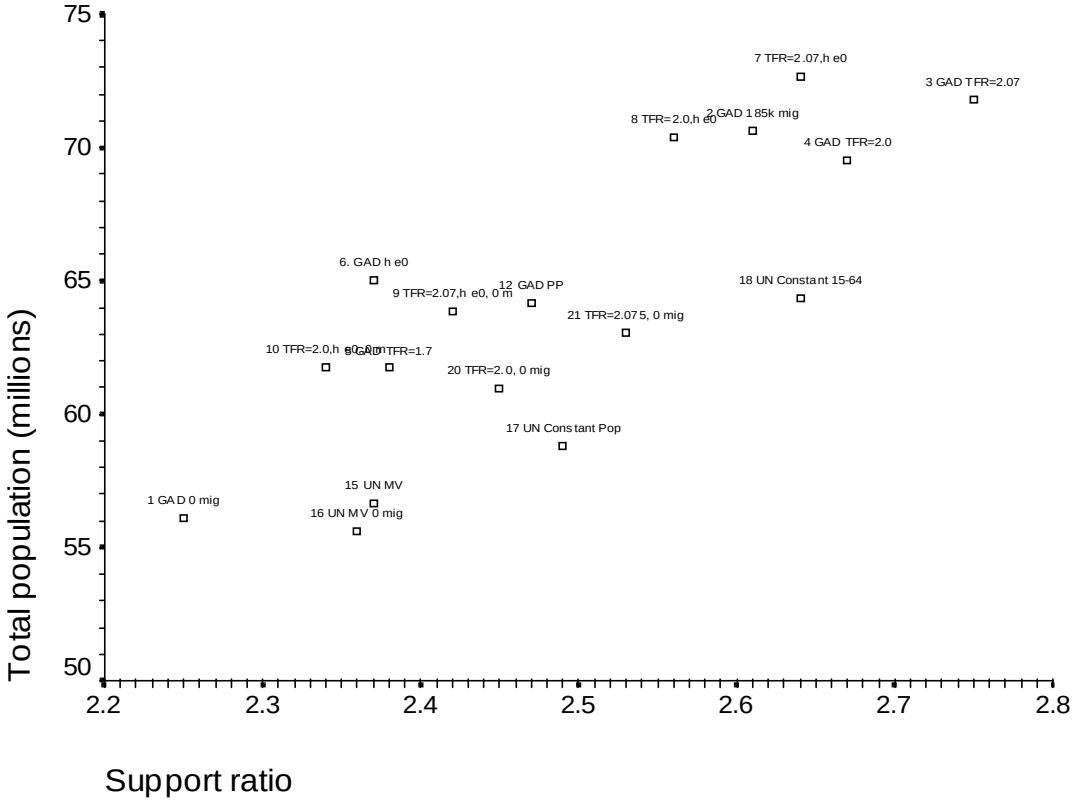
EVALUATING RESULTS

The first conclusion is that, short of the very high levels (annual 1.086 million) levels of immigration 'required' to maintain the support ratio, no reasonable assumptions of future demographic change makes a very radical difference to any of the indicators by 2050 (Table7, Figure 2a, b). Demographic aspects of population ageing and decline of potential support ratios are inevitable and presumably will have to be lived with for as long as the species survives, but in the UK case at least they 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,b below plot the population size against potential support ratio for the various simulations described above by the year 2050.

The late 1990s current estimates from UN and GAD are almost indistinguishable when compared to any of the projected figures in figure 2a. The 'constant support ratio' projection dictates the scale of the diagram, with double the population of any other projection. The next 'best buy' in terms of 'support ratio' is No 11, where vital rates and immigration are left at their current 1998 level. The distance between that projection and the current situation shows how much of today's potential support ratio is owed to the inheritance of the vital rates of the past, enshrined in today's age-structure. That cannot be preserved. Most of the additional 5 million population here is the result of the continuation of immigration at today's high level of 185,000 per year. That outcome is hardly an option unless governments act to prevent both survival and birth rates rising. Eliminating these we concentrate in Figure 2b on the range of scenarios based on 'reasonable' assumptions noted above. These occupy a much smaller 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%.

Figures


Population versus support ratio, GAD and UN
Total population (millions)
Support ratio
19 UN Constant SR
11 Constant 1998
14 UN 1995 Estimate
13 1998 Actual
18 UN Constant 15-64
17 UN Constant Pop
15 UN MV
16 UN MV 0 mig
1 GAD 0 mig


Total population (millions)
Support ratio
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 m
12 GAD PP
18 UN Constant 15-64
21 TFR=2.075, 0 mig
10 TFR=2.0,h e0, 0 mig
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 projections fall naturally into three loose clusters along this narrow range of support ratio. The first, with the lowest population growth and support ratio between 2.25 and 2.35, include the two zero migration scenarios. The UN Medium Variant 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 projection to a higher level of population growth and support ratio (GAD 9) in a second middle cluster, all close to the GAD 12 Principal Projection. This assumes constant 95,000 migration, at about the same population size. Increased survival with 95k migration (GAD 6) slightly worsens the support ratio. A third cluster of variants generates considerably higher population growth, by 4 - 8 million people. These are all the higher TFR GAD variants (TFR = 2.0 or 2.07), some in combination with higher survival, all with GAD 95k immigration, plus the standard GAD variant with the high current migration level of 185k. Among these the GAD 3 projection with replacement fertility (and 95k immigration) gives the highest support ratio (2.75). The effect of the three variables of fertility, mortality and migration can best be understood by drawing lines on the graph. The diagonal from GAD 1 through GAD 12 to GAD 2 shows the effect of increasing immigration with constant fertility from 0 to 95k to 185k. 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; 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 of the migration route (0.025). However, any increase in fertility brings an increase in child support costs and even replacement TFR, of course, cannot more 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.

Table 7 Outline comparison of GAD scenarios at 2050

Population values in 2050

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

Comparison with GAD 1998 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 4a.

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. Running together the low mortality runs create a diagonal which runs parallel with that of the track of fertility increase but, not surprisingly, at a less favourable level of support ratio for any given population size. GAD 10 and GAD 9 show a similar trend with increasing fertility, enhanced survival and zero migration. The UN scenarios form a parallel set at a somewhat higher level of support ratio. The starting population size was smaller, the final level of fertility higher, the level of immigration more modest.

Further work to be done includes the estimation of the level of TFR required to achieve the UN and other 'targets', the projection of the population of immigrant origin and variant workforce projections. Initial projections suggest that a TFR required to achieve all but the most general demographic 'targets' would, even more than the migration targets, need to be too finely-tuned to be worth considering. The question of the proportion of population of immigrant descent is more substantial. High migration envisaged in some scenarios would indeed create a 'replacement' population, eventually reducing the indigenous population to a minority. This process would be faster than that sketched in the UN PD projections. First, because they discount the existing population of immigrant origin. This, depending on how 'immigrant origin' is defined, is already between 5% and 10% in many European countries, and growing rapidly. Second, because the UN projections assume, for purposes of understandable technical convenience, that immigrant fertility instantly converges to that of the population average. This is unlikely. Thirdly, because the UN model assumes that zero net immigration means zero contribution to the growth through immigration of population of foreign origin. For example, UN Medium Variant gives UK 2050 population as 56.7 million, UN zero migration variant gives 55.6 million. Therefore the percentage of 2050 population which is post-1995 immigrant descent is (56.7-55.6) / 55.6 = 2%. This only works if all migration is inward. In most years up to the mid 1980s, the UK experienced a net outflow of population, but the inflow usually included many more persons of non-British origin than the outflow. Thus a post-war ethnic minority population could grow from negligible numbers in 1951 to over 3 million in 1991, during a forty year period of predominantly net emigration. The consequences of population ageing and of the end to population growth, and possible policy responses, are discussed in Part Two of this paper, which also includes the conclusions and references.

PART TWO

CONSEQUENCES OF POPULATION AGEING

These have been discussed too much in the recent literature for the last decade or more to need repeating here in any detail (Lee, Arthur, & Rodgers, 1988, OECD, 1988, International Labour Office, 1989, Johnson, Conrad, & Thomson, 1989, Johnson & Zimmermann, 1993). Concerns about population ageing focus on three main macroeconomic areas:

Worsening elderly dependency ratio (or support ratio) which increases government expenditure, and therefore taxation, for pensions schemes and to cover the increased medical, social services and residential care cost needed by the elderly. This reduces competitiveness and raises the prospect of intergenerational conflict. The falling relative size of the workforce could reduce output relative to consumption (but also needs less new capital investment) and its increasing average age is claimed to make it less productive, less able to be retrained, less geographically and professionally mobile and less innovative, needing government subsidy to preserve old skills and techniques rather than adopt new ones. And consumption propensities change as the population ages. Corresponding advantages might include a lower crime rate and a higher standard of civic behaviour, among other things (Thane, 1989, Day, 1992). Another effect will be that an older population may be politically more conservative, relatively more numerous and certainly committed to maintaining the value of pensions (Fosler, 1990).

FACING POPULATION DECLINE

Population decline, while inevitably linked to population ageing, has some effects which can be considered separately, although since the pre-war period the topic has attracted little attention from UK economists. It shares this neglect with the economic aspects of migration, which is correctly regarded as a marginal affair. In the UK the prospect of population decline is far off (2035), the forecast decline modest and previous projections always wrong. Much more pressing concerns include competitiveness, innovation, productivity and unemployment. Much that has to be said is probably known already, from the work of the 1930s.

Overall national population decline (Teitelbaum & Winter, 1985, Teitelbaum, 1999), has often been regarded as a symptom, as well as a cause, of national decline relative to neighbours in a competitive and hostile world. Concern is often acutely developed with respect to the declining relative size of sub-groups (patricians in ancient Rome or the middle class in early 20th century England (Marchant, 1917) or religious and ethnic minorities (Jews in contemporary UK: Sacks, 1994). This concern , nearly universal in the mercantilist climate of previous eras, and frequently encountered in practice, can be traced back to the beginnings of states themselves (Glass, 1967, Chapter 2).

Problems of population decline focus on particular age-groups, especially persons of active age, conventionally 15-64. Enthusiasts for population growth (e.g. Simon, 1981), of whom there are few in the UK, point to the counter-inflationary effects of workforce growth and the guarantee provided by growing numbers of consumers in underwriting productive investment and promoting innovation. Some of these effects, often cited in US economics and business circles, chime with common sense but tend to lack empirical support.

However, unemployment (concentrated among the young) as much as labour shortage has been the over-riding concern today in many western countries, including during periods of low fertility. But in a modern economy increased productivity growth and higher competitiveness are seen as the keys to economic growth. That involves higher capital inputs, in some cases removing workers from production altogether. Cheap

imports and offshore IT services allow some unprofitable activities to be run down altogether. It is difficult to take seriously the rate of growth (as opposed to the size) of the domestic consumer population as a sign of a strong aggregate demand in a global economy where export markets may be dominant and where rates of population change either way are modest. There is no cross-sectional relationship in Western Europe between population size or growth and economic growth. The ancient concern about the effect of population sized on the ability to project military force still has relevance today, although former potential enemies have cohorts of military age declining in step. The declining proportion of the Western world in global population must eventually weaken this aspect of power, as in the more peaceful aspects of representative world governance (McNicoll, 1999). But all that is a very long-term affair, quite overshadowed by more immediate considerations.

Facing population decline

Can we then face declining population with equanimity (apart from the specific problems of ageing mentioned above)? It seems difficult to give an unequivocal answer, except to say that the answer does not seem to be glaringly obvious either way. By contrast in the 1920s and 1930s demographers, sociologists and activists of various kinds throughout Western Europe were busy presenting horrendous projections of population decline (Charles, 1936) amidst concern for race-suicide, the twilight of parenthood and national decline (Glass, 1936, Hogben, 1938). Economists, on the whole, took a more cautious position than some popular writers and saw some advantages in a population no longer increasing or even declining (Keynes, 1936, Reddaway, 1939).

This analysis was taken much further by the Royal Commission on Population (Royal Commission on Population, 1949), set up in 1944 to give a rational response to contemporary population fears. Many of its analyses have stood the test of time. Contemporary commentators expected population to peak around 1977, given that intrinsic fertility rates indicated a 6% deficit per generation. This is roughly the same number of years before population decline which the UK faces in 2000, according to current projections. 'We shall have cause to be glad that our numbers will soon cease to grow' suggested the Economics Committee, (Royal Commission on Population, 1950 p 58) because of the likely continuing adverse trend in balance of payments arising from increased competition from a growing industrialised world. The British economy had always depended heavily on exports but usually runs a balance of payments deficit on visible trade. At the time it faced 'an economic Dunkirk' through the necessity of paying for six years of continuous warfare. Security of supplies of primary produce in which the UK was (and remains) not self-sufficient (including foodstuffs and oil) was then a prominent concern, although not today.

Advantages were seen in the diversion of infrastructure investment, e.g. house building from accommodating new households to improving standards and other investment; pressure on land and environment and natural products would ease (p 60). The adverse economic consequences of population ageing on pensions systems were underlined. Echoing Keynes (1936) the committee also felt that declining numbers made the maintenance of full employment more difficult through the failure of demand. That

concern is rather reversed today, with experience of rising NAIRU and the effects of labour shortage on inflation. But other considerations suggested that a stationery population was more likely to find it easier than one which is growing rapidly to increase its standard of life' (p 60). The report concluded that the 'balance of of advantage is strongly in favour of stationery as compared with increasing numbers' and that 'while a smaller population would, as such, be on the whole advantageous, the process of decline would be difficult.(p 61). Decline would have similar consequences as the end of growth, only more accentuated. But while the recovery of the birth rate to replacement level was obviously essential in the long run (to avert extinction), it might not be an urgent priority.

Only two other official reviews of these problems have been made at national level; they have come to similar conclusions about the undesirability of population growth. The First Report from the (Parliamentary) Select Committee on Science and Technology , alarmed by population projections at the end of the baby boom suggesting population rising to about 67 million by 2000, urged that 'The Government must act to prevent the consequences of population growth becoming intolerable for the every day conditions of life' (Select Committee on Science and Technology, 1971, p x).The government's lukewarm response to this enthusiasm (HM Government, 1971) was simply to set up a Population Panel. This uncommitted response, described by the Select Committee (Select Committee on Science and Technology, 1972, p vi) as a 'leisurely and disinterested attitude to the question of population growth', has characterised UK central government approaches to population growth issues ever since.

The Panel's Report (Population Panel, 1973), although formulated in a much more modern economic climate, came to similar conclusions to those of the Royal Commission, namely that a 'stationary rather than an expanding population would be more advantageous'. It (quite accurately) expected population to rise by about 10 million from 1971 to early in the next century (i.e. this one) , concluding that 'while there should be no undue difficulty in accommodating the extra 10 million or so in prospect, a large number of policy problems would be easier to tackle if the rate of population growth were slower rather than faster. We have found no overwhelming arguments in favour of continuing population growth ' , 'society will have to adapt itself to the social and economic implications of an age distribution consistent with a stationary population. ' (p 6). The population growth at that time came entirely from natural increase, migration having a net negative effect.

Although formulated on different grounds, from the 1960s until very recently UK Government policy on immigration has been consistent with these attitudes; namely, subject to various exceptions, 'to restrict severely the numbers coming to live permanently or to work in the United Kingdom (Home Office, 1994 p iii , Coleman, 1997). Public opinion polls then and later indicate that public opinion shares the view that the country is over-populated, with issues of land, overcrowding and environmental amentity much to the fore. A shower of publications advocating an end to growth (Brooks, 1974) linked UK population concerns with wider fears about material resources and enviromental protection, a concern revived in recent years by the rise of Green politics. The Green Party is on record advocating a UK population of 30 million. The

notion of optimum population (Taylor, 1970) has proved too difficult for most specialists or government to contemplate easily, although enthusiasts continue to advocate it invariably at lower levels than current population (see Optimum Population Trust, Myers 1998, Parsons 1999).

While the UK has always lacked an overall population policy, as Karen Dunnell makes clear in her paper, strong local 'population policies' have been articulated by central and local government in respect of regional housing issues. Cities had long been regarded as unhealthily overcrowded. The Royal Commission on the Distribution of the Industrial Population (1940) proposed the decentralisation of the industrial population on grounds of health and amenity, security from air attack and regional economic development. The Abercrombie Report of 1944 went further in creating 'New Towns' to aid the dispersal of London's population. Population distribution ever since has been powerfully affected by the 'green belts' around towns (where building is prevented) created by Town and Country Planning Act of 1938 and subsequent legislation. 80 % of the land surface of the South East region (the most prosperous, and most favoured by internal and other migrants) is now protected by planning restrictions.

Many local authorities in the South East of England (and elsewhere) today consider themselves to be overpopulated and 'full' and fiercely oppose any new house building proposals. To prevent the 'concreting over' of the South East, government has attempted to force new development onto 'recycled' land in urban areas, of which there is plenty in the less favoured rust-belt areas but less where people want to live. As household projections have been ratcheted up in recent years this conflict of land and population has become more heated, with considerable impact on elections in local constituencies. The main reason for the recent increase in household projections is the renewed growth of the population through the rapid rise of net immigration during the 1990s. The most recent household projections (Department of the Environment Transport and the Regions (DETR), 1999), which have already caused much controversy, are themselves based upon the obsolete population projections of 1996, which assumed only 65,000 net immigrants per year. The new assumptions of 95,000 per year imply a further 340,000 households to be accommodated by 2016. According to the sensitivity table in that volume (DETR table 16 p 28), the actual current level of immigration implies 1.3 million more households on top of the already projected increase of 3.8 million from 1996 to 2021.

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 will depend on a multiple response. Four obvious broad categories are:

Microeconomics and social policy

Financial and fiscal arrangement for pensions, savings and old-age health care need much re-arrangement. 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.

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 8). This reduction in the rate of increase in the real value of state pensions has attracted some criticism. 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 8 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 while any amelioration of the problem was to be found within the parameters of the existing system (none mentioned immigration) no specific pension reform provided a panacea. 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 (Eatwell 1997). The World Bank (1994) has suggested a three-pillar system of continuing flat rate Social Security blanket pensions, 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 and 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 off an 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). A relative shortage of workers could force entrepreneurs into the difficult 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 undercapitalised 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. The enhancement of international competiteveness quite apart from any response to supposed labour shortages and the costs of an ageing population, requires capital investment to increase productivity, thus moving 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 needed to cope by itself with the extra burden of old-age dependency (European Commission, 1996). This is similar to the estimate by Weil (1997).

Workforce measures

The other major adjustment within the demographic system is to increase the size of the active population, the numerator of the support ratio. First by mobilising the inactive population of working age; second by and expanding the boundaries of working age to take longer expectation of life into account and thereby simultaneously reducing the denominator as well. Workforce participation rates cannot increase forever, of course, and by themselves provide a once-for-all, but potentially enduring advantage (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 (EC 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 is only 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 28.032 million to 28.604 million (Table 9). 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% (Table 9). Early retirement of men has had a powerful erosive effect on the UK workforce. In the 1980s it was encourged to make way for young workers in the baby boom cohorts 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.

Table 9 Economic Activity Great Britain,Denmark, UK Labour Force 1998, 2011, 2051

	Percent in age-group economically active							UK workforce 1998, 2051					
	Great Britain					Denmark		United Kingdom					
	Male		Female			M	F	1998		2051		2051	
age-group	1999	2011	1999	2011	age-group	1999	1999	UK 98 rates		UK 98 rates		Danish 99 rates	
	Male		Female			M	F	M	F	M	F	M	F
16-19	66.9	67.9	63.1	61.4	16-19	65.6	60	1260	1126	1182	1066	1159	1013
20-24	83.7	85.7	70.5	74.1	20-24	82.3	75.3	1509	1210	1549	1265	1523	1351
25-34	93.3	91.0	75.2	79.9	25-29	87.9	80.7	2101	1608	1815	1420	1710	1524
	93.3	91.0	75.2	79.9	30-34	90.6	84.9	2304	1784	1848	1455	1795	1643
35-44	92.0	89.4	77.0	78.6	35-39	90.4	86.4	2130	1730	1818	1481	1786	1662
	92.0	89.4	77.0	78.6	40-44	89.8	86.8	1821	1512	1797	1461	1754	1647
45-54	88.5	87.3	76.8	82.7	45-49	89.3	85.6	1696	1473	1728	1468	1743	1637
	88.5	87.3	76.8	82.7	50-54	87.3	79.1	1730	1511	1742	1485	1718	1529
55-59	74.6	71.1	53.1	54.5	55-59	81.3	65.3	1131	821	1506	1057	1641	1300
60-64	53.8	49.2	30.3	36.9	60-66	36.9	20	742	436	1081	608	742	401
65-69	15.0	13.0	3.5	3.8	67-74	18.6	4.9	186	48	270	64	335	89
70+	4.6	4.4	3.5	3.8		18.6	4.9	48	45	72	57	290	79
					75+	7.7	1.4	0	0	0	0	106	21
					Total 15 and over			16658	13307	16408	12887	16303	13897
					16-64			16424	13213	16066	12766	16303	13897
					Dependent age pop			3825	5468	7218	8324	7218	8324
					Support ratio			3.189		1.855		1.943	
					Support Ratio by sex			4.294	2.416	2.226	1.534	2.259	1.67
					Workforce as % 15-64			**76.9**		**75.1**		**78.7**	

Note: participation rates not all available for 5-year age-groups for GB
Projection for 2051 makes no allowance for increase of female retirement age to 65.
Overall' includes workers aged over 60/65
Sources: GAD 1999 t. 14.1, Statistics Denmark Feb 2000. Statistiske Efterretninger: Arbeidmarked t 4, 5

The Government Actuary (1999), in his projections of active population in relation to pension entitlement, assumes that these rates achieved by 2011 will remain constant to 2051. They include about a million further individuals over retirement age over retirement age to bring the total from 28.963 million in 2001 to 29.768 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 (see 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. UK rates although relatively high by EU standards, still have some way to go before they match those of some rich European

countries (Table 10). For example, taken over the whole population from age 16 onwards the UK ranked only 9th overall in the UNECE in 1996 (UNECE, 1997) t 4.1. These comparisons are not altogether straightforward, not the

Table 10 Labour Force Activity Rates (percent) - the ECE's top nine in 1996

Country	Overall activity rate	Male activity rate	Female activity rate	% females in workforce
Iceland	82.9	78.0	47.6	38.4
Sweden	78.2	80.3	76.1	47.8
Denmark	77.5	83.8	71.1	40.2
Netherlands	70.1	80.8	59.1	39.7
Norway	69.6	75.1	64.0	45.7
Switzerland	66.8	78.6	55.8	39.7
USA	66.6	75.0	58.9	45.7
Canada	64.8	72.5	57.4	45.0
UK	63.2	73.2	53.8	43.3

Source: UN 1997; Trends in Europe and North America 1996/1997. Table 4.1 page 94
Note: These rates are relative to the population aged 16 and over (not 16 - 64)

Least because proportions of persons aged 65 and over and proportions of women working part-time differ internationally (the latter is high in the UK). The table above suggests that UK workforce participation rates could increase by another 24% before they matched even the 1995 levels of Denmark or Sweden. However, the real scope for improvement in the UK is much more modest, as the age-specific calculation in table 9 shows., where Danish 1999 rates are applied to the UK population. There is, however, considerable scope for increase in the proportion of women working full-time in the UK, and of course for extension of the average age at retiremment, noted below. 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 employment projected for the next twenty years.

Other reserves of labour and 'hidden unemployment'

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 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 proportions, 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. Foreign workers entering under work permit schemes for specified jobs are seldom unemployed, but form only a relatively small part of the total foreign population in many European countries today.

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.

When projections take into account both demographic change and workforce participation rate change, both the projected and the potential labour supply situation can look more favourable. Feld (2000) combining Eurostat variant projections with workforce participation rate projections concluded that except in the case of Italy, the workforce in most western countries will either remain constant or grow substantially at least until 2020, so that aggregate net inflows of labour will not be necessary before then, if at all. In the case of the UK, only a combination of a low TFR of 1.5, immigration of +20,900 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 have yielded a narrow range of maximum retirement ages around age 70 – 75, with average about 72 These estimates are between 5 - 9 years older than the current standard age of retirement in most countries (65 years). 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 (Dunnell, 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 parallel tracks over any length of time. These are not bad gains, although different studies give different results. Methods using cohort data may capture more substantial advances in expectation of active life. For the US population, for example, 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).

The real support ratio

We are not, however, starting from a real retirement age of 65. The actual 'support ratio' of real taxpayers to real pension recipients is already much less favourable than the 'demographic ' support ratio, partly thanks to early retirement. Rather than the 4.12:1 of the UK today, used in the demographic scenarios, it is already down to about 1.8 (Table 11). This is what the economy has been coping with for some time, 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 be about 116 million.

Table 11 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 mde, and pension recipients overseas
Earnings threshholds for NI 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

In the UK the 'real' support ratio is projected to fall to about 1.4 to 1 under projected 2011 workforce participation rates (see GAD projections, table 5). This substantial difference between demographic and real support ratios arises from higher education delaying entry into work, early retirement, unemployment and hidden unemployment, and non-participation in the labour force at all for reasons of inclination and incapacity. There are also international differences in official retirement age: for most countries 65, for Italy 60, for Denmark 66.

Column 2 of Table 11 shows the conventional support ratio on purely demographic grounds, familiar from previous tables. Column 3 gives the support ratio corrected for the fact that female pension entitlement age in the UK is still 60, rising 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. Not all women will work until 65, of course, but state pensions will not be paid out until that age, so the revision is important for the future solvency of the National Insurance Fund. Column 4 shows the support ratio computed on the basis of projected workforce participation rates (constant from 2011), taking also into account the zero contributions of workers whose earnings are too low for them to pay National Insurance.(see Government Actuary 1999 Appendix for details). Because of these deductions the ratio is already less favourable than the purely demographic ratio.

Column 5 reminds us that the aged are not the only dependents. The overall dependency ratio, and therefore its reciprocal, the support ratio, always includes youthful dependents,

conventionally 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. We have already been carrying a less favourable overall support ratio for some time. As the proportion of elderly increases with an ageing population, that of the young declines. Perfect compensation is not on offer, however, as elderly dependents are generally assumed to cost about three times youthful ones. The final column weights total support ratio by those proportions, thereby slightly ameliorating the future burden (see also Table 13).

Early retirement, which has become very popular in recent decades, has a substantial effect upon real 'retirement age'. Instead of age 65 for males assumed in our calculations so far, real age at departure from work is clearly lower. 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 - say 56. 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 age of retirement now is about 56, then 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.

We can see, therefore, that the UK economy is already surviving (indeed at present doing rather well) on a real support ratio of 1.8, not the 4.12 assumed hitherto. In these scenarios, numbers of contributors remain almost constant from 2000 to 2061, while pensioners increase rapidly after 2020. Their numbers then cease to increase and even decline after 2040 to establish a new equilibrium (see GA 1999 Figure 4.2) as the baby boom at last moves on from the benefit office to the Pearly Gates.

Who's afraid of low support ratios?

At the end of the day, the important consideration is not the simple figures of the support ratios themselves but what they imply, in a given national demographic, workforce and economic situation, for the relative costs of projected increases in old-age 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

It is not possible to go into fiscal details but it is worthwhile noting how sensitive future prospects may be to purely fiscal and economic change. For example, much depends on economic growth, the prospects for which now seem more favourable than for a long time. The faster is economic growth, and the more incomes rise, the more people will be drawn into National Insurance (NI) contribution 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.

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 1990), thus making the future pensions problem worse. Recent analyses suggest a radical change in macroeconomic relationships which may permit a coexistence of economic growth of between 3% - 4%, continued low inflation (2-3%) and low unemployment (4%) previously thought impossible. Furthermore, with higher economic growth, the relative cost of state PAYG pensions pegged to prices, not wages, will decline although at the cost of the relative but not the absolute income of recipients. That again underlines the importance of economic growth and investment.

Looking at the UK case, the ratios in column 3 and 4 of Table 11 would lead, *ceteris paribus*, to a 40% increase in the rate of National Insurance contributions (from today's 10% to employees to 14%, at the highest rate of contributions. Employers pay 12.5% in addition). This is a serious but hardly catastrophic increase in that form of tax (that of course is only the impact on state pensions, not funded ones). 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. 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 12).
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. Estimates of the proportion of GDP represented by the black economy range from 5% to over 30% in various European countries. 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 12 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 and 'phased retirement' encouraged whereby the pensioner continues in part-time work, a response currently discouraged by 'final salary' pension schemes (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). It has been noted that 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

It is generally supposed that several of the parameters of the old age support system should change at the same time. All are likely to change, 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 'support ratios' are. This paper intended to present further projections assuming various changes in the parameters of the system as outlined above for the UK. Time has not allowed this, but instead two examples will be presented from elsewhere which, it is hoped, may be relevant.

For example, 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 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 13 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: 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 not a doubling, as Ermisch (1990) pointed out in the case of the UK. 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 13). 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 13 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 measures here, including non-elderly dependents.
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, and 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 measure, 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

Euroepan 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 offer alternative suggestions for why fertility should not drop to very low levels (Foster, 2000; Morgan and King in press).

Some empirical data support this expectation., which is underpinned by the consistent finding, after 30 years of surveys , that European women wish on average to have about 2 children (although seldom 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. That 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). 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 higher ethnic minority fertility is an important component here, contrary to some views the non-minority population also continue to have higher birth rates than almost any European countries. The latest data from the US (1999) indicates a further increase from 2.059 to 2.075 (National Center for Health Statistics 2000 p 4), coincidentally exactly the replacement rate for the UK. Some analyses now suggest that richer and better educated women have more children than average, and that 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 happen spontaneously, is it susceptible 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, Gauthier and Hatzius 1997). Most governments favour welfare policies which might incidentally encourage fertility, most 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). As modern states spend between 30% and 60% of national income, policy measures of various sorts affect the rationality of most household decisions. Few western countries explicitly attempt to increase their birth rate although many are concerned that it is too low. France is one exception; in the early 1980s French pronatalist measures were estimated to add about 0.3 to the TFR (Calot & Chesnais, 1983). However most modern societies promote fiscal, workplace and childcare measures to support the family which might be expected to encourage fertility or at last remove some impediments to it, but not to those ends. Polices devoted to welfare, in improving the position of women and especially helping to

resolve work / childcare conflicts could be expected to make it easier for women to have the number of children they say they want.. 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. 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, is held to be due to the persistent patriarchal attitudes prevalent in those societies. Through placing such emphasis on the responsibilities of the family, those societies have not demanded a political culture favouring a stronger role for the state, one which could promote more extensive Scandinavian programmes of public family support. Such policy measures are related to broader attitudes of gender equality or the lack of it in different societies. Societies with high gender inequality will continue to suffer lower birth rates (McDonald).

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 TFR closer to 1.6 than its current 1.7, which other things being equal would not help with the problem in hand. How easy it is for populations to change their individual and political attitudes in this direction, and the welfare policies which follow from them remains to be seen.

Conclusions

There is no 'solution' to the problem of population ageing and cannot be one short of 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 ageing) are quite simple.
They are:
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 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. 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 with (in the case of the UK) similar nominal dependency ratio but of different, but less favourable composition. Change in the 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 equal needs weighting. 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 while a higher proportion of transfers of the elderly will pas through the state. Hence those populations which also have a tradition of family care for the elderly, less prominent in North-West European populations such as the UK, 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 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, at least in the sense that they underline the conclusion that substantial population again will be very difficult to avoid. That is, nothing plausible makes a big difference. In this they confirm the general conclusions made by the UN projections, irrespective of differences in detail.

None of these seem to this author to be obviously catastrophic. Results show a set of potential support ratios around 2.5 and a 'required' maximum formal retirement age around 72, median age about 42 (Table 7). As expected from theory, higher fertility is a

more ‘efficient’ way of protecting potential support ratio than is immigration. Whether further substantial population growth can be avoided is a more open question; increases in fertility with reduction of immigration would tend to minimise future population growth. Welfare measures, justified on welfare grounds, which might have the effect of encouraging future fertility would do so because they would respond to unmet need for children, helping women to have the number of children that, on average, they say they want. Look after the interests of women and the population will look after itself. In the opinion of this author, large scale migration is an undesirable alternative not just because it is an inefficient means to reduce population ageing but because it is also likely to present the host society with serious cultural, social and political difficulties and economic costs (Coleman 1994, 1997).

In the future, population ageing will, insofar as it increases, do so primarily as a result of longer survival. Although estimates of gains in active life differ, there are grounds for hoping that increases in active life will make reasonable, as well as to some extent necessary, an extension of working life. In other words, some aspects of population ageing bring, in part, their own solution, by pushing back the real, as opposed to nominal, boundaries of old age.

Potential support ratios on fixed boundaries therefore remain a demographic abstraction. A number of possibilities exist to ameliorate the consequences of population ageing within the demographic system. 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. What matters is not demographic abstractions but whether the future costs of dependency are sustainable in the economic and social environment of the future.

In the UK situation, 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’. Furthermore, consideration of support rations need 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’. In the UK ‘demographic time-bombs’ only go off in the media, not in real life. A later version of this paper will, it is hoped, present a simple model showing the consequences of taking several of these factors into consideration separately.

It would greatly improve public, and governmental, appreciation of the problems of ageing facing modern societies if the UN Population Division will, as a result of the Expert Group meeting, choose to focus its talents more widely in addressing this broader repertoire of responses and move away from a concentration on what was already known to be an unsuitable demographic and social expedient in the form of mass migration.

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