Population Decline – the Consequences of the Unthinkable.

David Coleman and Robert Rowthorn

'in the multitude of people is the king's honour; but in the want of people is the destruction of the prince'. Proverbs 14, 28.

Introduction

Fear of population decline, censuses to warn of it and pro-natalist and other policies to avert it, are almost as old as states themselves (Glass 1940, Teitelbaum and Winter 1985). Rulers and states in the past and present, and stateless tribal societies, found affirmation, strength and protection in population growth and cause for alarm in decline as symptom, and cause, of failure and weakness. Where increases in productivity are difficult or almost unimaginable and where international trade is a zero-sum game, population becomes with land the chief factor of production, its increase to be encouraged by any means including conquest, the prohibition of emigration, and enslavement; its diminution to be avoided at all costs. Mercantilist thinking gave first place to the power and wealth of the state and regarded population as a prime factor, to be increased irrespective of the effect on individual standards of living. The demographic transition blew away those fears, only to replace them with others, although some losers in the transition remained disgruntled with their new, lower position in the international league table.

Since the end of the 20th century, the demographic, political and business worlds have rediscovered population decline. For the latter, at least, this prospect is unappealing (see Longman 2004). It is incompatible with the American Dream and, probably, with the dreams of businessmen everywhere. Decline in European populations is regarded with pity, with blame and an element of *schadenfreude* (Wattenberg 2004). At the global level the notion of decline first edged into respectable discussion with the UN population projections after 2000. These for the first time included, as a major variant, the onset of global decline by 2050. Hitherto, the low UN variant had assumed a stabilization of number. That was in line with the assumptions of demographic transition theory, which until the 1980s took for granted that populations emerging from the transition would resume the previous pattern of maintenance, or slow increase, of numbers sustained by approximately replacement-level fertility. The convenient, reasonable but evidence-free assumption that fertility would cease its decline at replacement rate then began to be challenged (United Nations 2002, Demeny 1997). Fertility in most of the developed world remained resolutely below replacement level from the 1970s onwards, emulated by a growing number of semi-developed or even poor countries, provoking some interesting long-term speculations (Bourgeois-Pichat 1988).

In fact the era of substantial and dependable population increase has been a short one in the broad sweep of human history, as Reher (2007) has pointed out in a seminal article. Rapid and continuous growth dates back for little more than two centuries and is now drawing to its close in the West. Before then, population decline was a constant preoccupation and not infrequently the experience of past human societies (Glass, 1973, Biraben 2004). Projections by the United Nations (2009) suggest that the high water mark of human population is likely to be under ten billion, and projections based on other assumptions and methods expect global decline before the end of the century (Lutz and Sanderson 2001).

Aim of the article

This article examines the prospect of population decline in the modern world and its relationship with population ageing. It briefly distinguishes between episodes of population decline which arise from clearly adverse or pathological events in the society and those which are symptoms of malaise and those causes that are less axiomatically harmful in themselves, but which are potentially sources of problems. It evaluates the likely consequences for economy and society, and considers whether population decline should be considered as part of a broader system of feedback linking micro and macro demographic processes to the economy and the environment. Space precludes any systematic treatment of past population declines (see Dumond 1975, Charbonneau et al, Galloway 1985, Tainter 1988, Brooks 1993, Kennedy et al 1993, Chu 1994, Hatcher 1996, Friedrichs 1997, Russell et al 1999, Dyson et al. 2002, Biraben 2004, Chavas et al. 2005, Diamond 2006), or the reasons for the low fertility or high mortality that underlie the prospect of decline. The importance of distinguishing between the process of population decline over time and the fact of having attained a smaller population is emphasised, keeping in mind that the transition from a growing to a stationary population has effects similar to the subsequent further progression to a decline in numbers (Reddaway 1939 p 229). Whether population decline itself should be regarded always as a problem is a controversial matter. It is concluded that it should not be.

Population decline - the current reality

Population decline can arise from low birth rates, high death rates, net emigration or any combination of these. In the modern world, low birth rates are the key. Seventy years ago the developed world adopted a two-child family norm. Today, its birth rates, with the exception of the United States, are below that norm and below the level required to maintain the population. In this situation , and in the absence of migration, almost all the developed world faces population decline in the short or medium term. And an increasing number of semi-developed and developing countries are likely to follow that example within a few decades. While natural increase remains positive in parts of North-West Europe, in some countries elsewhere, deaths now exceed births especially where chronic low birth rates have exhausted demographic momentum (Germany, Schwartz 1999, Birg 2002, and Japan). A number of these countries have now tipped into negative momentum, (Lutz et al 2003); all will eventually follow unless fertility returns replacement level. Positive natural increase can continue even with sub-replacement period fertility as long as a favourable age-structure inherited from times of higher fertility continues to supply positive demographic momentum. That can only propel growth for a few decades. Once momentum becomes negative as the age-structure stabilises in accord with the new schedules of birth and death, the deferred decline will begin and continue for some time even if fertility returns to replacement. The last generations completely to replace themselves in Western Europe were born in the 1950s – in the 1930s in the case of Germany (Sobotka 2008).

Countries with 'natural decline' in 2008 included Italy (-0.06 per thousand per year), Germany (-2.05 per thousand per year) and twelve countries in Eastern Europe and the Russian Federation, notably the Ukraine (-5.28 per thousand per year, Table 1). Further afield, Japan is now in this position and its total population is declining. In Hong Kong, Korea, Taiwan and Singapore, despite very low recent total fertility, demographic momentum will keep births well ahead of deaths for some time because fertility decline is more recent: in Taiwan, for example, until 2025. Immigration allied to comparatively high fertility amongst the native population is projected to generate considerable population growth, not decline, in most of NW Europe, including Ireland, Scandinavia, France and the UK, for the duration of current projections. In Italy and notably Spain, the official recognition of the large scale of illegal immigration has turned around recent projections of impending population decline. In

Eastern Europe immigration can mitigate decline (e.g. Hungary) while in others emigration exacerbates it (Bulgaria). Emigration can become institutionalised especially if there are few barriers to movement to attractive destinations. In Ireland emigration at a depopulating level became embedded in the culture in the 19th and the first half of the 20th centuries.(Kennedy 1993; Daly 2006). By 2000, the governments of most European emigration countries considered that emigration was too high and should be lowered (Haug, 2005). East of the Elbe, population decline is accelerated not only by emigration and by the very low fertility of ex-communist countries still in transitional turmoil, but also, in the unreformed former republics of the Soviet Union, by high levels of mortality (DaVanzo 2001; Vladov 2007). In 2008, deaths exceeded births in 14 countries in Europe, and in thirteen, total population was declining after taking migration into account (Table 1).

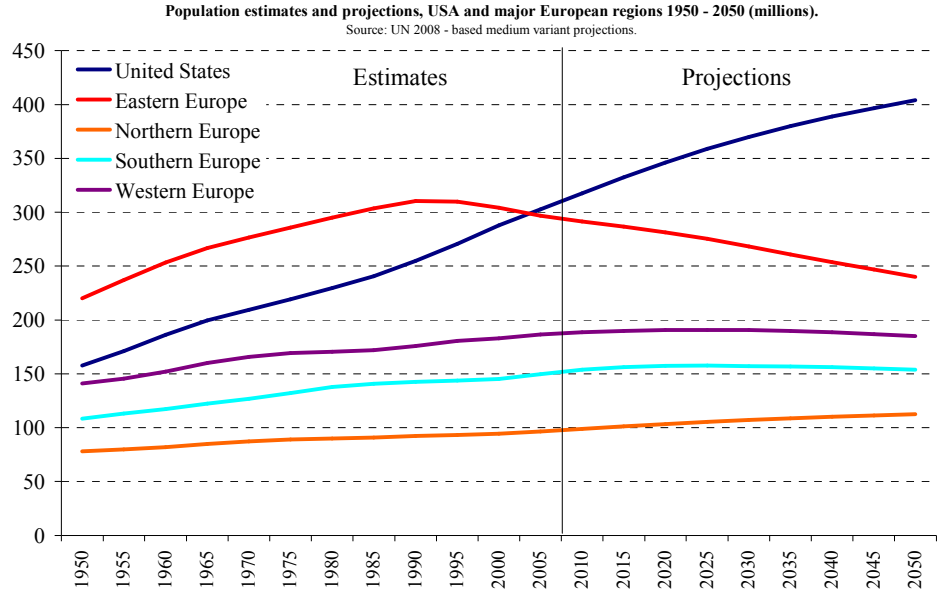
Table 1 Natural and total population change in Europe, 2008 (per 1000 population)

States with increasing population 2008 (first 14)				**States with declining population 2008 (all)**			
Natural increase descending order		Total increase descending order		Natural decline descending order		Total decline descending order	
10.51	Ireland	Ireland	14.59	-0.06	Italy	Croatia	-0.30
6.34	Albania	Switzerland	14.05	-0.27	Lithuania	Estonia	-0.39
4.55	France	Norway	13.10	-0.48	Estonia	Lithuania	-0.51
3.97	Norway	Kosovo	12.80	-0.82	Moldova	Russian F.	-0.74
3.51	UK	Spain	12.03	-1.45	Romania	Romania	-1.39
3.03	Netherlands	Slovenia	10.99	-1.89	Croatia	Hungary	-1.41
2.90	Spain	Czech Republic	8.32	-2.05	Germany	Moldova	-1.45
2.19	Belgium	Belgium	8.22	-2.55	Russian Fed.	Belarus	-1.84
2.00	Switzerland	Sweden	8.00	-2.68	Belarus	Germany	-2.04
1.97	Finland	Italy	7.28	-3.07	Hungary	Latvia	-4.23
1.94	Sweden	United Kingdom	7.21	-3.11	Latvia	Bulgaria	-4.41
1.94	Macedonia	Denmark	7.19	-4.29	Bulgaria	*Serbia*	*-4.57*
1.91	Denmark	France	5.75	-4.57	Serbia	Ukraine	-4.96
1.41	Czech Republic	Netherlands	4.95	-5.28	Ukraine		

Note: states below 1 million population excluded. Serbia - total change unknown.
Source: Eurostat Data in Focus 31/2009, Table 1.

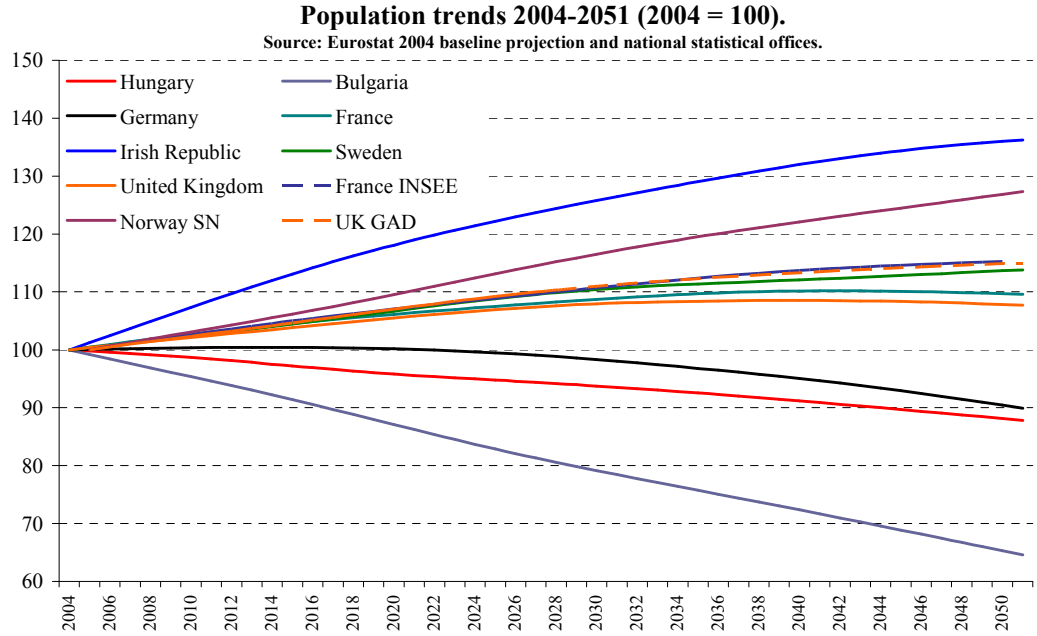
And it follows from the above that the exciting decline in Europe's population, current and projected, of which the media are so fond, arises mostly because of the lumping together of Eastern Europe (including the European former Soviet Union) with all the other regions of Europe (Figure 1).

Figure 1 Population projections, USA and major European regions, 1950 – 2050 (millions)



The most striking example of continued growth in the developed world is the United States. Having passed 300 million early in 2007, US population is expected to surpass 400 million by mid-century and to exceed its first, but possibly not its last, half-billion by the end of the century. Only Australia is in a similar league among developed countries. Taking all this together, the expectations for the future of the developed world are a picture of expanding diversity, not a collective descent into oblivion (Figure 2).

Figure 2 Population trends 2004 – 2051, selected European countries, 2004 set at 100.



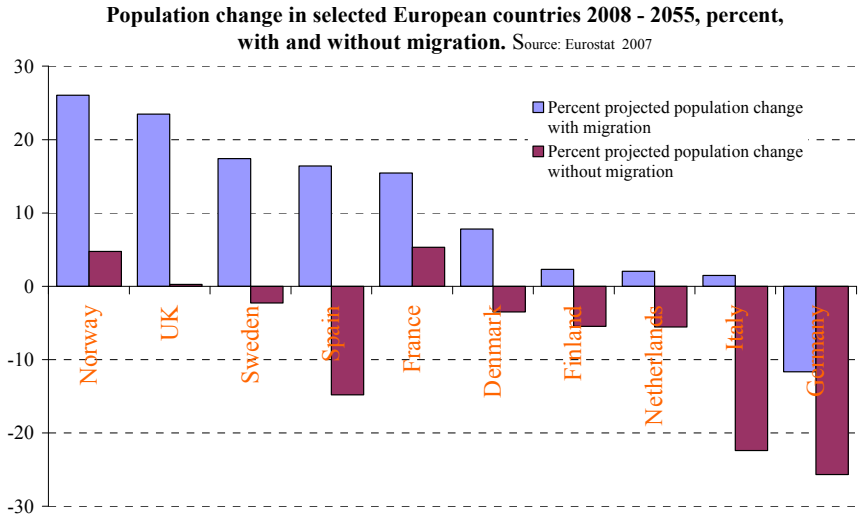
These are only projections, and projections are always wrong. What matters is how wrong. In developed societies with potentially near-perfect control over fertility, the future of the birth rate is in many ways less easy to predict than ever. We even lack a persuasive explanation as to why educated adults in modern societies should want children in the first place, given the

trouble and expense. However despite high levels of voluntary childlessness, according to the Euro-barometer survey of 2006 women in all European countries except Austria keep saying that they want at least two children (Testa and Grilli 2006). The position in developed societies – and increasingly, all societies - is complicated by the delay of childbearing since the 1970s. That deflates annual births and period indices of fertility. Postponement – or delay - (NiBhrolcháin and Toulemon 2002) can thus have an independent effect upon population decline. Continuation of current postponement until 2020 would account for 45% of projected decline, according to Lutz et al. Postponement also increases generation length and that, other things being equal, should slow down the rate of population decline because generations succeed each other more slowly. But that has only minor effects on population decline until the very long term (Goldstein et al 2003).

If births postponed are delivered later then period birth rates will recover. Mostly for this reason, birth rates have been rising for some years in several European countries, together with the US and Australia, even in countries with very low birth rates (Myrskylä *et al*, 2009). However few demographers believe that period fertility will return to replacement level (e.g. Lesthaeghe 1999, Frejka et al. 2004). Some consider low fertility to be an inevitable consequence of the attitude shift of the 'second demographic transition' which will spread to all countries (Lesthaeghe 2004) . And persistence of very low fertility over a long period may socialise new generations into very low expectations and desires for family size; a 'low fertility trap' (Lutz 2005), which can be reversed only with the greatest difficulty (Dalla Zuanna 2004, 2006). The medium variant UN long-term projections assume that all countries will eventually converge only to a TFR of 1.85 (UN, 2009). With constant mortality and no migration, such a fertility rate implies an eventual decline in population of around 0.35% p.a. However, although reasonable in the light of recent trends, there cannot be any firm scientific evidence for choosing that number (or with present knowledge, any other) as a final equilibrium figure. In fact fertility of all European countries has increased in recent years (Sobotka 2008) and in some, it is now close to replacement (France 2.02, UK 1.96 in 2008). The pessimistic views of most demographers may need to be revised.

Migration, which has the greater effect upon the prospects of growth or decline, is much more difficult to project. The data given in Table 1 give some indication of how current and projected future migration influences population growth. However, they take no account of the longer-term influence of migration on births and, eventually, deaths. In most developed countries, immigrants are on average more fertile than natives and more of them are of child-bearing age. Their entry increases both overall national fertility and the total number of births. But because some immigrants (many Europeans, also Chinese and in the UK East African Asians) have lower than average fertility, the overall effect on fertility, as opposed to births, is modest in countries such as Germany and France. The full importance of future migration in Western Europe can be gleaned from Figure 3, which strips out both the (more important) direct effect of projected migration on population size and its indirect effect on natural increase.

Figure 3 Population change in selected European countries 2000 – 2055, percent, with and without migration.



Population decline and population ageing – divergent sisters

The modern form of population decline is novel (Reher 2007). Past population declines were not accompanied by population ageing, being provoked by general increases in death-rates through famine, epidemic or war. Fertility was not limited by parity-specific family planning, or not greatly so (Zhao 2006) and so ageing from the bottom was modest or unusual. Ageing from the top through longer life expectancy was generally unknown. In high mortality populations, general improvements in survival make populations younger, not older.

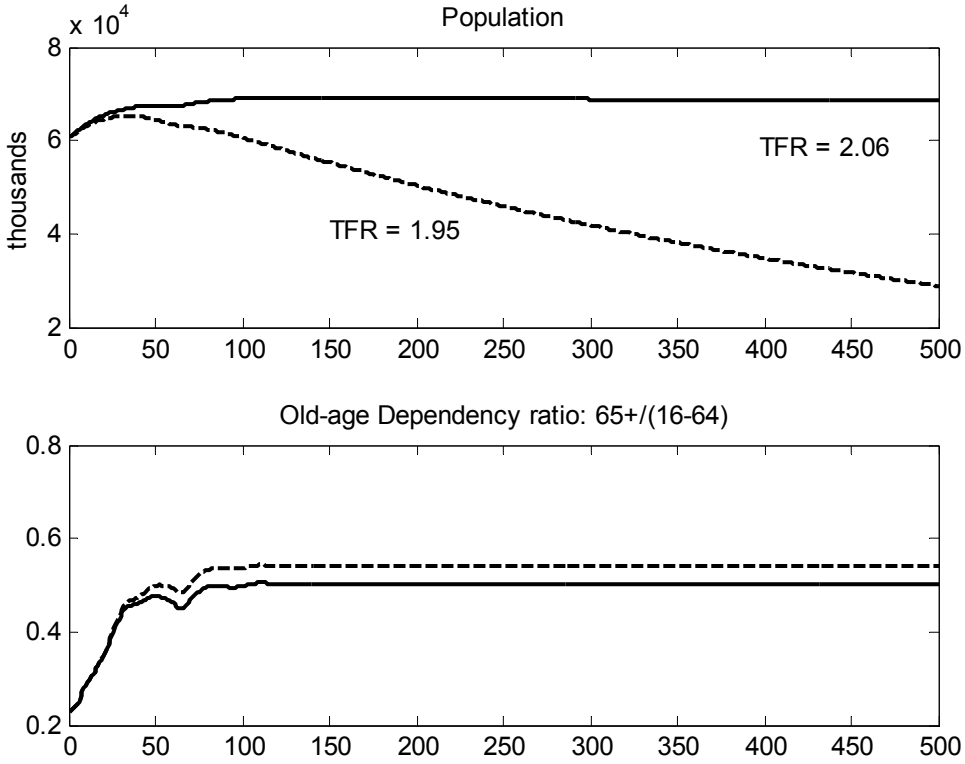
Population decline is often treated as a sub-text of population ageing, which has received the greater attention. Those processes can proceed in parallel, while in other respects they diverge. They share a common cause in low birth rates, but one does not lead to the other. Any reduction in birth rates promotes population ageing, even in the most youthful societies. Decline only follows (excepting the effects of migration) when the birth rate falls below the death rate. Migration (in the youthful pattern most usually experienced to developed countries) acts similarly upon both, tending to minimise population ageing and decline, and preventing decline altogether if it can equal or exceed the deficit of births. Mortality decline has opposite effects upon the two processes – tending to increase population, or at least to moderate decline, while (in modern societies) exacerbating population ageing.

Sub-replacement fertility, continued for many years in the absence of migration, has divergent effects upon age structure, and population size. The effect on age-structure (ignoring migration and mortality) is to make the population older for about two generations before it stabilises upon a new, unchanging and permanently older but stable age-distribution. Population size follows a different path. That continues downwards at an eventually constant rate. In the medium to long run the effects on age-structure are modest; on population size eventually highly significant, tending towards extinction.

Figure 4a shows some long-range projections for the UK. For simplicity they assume no migration. Age specific mortality rates up to 2081 are the same as those used in the Government Actuary's Department 2006-based Principal Projection; constant thereafter. Age-specific birth rates are distributed as in the GAD 2006-based projections but raised

uniformly to produce a replacement-level fertility of 2.06 and a marginally sub-replacement rate of 1.95 (which happens to be very close to the actual UK rate for 2008).

Figure 4a: Mortality rates constant after 2081

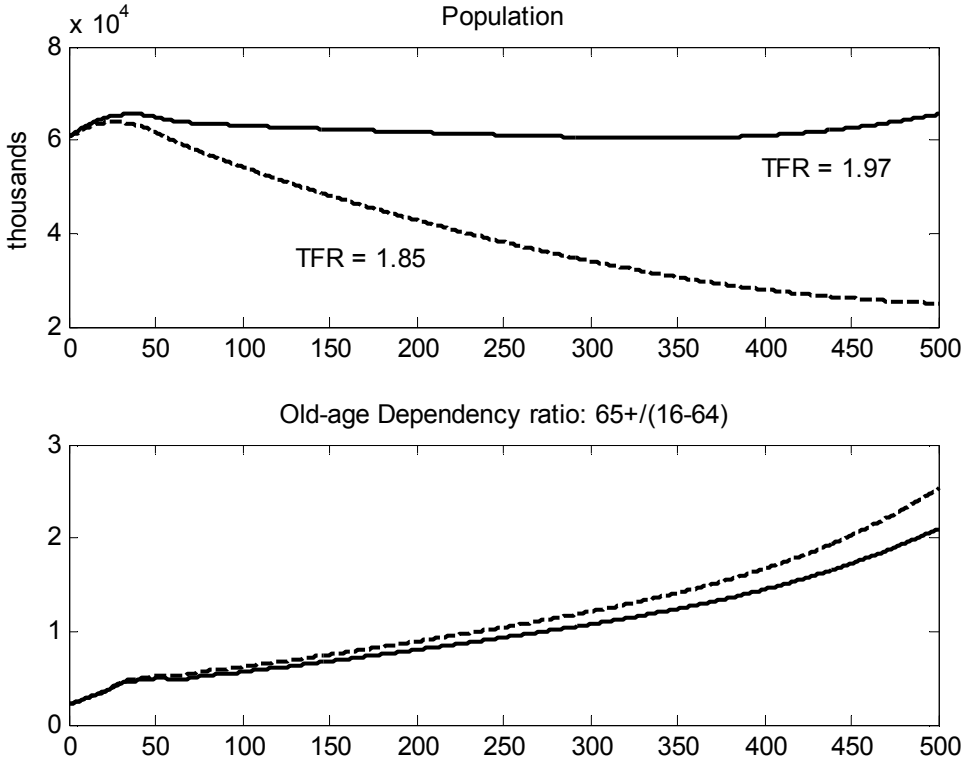


Note: The X-axis shows years elapsed since 2006. The y axis shows population in tens of millions (upper graph) and the old-age dependency ratio (number of persons of nominal pension age for every person of nominal working age –lower graph). The curves for a total fertility of 2.06 (replacement level) and for a sub replacement 1.95 (as in UK 2008) are shown together.

With both levels of fertility, the dependency ratio rises to about 0.5 after two generations and then remains constant. That arising from the higher fertility projection has the lower dependency, but the two do not diverge from each other. However, even the modest difference in fertility eventually generates a great divergence in population size, which quickly becomes apparent and in the long run becomes extreme, tending to extinction in the case of the lower fertility population.

Figure 4b repeats the same exercise assuming that mortality will continue to fall at 1.0% per year rather than remaining constant. As before, a modest reduction in fertility has a strong impact on population but a modest impact on age structure (Figure 4b).

Figure 4b: Mortality rates fall 1.0% p.a. after 2081



Can longer life moderate or stop population decline?
By projecting forward over several thousand years, we can appreciate the theoretical power of a longer life-span in moderating the population decline inherent in low birth rates, albeit at some extreme possibilities of maximum length of life. The following projections are based on a TFR of 1.84 (as GAD assumed in the 2006-based PP) with no migration. If mortality remains constant after 2081, population falls to 11.6 million after 500 years and carries on falling. But if mortality continues to decline at 1 per cent per year (the rates assumed by GAD at the end of their 2006- based projection period) and the projection is allowed to run for 4000 years, the effect is remarkable. With no limit to the span of life, population rises for a few years from 60 million at the beginning of the period, then falls away to 25m after 500 years and finally recovers to stabilise at 37m. A falling death rate, with no limit on the length of life, halts the population decline that would otherwise follow from the (constant) low birth rate. However if the length of life is limited, or with a slower decline in mortality, the collapse of population continues. Thus with a limit on lifespan of 140 years, population falls to 20 million after 500 years and falls away to zero thereafter. With a more modest reduction of mortality of just 0.2% a year after 2081, but without any limit on lifespan, population falls to 13 million after 500 years and carries on falling.

Thus, if longevity increases fast enough it has a big effect on population size and may eventually stabilise population provided the reduction in mortality is fast enough to offset the declining number of babies being born. In this case, however, people become extremely old – 1000 years and over becomes very common. This is in the realm of science fiction (Borges, 2004). If we take 150 years as our time horizon, then increased longevity does not have a major effect on population size. Without migration the population falls to between 44 and 48 million, assuming a uniform mortality reduction of between 0% and 1% a year respectively

after 2008. The corresponding figures for the old-age dependency ratio (65+/15-64 years) are 0.59 and 0.75 respectively. While increasing longevity over this period has a modest effect on population size, it has a substantial effect on the age structure.

The above observations can be summarised as follows. Over a period of centuries, small changes in fertility have a big effect on population size, but very little effect on the age structure. Over the very long term, cumulative reductions in mortality can have a big effect of on both population size and age structure. If mortality declines fast enough, population will stabilise despite a fertility rate that is below replacement. The number of children born in each generation will decline, but this will be offset by the growing number of people surviving to extreme old age.

Reasons for fearing population decline

Population decline has received less attention in contemporary debate by economists and others, compared with the problems of population ageing (McMorrow and Roeger 2004, Nyce 2005). But at official level and among business interests it is assumed to be axiomatically bad, despite much environmentalist concern about continued growth. Concern at government level is reflected by an increasing number of policies to stem the fall in numbers and the ageing of the population in a number of countries (Heleniak 2003, Chapple, 2004, Vladov, 2007; Jones et al. 2009).

When considering the objections to population decline, and its possible benefits, it is important to make a distinction between the prospect and process of decline, and the fact of having a small population, or a smaller one than hitherto. A distinction must also be made between absolute and relative decline. A decline in population may be a cause of particular concern if it exceeds that of political or economic rivals. Finally, the pace of decline matters. A given reduction in population will have different implications depending on whether it occurs gradually through the course of centuries or is compressed into a few decades.

Economic growth As labour (equivalent to population) is one of the key inputs to production is axiomatic that population growth increases total output (GDP) as long as additional workers can be usefully employed. Conversely, declining population implies slower output growth, unless it is accompanied by a compensating acceleration in productivity. In theory, growing populations permit increased economies of scale and division of labour, thus improving productivity. Confidence in an increase in numbers may underpin confidence among investors and inventors that their products and services will be launched onto a growing market that will sustain demand, and that a growing labour force can match demand with the required output. With population growth, certain manufactured products with high development costs come within the reach of growing capital markets.

Population decline, it is claimed, or even the end of population growth, pulls the rug from under these advantages and reverses them. It inevitably implies, but does not cause, a greater degree of population ageing with all its costs.. GDP declines *pro rata* with numbers of people, except for productivity increases. Economies of scale may diminish. The combination of shrinking markets and a diminished workforce could confront companies with an uncomfortable pincer movement on profitability – declining domestic demand accompanied sometime later, as the workforce contracts, by rising wage pressures from an increasingly scarce labour supply. Failure of new investment – discouraged by the prospect of declining markets – means that plant begins to age and is no longer competitive with that installed overseas, which benefit from incremental capacity addition that reduces the average age of

plant and boosts productivity. Domestic plant becomes unprofitable and the manufacturer supplies the home market from overseas. Domestic manufacturing capability gets hollowed out.

Similar considerations apply to public investment in infrastructure. A falling population base means that taxes need to rise to maintain existing infrastructure or to fund indivisible new projects. There comes a point where the State may have to abandon some of the infrastructure – amalgamating schools and hospitals and confining repairs to major buildings and main roads, or perhaps ceasing to maintain sea defences protecting marginal coastal land. Churches, ancient buildings and the like are allowed to decay. A contracting housing market, together with falling public investment infrastructure, reduces the demand for building materials and puts construction companies out of business. More generally, smaller communities become unviable, as has happened in Siberia, northern Russia, East Germany, rural Bulgaria and the more hostile regions of Spain and Italy, with the population clustering back into major centres like London and Madrid (Richard Cragg, pers comm.. 8 July 2009). As local populations decline, their numbers fall below various critical minimum thresholds for maintaining services. Rural population decline has troubled modernising economies for more than a century (Sutter and Tabah 1951, Saville, 1957). But it reflects a more productive agriculture and cheaper food, and liberates a workforce for urban industry and services. Not all grieve to leave the often impoverished countryside.

A declining population thus puts the spotlight on increasing standards of individual consumption to maintain the level of investment and confidence; vulnerability to slumps may be higher because there is not the prospect of rapid long-term demand growth to buoy up confidence. Products with high research and development costs can no longer be contemplated, at least not solely from the resources of the national economy. Ireland was a unique example of population decline from the 1840s to the 1950s, although only a nation-state from 1922. Official reports drew attention to high overhead costs in provision of services, the limitation of economic growth from the domestic market, the discouragement to risk-taking, the lack of optimism about prospects (p8). Excess space, freedom of movement, flexibility in land use, 'induces in the minds of many people an attitude of helplessness and hopelessness '(p17), and lack of pressure of increasing population failed to force the pace of development (Walsh 1974 pp 8, 16, 17).

Military security. Political and military power accrues more to larger countries (McNicoll 1999, Kennedy 1988). Decline *ipso facto* reduces the size of armed forces that can be raised. GDP, smaller than hitherto in absolute or relative terms, can no longer support the domestic production or development of expensive or advanced equipment. Such equipment must then be imported at a cost to the balance of payments or else foregone. The mechanisation of warfare and the advent of nuclear weapons have not eliminated the importance of the balance of numbers and of resources between rival powers at similar levels of development. The classic example is the failure of French population to grow in the 19th century, following its very early fertility transition. France began the 19th century as Europe's demographic, military and economic superpower. It ended it on a par with the United Kingdom and Germany, to which it lost two provinces in 1871. Near-defeat in the First World War reinforced fears of population decline (see Teitelbaum and Winter 1985). More recently, the downsizing of the power residing in the Kremlin has gone hand in hand with the loss of population, space and economy under its control. After the loss of its satellites in 1989 (total population with the Soviet Union 385 million) and the dispersal of the Soviet Union itself in 1991 (population 289 million) Russia will, other things being equal, face even further loss of capacity if the Russian

population declines as projected from 148 million in 1990 to 116 million by mid-century (UN 2009). Elsewhere, the relative decline projected for the 21st century of the Western powers, even including the US, compared with the population increases of third world countries, multiplied by their economic growth, promises a radical shift in the strategic balance.

Civil political power. Numbers also matter in the peaceful exercise of power: either directly because population determines participation in international bodies, or because of its connotations with economic power. Representation in the European Commission and the European Parliament is directly related to population, although with a favourable weighting for small countries. G8 membership depends on GDP, closely related to population within today's developed realm. Over a few decades relative rank-orders of population will change, with consequences for economic and political weight in the international order (McNicoll 1999), including shifting the rank-order of size in the EU. The relative and absolute numerical decline of Germany is the most salient example. The UN 2008 – based projections suggest that Germany's population will be eclipsed by that of the UK by 2050, with France not far behind – a development of considerable symbolic power, if nothing else. And smaller countries such as Bulgaria and Hungary fear damaging depopulation. More broadly, the relative and eventual absolute decline of the population of Europe invites an unfavourable strategic outlook compared with the continued rapid growth of the USA, diminishing Europe's importance to the USA as an ally in competition with other, growing global centres of power and wealth.

Finally a smaller and older country risks losing more than manpower; its creativity is allegedly at risk as well. Population decline is held not only to remove the guarantee of future customers to underwrite future investment, to diminish the size of markets, to reduce productive capacity as the workforce falls but also to reduce the stimulus and capacity for innovation. At the extreme, technical level in society in general is claimed to fall to a more extensive, less specialised level (Boserup 2003). For the enthusiast such as Simon (1981) population is the 'ultimate resource', fewer people implies fewer geniuses and therefore less innovation. In like vein, Alfred Sauvy famously complained of the need to preserve a younger, more productive population and to avoid a state where 'old men lived in old buildings thinking old ideas' (cited in Chesnais (ed.) 2001).

Is population decline really such a problem?

Population decline, therefore, is seen as bringing some disadvantages to any society. Much depends on whether the decline is fast or slow, and when and at what level it comes to an end. It is difficult clearly to separate clearly the effects of population decline, and the end-consequence of having a smaller population, so the two will be treated together in this section.

Rapid decline, in countries such as Bulgaria, has social and economically pathological causes exacerbated by the process of decline itself. There, the most crucial policy problem is to address the underlying causes of emigration and very low birth and survival rates. The population declines currently projected for other countries in Europe are more gentle, buffered by immigration and by improving survival and, recently, increasing birth-rates. Thus countries such as Belgium, Czech Republic, Denmark, Finland, and Portugal are projected by the UN (2008) to increase by about 5 percent from 2005 to mid-century. More substantial declines are projected for Germany (14%) and other countries as discussed earlier. In the case of Germany, that would take population size back to its level in 1955, in Poland to 1967, in Italy to 1977, although the populations will be much older. But this would remain true even if population had remained constant. The rapid rural decline and ageing in the 'demographic losers' of South Eastern Europe is a pathological acceleration of a process common to all

developed societies, which has been in progress for over a century as efficient agriculture occupies a much smaller proportion of the workforce, and which proceeds even in countries with growing total populations. In some of them, counter-urbanisation has partly reversed the trend, although not to the agricultural sector (Champion 1989, 2000).

So far we lack empirical evidence that modern population decline will have seriously depressing effect on innovation, investment and labour supply– the process is still some way off for some countries and has scarcely begun in others. Of major countries, Germany's total population has been falling since 1974 (Federal Republic) and then again from 2005 after a period of immigration –fuelled growth; East Germany has declined in numbers ever since 1949 until a small revival in 2001; and since 2002 all Germany has lost numbers. The two basic variants (out of 11) in the official projections of 2006 gloomily assume a stagnant total fertility of 1.4, leading to a decline to 68.7 million by 2050 with 100,000 net immigrants, or to 74.0 million assuming 200,000 immigrants (Statistisches Bundesamt 2006). Japan's population tipped over the edge in 2006. Official projections, assuming an even more gloomy future total fertility of a perpetual 1.26, see the population falling from 127.8 million in 2007 to 95.1 million in 2050, by which time natural decline would have reached 1.16% per year (Government of Japan 2009, tables1.4, 1.6). Population in all the major West European countries, including the UK, had almost ceased to grow from the 1970s until the 1980s, until the revival of immigration from the mid 1980s. At the time there was no reason to expect an increase in the populations of either country, indeed no reason to suppose that German population would not continue to decline, given its long-standing low birth rate.

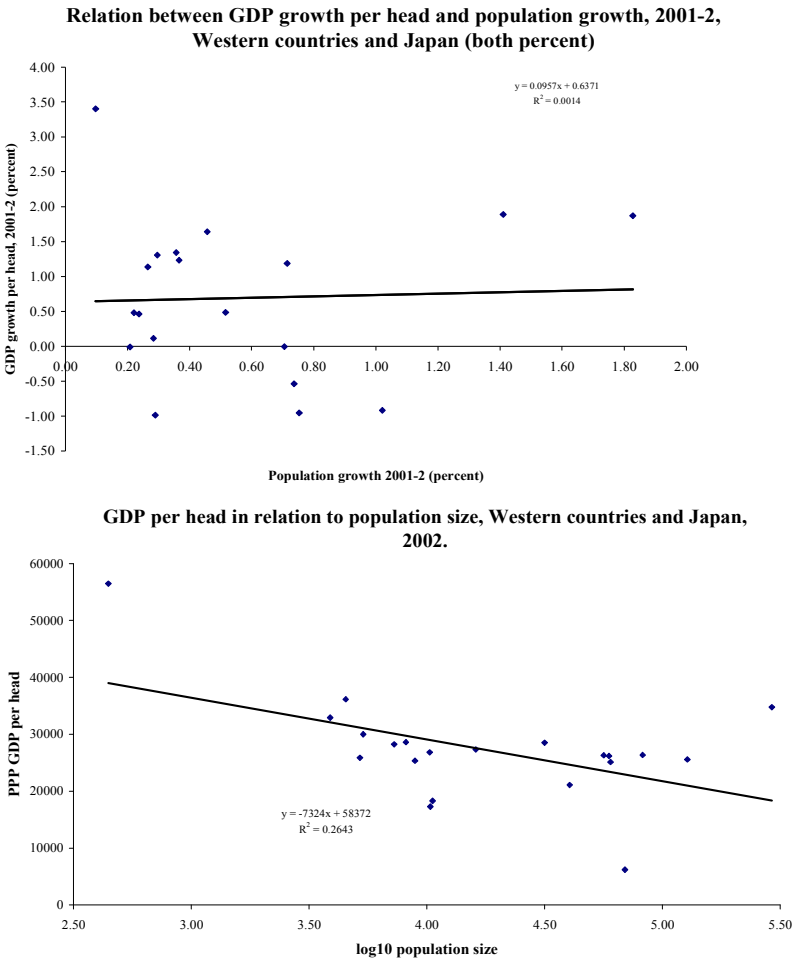
Despite this decline German GDP continued to grow substantially, by 26% over the period compared with 29.1% for 13 countries of Western Europe (UNE Economic Survey of Europe 1989-90 table A.1). No crisis of business confidence ensued, or was even discussed. However the mood in Japan is much more despondent (Chapple, 2004). All of the concerns presented above are very much to the fore, although most relate more to population ageing than to decline in numbers. The problems of ageing would persist even with a recovery in the birth rate (although at a less acute level).

On closer scrutiny, some of the arguments seem to lack less substance, or to be the reverse of what is feared. For example, current recession apart, the practical concern most often voiced is not unemployed resources and unemployment, as feared by Malthus and by Keynes (1936), but a shortage of labour hampering output, and inflationary wage pressures. Concern about GDP can only be justified if national power, defence and international influence are given a greater weight than individual welfare. Naturally, total GDP tends to expand with total population size, but this has no necessary bearing upon individual welfare. As Sauvy (1967, Ch.6) pointed out, the 'power optimum' that gives greatest comfort to strategists and to rulers may be quite different from (usually bigger than) the population size that optimises individual welfare. The interest of the poor might be quite other. Those who sell their labour do better by making themselves scarce, not numerous

In the Western developed world, population size and growth have no statistical association with GDP per head, a much more important measure which approximates to individual average income (Figure 5). (Barlow 1994, Kelley et al. 1995, Sheehey 1996, Barro and Sala-i-Martin 2003), In the industrial world, small countries are as rich as big ones (Figure 2a, b). Economic growth measured simply as GDP growth, as opposed to increase in GDP per head, has little or no bearing on individual welfare, as the UK House of Lords (2008) has emphasised in its recent report. A number of European countries have lost territory and (in

most cases) the corresponding population over the last century (the United Kingdom, Germany, Austria), without adverse consequences for the individual standard of living, as did other countries in earlier times (Denmark, Sweden). GDP per head in Ireland was increasing in the first half of the 20th century even though population continued to fall until the 1950s. For the most part, the universal loss of colonies has probably been a beneficial relief. And while a large domestic market is obviously an advantage, as the US example clearly shows, equivalent advantage may also arise from the adoption of free trade. This was the idea behind the European single market. The same principle may in theory apply in military and political affairs, where countries that are too small to have much influence on their own can increase their leverage by forming alliances. However, as the EU illustrates, alliances can be fraught with problems and are rarely able to mobilize their combined diplomatic or military resources as effectively as a large centralized state.

Figure 5 Relationship between population size and growth, and GDP per head and growth in GDP per head, 2001-2002, Western Countries and Japan.



The experience in the European Union and in some disputes between peaceful states suggest that small countries within a civilised international order can have influence out of proportion to their size, such as the Irish Republic and Iceland (Krebs and Levy 2001, Weiner and Teitelbaum, 2001, Ch. 3). Their impotence makes them convenient as neutrals. Some smaller states, whether armed to the teeth with mountains and guns as Switzerland, or devoid of both as Luxemburg, earn part of their living as uncontroversial hosts to international bodies. Small

nations, all with the same vote as the biggest, also thereby disproportionately influential in the UN General Assembly and are over-represented among EU institutions compared with their populations. For the most part, it would be vain for countries locked into modern low-fertility demographic regimes to seek to change their position radically in the international league table of population size. And to try to do so through mass immigration would risk a serious breakdown of cohesion and a confusion of policy.

As regards economies of scale in manufacture at national level, the significance of this factor depends on the extent to which overseas markets can compensate for the diminution of domestic ones. The process of globalisation, given a political commitment to free trade, makes national-level population decline less important because it increases the proportion of outputs that are exported and of inputs that are imported. In countries that rely heavily on international financial services, such as the UK, population size becomes particularly unimportant as most of the consumption is not domestic. In a highly globalised world economy, finance-house city states without the burden of old post-industrial populations do well, for example, Singapore and Hong Kong. Smaller economies, however, may be at a disadvantage because they lack the resources to invest in new highly competitive products requiring expensive research and development. But that can also apply to very large countries – there may only room in the world for two major manufactures of civil aircraft, and two or three of aero-engines, and a diminishing number of volume car manufacturers, for example.

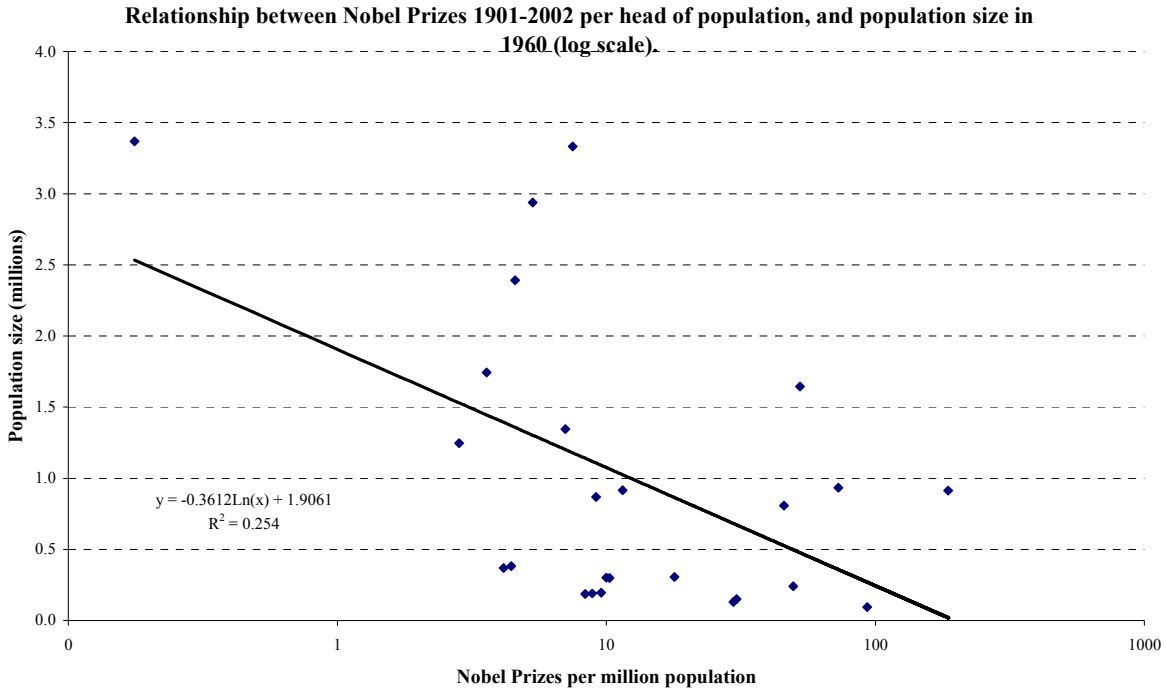
As regards demand, some earlier worries have lost impact. Consumer demand for ever-cheaper goods appears to be insatiable – it is difficult to imagine it flagging in the way that Keynes (1937) and Reddaway (1939) – and before them Malthus - had feared. Reddaway's concerns were primarily directed to the economy of a manufacturing nation, not one where services predominated, and seem to have been wrong even then. Shrinking demand is less a risk now. Superior macro and micro-economic policies have developed in the post-war years, with floating, not fixed exchange rates, more open international trade, judicious management of inflation and (in most countries) a less regulated labour market and price mechanism. Consumer demand in particular has been fuelled by the accelerating inventiveness of (ever-cheaper) consumer products promoted by advertising in ways unheard of in earlier times. The recent economic failure provoked by high consumption fuelled by excessive unsecured debt had nothing to do with population decline.

It has been suggested that a decline in numbers, or small size, triggers a lack of critical mass for specialist activities - economic, intellectual /academic, support for research and development, which is damaging to innovation and which drives specialists abroad. For example, one prominent scientist has complained that Austria is too small to for intellectual sustainability, and that without large population, innovation requires internationalisation, or the abolition of national frontiers or even nation states in order to participate membership of a larger population, as the European Union offers. But except for damaging restrictions in hot or cold wars, scholarship has always been mobile and international, since the middle ages and earlier.

The related notion advanced by Simon (1981), that population size and growth is essential because it produces more geniuses, to the general good, seems *a priori* absurd. The briefest refection about the intellectual output of 5th century Greece, and of renaissance Florence, with the stagnation that followed, or the relative intellectual barren-ness of much larger populations then and today, allow us to dismiss it. We may look for some simple evidence from the distribution of Nobel Prizes in relation to population size. Figure 6 shows that there

is no significant difference association between population size and the number of Nobel Prizes awarded per million population. If anything, the smaller populations do better – first in rank is Iceland, the first eight (mostly Nordic) all have populations under 10 million except for the United Kingdom.

Figure 6 **Distribution of Nobel prizes per head of population, in relation to population size.**



Sources: The Nobel Foundation; population data from the United Nations.
Note: 25 countries included, most of which were economically developed by 1900; mostly European plus United States and Japan. All other countries had negligible or zero Nobel Prizes.

The need for a younger, more productive, more innovative population is a prominent argument (Skirbekk 2005, Lindh 2005), given extra edge by the rapid growth of new service industries requiring new skills, especially IT, to which older people are allegedly refractory. This proposition is only unequivocally justified in the case of heavy manual work which is a small and diminishing component of modern economies and labour forces. For other areas of work, this concern for the most part lacks empirical support.

Deflation of housing demand is often cited as an economic threat arising from falling population. Downturns in house-building are often regarded as a herald of decline in the economy as a whole, depressing demand for other products and leading to layoffs among building workers (although that could be mitigated if a large number are immigrants). Falling house-prices would also erode the asset value for the aged population, on which many in property-owning countries will be relying for their pensions through equity release. Would population decline therefore trigger a perpetual slump? In fact, large and damaging fluctuations in house prices and demand have so far had little to do with demographic change, at least in the UK. Their recent instability has been provoked by the growth of highly-geared mortgages and by the use of property as an inflationary hedge in which a huge proportion of private asset value - £3 trillion in the UK, twice GDP - has been hidden in unproductive fashion.

Furthermore, in most countries household growth is far ahead of population growth and will continue long after the latter ends, being driven by independent trends in living arrangements which have substantially reduced household size and increased headship rates over the last century: divorce, longer survival, a more independent youth. That trend towards smaller household size, however, has already slowed in the US and UK. Costs per head are greater for the single-person household. The gap between male and female expectations of life has narrowed and young people in many countries have tended to remain at home with their parents, or returned after the failure of jobs or marriages**.**

In some countries, notably the UK, house prices are very high, and volatile, in relation to earnings, with an excessive land element in the price (40% or more). Some claim that this is driven by planning constraints on land (Evans 2004, pp 18-19) although others regard land price as a residual. Those constraints, in turn, follow in part from the pressures on land in a densely-populated island, especially one long addicted to houses rather than to flats. The Japan's high population density has driven ratios of house prices to individual earnings to double those of the UK (Balassa and Noland 1988), although speculation and urban agricultural land subsidies are among other powerful factors. In the UK there has been an irrational tendency to run two inflation systems (national inflation bad, house-price inflation good) leading to inflationary bouts of equity withdrawal. Deflating that bubble, even if painful for a while to the building industry, would eventually benefit national economies. Population stabilisation, and decline, would provide one of the pins once household growth had run its course. Storing up treasure in bricks and mortar is as productive as hoarding gold under the bed. And as house-building in many countries is among the most technically backward of all enterprises, with the lowest productivity, it is regrettable that so much economic stimulus should apparently depend upon it and therefore, in part, on continued population growth that cannot in the end be sustained.

The Other Side of the Argument: the Merits of population stabilization and decline

Some advantages emerge from population decline. And small population size can be a positive advantage to individual welfare.

On the economy as a whole, the end of population growth was seen long ago by the Royal Commission on Population (1949) as a relief from the balance of payments problems that have plagued some industrial countries (notably the UK) for most of the 20th century, as earlier competitive advantage in manufacturing was lost. Certain kinds of imports – of some food, fuel and some raw materials, in Japan all fuel and most raw materials - are unavoidable. With fixed land area there are limits to sustainable food output; so with fewer people self-sufficiency is more in prospect and with it some relief from balance of payment costs. With food cheap on the international market, and wartime threats long forgotten, concern about food security has waned. But this concern is re-emerging as the era of abundant global food surpluses appears to be drawing to an end (Roberts 2008), a crisis hastened by global climate change and global population increase.

As population diminishes and the stock of capital goods does not, the ratio of capital to population improves and average person should be wealthier. Resources can also be directed to improve standards, not to make wider provision for a growing population. However the capital stock needs eventually to be renewed, perhaps at a faster rate than when Reddaway (1939) made this point. Moreover, the annual cost of maintaining the complete transport

network and other infrastructure may be unchanged, so that with a smaller population the cost per head may be greater unless some parts can be closed down. Once these factors are taken into account, it is less obvious that, over the longer run, a smaller population benefits from inheriting a capital stock designed for its more numerous ancestors.

The scarcity of labour in a declining population will cause inconvenience to employers. But there are two important compensations. The first is that employers will be obliged to review the efficiency of their operations and introduce equipment and techniques to increase productivity, substituting capital for labour and creating demand for higher technology products in a more 'knowledge-based 'economy. Another important compensation is that much greater efforts will have to be made to mobilise the unemployed underclass into the workforce. With abundant labour, immigrant or otherwise, this part of the population; often under-educated and otherwise unattractive to employers, can be ignored, remaining in its marginalised and often criminalized status. Mobilising this population would improve their social standing and income, cut crime and reduce material inequality. But if generations have now been socialised without work; new investment in training will need to be substantial, and welfare arrangements more discriminating and radical.

Costs of congestion and crowding (both economic and non-economic) should decline with smaller population. Traffic speeds might increase and journey to work times might fall. However, a lower density could increase some journey times (because average distances would be greater) and reduce interaction. Furthermore, below certain density levels, investment in the maintenance of roads and other infrastructure would be uneconomic, provoking further decline or requiring expensive subsidy. Overall reduction in density, however, could have the paradoxical effect of making population more geographically concentrated, as some areas became effectively depopulated.

With fewer people, fewer resources need to be devoted to housing and its associated infrastructure of roads water and other services once household formation had also ceased to grow. Housing, much criticised recently in the UK for its cramped plots enforced by land scarcity and planning restrictions, could be built at a somewhat lower density, with gardens free from the threat, or the temptation, of infill. Old unsatisfactory housing, especially in peripheral social housing estates requiring, at least in the UK requiring apparently perpetual refurbishment, would be demolished and returned to open land. Costs of housing and of land can be expected to peak and then to fall with a stable and eventually declining population. That might encourage family formation, to be discussed later.

The pace of decline

The transition to a smaller population can occur quickly or slowly. Slow decline is preferable because it less disruptive and is accompanied by less ageing of the population. Some of the economic arguments against population decline relate to shrinking markets and their supposedly depressing effect on innovation and investment. The validity of these arguments depends on the time horizon for the product in question and the pace of population decline. For products with a short life-cycle, say 5 years, there is little difference between a market which is expanding at 0.5% a year and on that is shrinking at this rate. After 5 years, the expanding market is 5% larger than the shrinking market. Such a difference would not have much effect on the incentive to innovate or invest. However, over a 50 year period, which is the horizon that applies to housing and many infrastructural projects, the divergence been the fast and slow growing markets is substantial. After 50 years, the expanding market will be 64% larger than the shrinking market. Such a difference is highly significant from an

environmental point of view. Small differences, that may be hardly apparent when they are occurring, may have massive long-term effects.

Environmental aspects of decline
The environmental consequences of lower population density could be considerable, and mostly good. Most encroachment on countryside would cease (not all, as population would always re-distribute). With a relaxation of pressures, marginal land would to wilderness, as it did in previous eras of population decline (e.g 6^{th} century and late 14^{th} century Europe). Building on flood plains would cease. Expensive sea defences protecting low-lying coastal land no longer needed for agriculture could be abandoned, enabling land to be reclaimed by sea and saltmarsh. Not all aspects of nature and wildlife conservation would benefit. In much of Western Europe, especially the UK, most 'nature' is man-made. The climatic climax vegetation over most of Europe is forest, to which untended land would revert within a century after an unaesthetic interval of scrub. That final forest stage supports less wildlife diversity than more open land, although potentially more species.

Ceteris paribus, emissions and pollution of all kinds would fall, roughly *pro rata* with population size (Smith 2008), with benefits for human health (Costello et al. 2009) and animal and plant populations. Households are a most important source of emissions and of consumption of energy. In the UK, for example, in 2007 the domestic sector consumed 28% of all energy generated and was responsible for 26% of UK CO_2 emissions; the single most important source except for transport (DEEC 2009, DEFRA 2009). Energy consumption in the sector grew 20% from 1970 to 2007, mostly due to growth in the number of households. Smaller household size also increases consumption per head. Over one third of the growth in households projected for the UK arises from renewed population growth. That also contributes to higher energy consumption through increased transport use. Population growth will prevent the UK from meeting its self-imposed target to reduce emissions by 20% from 1990 levels by 2010 (higher than the Kyoto agreement of 12.5%, Environmental Change Institute 2007), even if nothing else does. This problem is shared with European countries with similar projected growth.

The environmental effects of the more substantial population growth in the US, Canada and Australia are correspondingly more potent. The US, with 5% of the world's population, consumes one fifth of its energy and generates one fifth of its emissions), with oil use projected to increase by 43% by 2025 **(**Markham and Steinzor 2006). US population is officially projected to grow by 40% by 2050 (US Bureau of the Census 2004). A reduction in US population in hardly on the cards at the moment, any more than it is in the UK. But the environmental benefits of an eventual reduction in growth are obvious, and may in the long run force such a reduction.

Climate change, however, is the ultimate globalised consequence of industrialisation. Even for the biggest countries, most climate change is imported. Reductions in emissions from one country alone, whether from the management of emissions or fewer people, would have little effect. Reductions in projected growth in OECD countries alone would probably not make sufficient difference globally (except possibly for emissions from the US). World-wide energy-related gas emissions are growing annually at the same rate as population (1.4%); GDP per head is growing at 1.9%, exactly counteracted by reductions in global carbon and energy intensity (Stern 2006 t 7.2). As regards the consumption of hardwood forest products, the protection of whale and other marine species, the moderation of environmental damage in the fragile Arctic and subarctic, and the survival of large mammals used for traditional

medicine, the projected diminution of Japanese and Russian and eventually Chinese populations must be accounted a blessing.

The inevitable end of growth

The final argument is that population growth, and economic growth measured as GDP, must come to an end. However premature the forecasts of exhaustion of resources may have been and may continue to be, eventually those vultures will come home to roost. Evidence for unavoidable shortage of fresh water in many parts of the world, even more than projections of food shortage, is looking more convincing. Population growth and economic growth in combination are bringing about their own limitation, if forecasts of the climate change that they provoke have any validity. The demographic consequences of climate change are even more difficult to project than climate change itself; uncertainty piled uncertainty. Areas in the higher latitudes of the Northern hemisphere are expected to become more benign, able to support more population than at present. Others may be little affected; the UK and New Zealand, for example, but the expectations for many other areas, especially those with high population growth in fragile arid lands in the tropics, are severe (e.g. Boko et al, 2007). Expectation of the serious consequences of climate change have now crept within the range of conventional population projections, although for the most part not incorporated into them. If some of the populations of the world do not reverse their growth, then negative feedback from their and our previous activities may force them to do so, in disagreeable ways. But prognoses must be cautious. Before climate change was on the horizon, ambitious world models attempted to quantify the negative environmental consequences on population growth, through pollution and food and resource depletion (Meadows et al 1972, 1992). Some scenarios projected sharp future declines of population. Through the excessive simplicity and magnitude of the negative feedbacks envisaged in the models, they fell flat on their face and were much derided. Those cries of 'wolf' have devalued later warnings based on better evidence.

Quite independently of that, a high proportion of the world's population has already turned (neo)Malthusian, deciding that its own private population – its family size – has no further need of increase and indeed would be better smaller. Many poor countries now have low birth rates; some already below the level required for long-term replacement (China, Iran, Thailand), with others close to it (Brazil, Sri Lanka, Vietnam, some Southern states of India). A conclave of demographers summoned by the UN could see no convincing reason why this nearly universal decline should conveniently stop at the replacement fertility level of just over 2 children, rather than falling below it as in the developed world (UN Population Division 2002). That is why the UN population projections have since 2002 included a low variant indicating population decline before 2050, and why demographers at IIASA believe that global decline by 2070 is an odds-on favourite (Lutz and Sanderson 2001).

Pressure groups, public opinion and politics

Environmental pressure groups and writers welcome the prospect of population decline and stabilisation at a much lower population size than at present, both in the developed and in the developing world, irrespective, it would seem of the cost in population ageing (Myers 1998). Researchers and activists (e.g. the Optimum Population Trust) concerned with issues of sustainable population and 'optimum' population size characteristically argue for an ideal population size for countries such as the United Kingdom which is about a third or less of the existing total (20 million rather than the present 61 million). Australian environmentalists (e.g. O'Connor and Lines 2008), arguing on a similar basis from considerations of 'environmental footprint' argue for an Australian population of ten million rather than the present twenty. Negative Population Growth, a US pressure group, cited 'scientific opinion' in favour of an optimum US population defined on

environmental grounds of 150 –200 million, a total surpassed 50 years ago (http://www.npg.org/faq.html#anchor4).

The ambitious nature of these goals can be appreciated by considering what would be required to reduce the UK population from the present figure of 61 million to 20 million. Table 2 shows how long it would take to achieve this goal under various assumptions about fertility. The most extreme scenario is based on a total fertility rate of 0.8. This could be the result of a rigidly enforced one child policy and the failure of some women to bear children. In the absence of migration, and making a conservative allowance for future mortality trends, this draconian policy would bring the population down to 20 million in just 82 years. Such a fast pace might be desirable from an environmental point of view - CO_2 emissions and the like- but it would have a huge social cost. Around 16% of the UK population are currently over 64 years of age and the old-age dependency ratio is 0.24. Under the scenario we are considering, the share of people over 64 would rise to 60% by 2081 and the dependency ratio

Table 2 . Demographic implications of reducing the UK Population to 20 million (starting from 60.6 million in 2006)

		Age Structure in 2081	
TFR	**Years to reach 20 million**	**% 65+**	**Dependency ratio 65+/(15-64)**
0.8	82	60.0	1.65
0.9	87	56.2	1.43
1.0	92	52.7	1.26
1.1	99	49.4	1.12
1.2	107	46.4	1.01
1.3	118	43.6	0.91
1.4	133	42.0	0.83
1.5	154	38.6	0.76
1.6	184	36.3	0.70
1.7	232	34.2	0.65
1.8	325	32.3	0.60
1.9	545	30.5	0.56
2.0	1899	28.8	0.53

This table is based on the GAD 2006 projections. Assumptions: no migration; mortality rates as GAD principal projection up to 2081 and thereafter 0.2% p.a. reductions in all age-specific mortality rates and a maximum age of 140 years; age-specific birth rates constant after 2081 and all birth rates raised or lowered uniformly to obtain the desired TFR.
Note: In 2006, 16% of the UK population were 65+ and the dependency ratio was 0.24.

would be 1.64. It would be a society with virtually no children and a multitude of pensioners to be supported by a rapidly shrinking working-age population. Increasing the pension age would help, but not by much. The ageing problem would be less severe with a more liberal policy, but the time required to achieve the target number could be much longer. For example, the environmentalist Jonathan Porritt (2009) has suggested that no family should have more than two children. Allowing for the fact that many women would have less than the maximum limit, such a policy would imply a TFR of around 1.5[1]. To achieve the target population would then take 154 years. If speed were no objective, a TFR of 1.9, which is around the present rate, would do the job nicely. It would take 545 years to get the population down to 20 million, and by 2081 the dependency ratio by would rise to a "mere" 0.55. Ageing would still be a problem, but that is inevitable given the present unbalanced age structure in the UK and expected changes in mortality. The authors of this paper do not, however, see any easy road to the definition of an 'optimum population' size for modern human populations, despite various attempts over the years (e.g. Taylor 1970). It is much easier, however, to point to the lack of any advantage in further increase in numbers, and possible benefits from fewer.

The desire for an end to growth, or for a reduction in numbers, is not confined to modern pressure groups (e.g. Robinson 2003). While the slogan in the epigraph to this paper has probably been the dominant sentiment, at least among the owners of populations, disquiet about number is a recurrent minor theme from the earliest times. In the Epic of Gilgamesh, the gods complain of the pressure of people on the Earth, and their distressing noise rising to heaven. Mediaeval Christian thinkers considered whether the world had not become full, and whether the command to 'increase and multiply' had by then been sufficiently obeyed (Biller 2000, Ch.5). The European population peak of 1300, with its land shortage, from which numbers declined substantially before the plague of 1348, must have focussed attention on overpopulation. Out of the horrors of the mass mortality emerged a 'golden age of the peasant', according to some economic historians (Postan, 1972; Hatcher, 1996). Labour shortage, it is claimed, drove up wages, weakened the ability of magnates to enforce feudal duties, provoked labour saving technical innovations in milling and other productive activity. Four decades of argument by economic historians has not, however, created a consensus on the matter.

More recently, the UK Royal Commission of 1949, and the Population Panel of 1973, saw advantages in the end of population growth. The UK Parliamentary Select Committee on Science and technology warned in strong terms about the consequences of the rapid population growth at the time of the baby boom (Select Committee 1971). An authoritative demographic review for the Council of Europe in 1976 came to interestingly nuanced conclusions on the drawbacks and advantages of growing, stationary and declining populations (Wunsch 1976), reporting that '…accordingly, a stationary or declining population might, in the judgement of governments, be an acceptable population policy target for Council of Europe member states' (Guilmot, 1976, p. 30). For much of the 20th century the Netherlands considered itself over-populated and sought, as did the United Kingdom up to the end of the 1950s, to encourage emigration to ease domestic population pressure (and in the case of the UK) to strengthen imperial links. More recent official Dutch pronouncements

[1] This figure assumes that 70% of women have 2 children, 10% have 1 child and the rest have no children.

have still alluded to the desirability of a lower population but no policy measures remain in operation. Some authoritative German opinion has also expressed little concern about the prospect of a lower population size (Höhn 1991), noting the high population density in Germany, while emphasising the problems of population ageing. Even in the US, the Report of a Congressional Committee (Rockerfeller 1972) saw clear advantages in an end to growth , recommending that 'appreciating the advantages of moving now toward the stabilization of population, the Commission recommends that the nation welcome and plan for a stabilized population'. These concerns, however, have been eclipsed by the apparently unstoppable official American enthusiasm for immigration, which together with higher fertility will guarantee substantial further increase in numbers.

Conclusions

Sub-replacement fertility in a growing number of populations has focused attention on the new prospect of population decline. That is already underway in a number of countries: in Germany, on the Eastern edges of Europe, and further afield in Japan. Some think it will become universal. But it is important to remember that in other Western countries, the medium term issue is *growth* in numbers, not decline (UK, Sweden, Netherlands and France*) as well as* ageing.

Population decline and population ageing in modern societies share a common cause in low fertility. But one does not cause the other. Much more attention has been given to ageing than to decline, unlike the position in the 1930s (Glass 1936; Charles 1938). The process and effects of decline are distinctive; the latter assumed to be so obviously negative as not to require discussion. The dynamics and the effects of ageing and decline are divergent. Slightly sub-replacement fertility, ceteris paribus, ages the population until a new stable age-structure is reached after two generations. Decline, although slow, would continue indefinitely and in the long run be very substantial. In modern societies, reductions in death-rates exacerbate population ageing but moderate decline and on extreme assumptions can even reverse it.

There is an important distinction between the process of population decline and the consequence of getting to a smaller, stable level (assuming that declines halt). Decline itself inevitably brings problems, not least its necessary association with higher levels of population ageing, although low levels of decline would hardly be perceptible to contemporary observers. However, a smaller stable population, once achieved, could have advantages, some of which overlap with the effects of the process of decline but free of its drawbacks.

The question arises whether smaller population size might of itself arrest further decline and permit the resumption of growth. That raises the question of the existence of feedback relations, between population and family building and other small-scale processes. Such notions have been marginalised in modern population thinking. As Lee (1987, p.443) noted: 'the concept of population equilibrium or homeostasis, maintained by density-dependent checks, plays so small a role in human demography'. But homoeostatic macro/micro mechanisms are well documented in earlier centuries between population and family size and formation (e.g. Wrigley and Schofield 1981, Lee 1985) and indeed if Malthus (1802) was right, at all previous periods. Lee (1987, p 459) goes on to conclude that 'ordinary homeostatic tendencies …. were probably all but gone from much of Europe by the end of the 19th.century….National production came to depend very little on land, mortality became largely independent of income, and fertility came to respond perversely to growing productivity of labor. At the same time, the potential sensitivity of fertility to economic change has doubtless increased greatly, raising at least the possibility of overcompensating

dynamic behavior, driven not by density but by age distribution fluctuations and appearing as Easterlin cycles'.

The possibility of negative feedback in modern societies may have been underestimated. Some have suggested that Western – and other – populations have 'overshot' their sustainable limits because of the inevitable lags, protracted by culture and tradition, between the beginning of negative effects upon family welfare of larger surviving family size, and larger consequent population size, and the appropriate responses of individuals to it (Ehrlich and Kim 2005). The momentum of age-structure bulges exacerbates such delayed response. Replacement fertility was reached in Western Europe by the 1930s but population has since increased 20% - 80% since, mostly thanks to 'demographic momentum'.

Density-dependent responses may still be discernible in modern human populations, at national and sub-national level.. A recent study of 187 countries showed negative relationship between population density and fertility, independent of the effects of urbanisation, female literacy, GDP per head and other important influences (Lutz et al 2002, 2005, Costello, in press)

Defining optimum population for modern societies is difficult if not impossible. While it is clear that the process of decline has numerous drawbacks, these are only important if the decline is fast and protracted. Smaller population size, however, has social, economic and environmental advantages. And it may be forced on us, as a requirement for our survival, if the ultimate feedbacks from our growth arising from climate change come to pass (Dyson 2005).

Bibliography

Balassa, Bela and Marcus Noland (1988). Japan in the World Economy. Washington DC, Institute for International Economics.

Balzer, Harley (2005) The implications of demographic change for Russian politics and security.Weatherhead Center for International Affairs Conference, Harvard University, Health and Demography in the States of the Former Soviet Union. April 29-30 2005. pp 38.

Barlow, Robin (1994), "Population Growth and Economic Growth: Some More Correlations." *Population and Development Review*, 20, No.1, pp. 153-165.

Barro, Robert J. and Xavier Sala-i-Martin (2003), *Economic Growth*, Cambridge Mass., MIT Press.

Biller, P. (2000) The Measure of Multitude: Population in Mediaeval Thought. Oxford, Oxford University Press.

Biraben, J.-N. (1979). Essai sur l'evolution du nombre des hommes. Population, 34(1), 13 - 26.

Biraben, J.-N. (2004). L'histoire du peuplement humain des origines à nos jours. Démographie: anayse et synthèse. V. Histoire du Peuplement et Prévisions. G. Caselli, J. Vallin and G. Wunsch. Paris, Institut National d'Etudes Démographiques**:** 9 - 31.

Birg, H. (2002). "Demographic Ageing and Population Decline in Twenty-First-Century - Germany: Consequences for the Systems of Social Insurance." Population Bulletin of the United Nations, 44/45, Policy Responses to Population Decline and Ageing: 103-134.

Boardman, B. (2005). The 40% House. Oxford, Environmental Change Institute.

Boko, M., I. Niang, et al. (2007). Africa. Intergovernmental Panel on Climate Change (IPCC) Working Group II Climate Change Impacts, Adaptation and Vulerability. Working Group II contribution to the IPCC Fourth Assessment Report. . Intergovernmental Panel on Climate Change (IPCC), World Meteorological Association / United Nations Environment Programme (WMO/UNEP)**:** 36.

Borges, J. L. (2004) ."The Immortal" in *The Aleph and Other Stories*, London, Allen Lane, Penguin Books

Boserup, Ester (2003 and earlier editions) The Conditions of Agricultural Growth. The economics of agrarian change under population pressure. London, Routledge.

Bourgeois-Pichat, J. (1988). "From the 20th to the 21st century: Europe and its population after the year 2000." Population **44**(1): 57-90.

Brooks, F.J. (1993) Revising the Conquest of Mexico: Smallpox, Sources and Population . Journal of Interdisciplinary History 24, 2.

Cabinet Office, Government of Japan (2007). White Paper on the aging of society (summary) FY 2007 The State of Aging and Implementation of Measures for an Aging Society in FY 2006. Measures for an Aging Society in FY 2008. Annual Report by the Government to the National Diet. Tokyo, Government of Japan.

Champion, A., Editor, , 1989. Counterurbanisation**:** the Changing Pace and Nature of Population Deconcentration, Edward Arnold, London.

Champion, T. (2000). Flight from the Cities? In On the Move: the housing consequences of migration. (ed) R. Bate. York, Joseph Rowntree Foundation.

Chapple, J. (2004). "The Dilemma Posed by Japan's Population Decline." Electronic Journal of Contemporary Japanese Studies **2004**(Discussion Paper 5).

Charbonneau, H. and A. Larose (eds, nd) The Great Mortalities: methodological studies of demographic crises in the past. Liege, International Union for the Scientific Study of Population.
Charles, E. (1938). The effects of present trends in fertility and mortality upon the future population of Great Britain and upon its age-composition. Political Arithmetic. L. Hogben. London, Allen and Unwin**:** 73 - 105.
Chavas, J.-P. and D. W. Bromley (2005). "Modelling population and resource scarcity in fourteenth-century England." Journal of Agricultural Economics 56(2): 217 - 237.
Chesnais, J.-C. (1996) La crepuscule de l'occident. Paris, Robert Laffont.
Chesnais, J. C. (Ed.). (2001). Alfred Sauvy: La vieillesse des nations. textes choisis, présentés et annotées par Jean-Claude Chesnais. Paris: Gallimard.
Chu, C. Y. C. and R. D. Lee (1994). "Famine, revolt, and the dynastic cycle - Population dynamics in historic China." Journal of Population Economics 7(4): 351-378.
Chu, C. Y. C. and C. Tai (2001). "Ecosystem resilience, specialised adaptation and population decline: A modern Malthusian theory." Journal of Population Economics **14**: 7 - 14.
Costello, A., M. Abbas, et al. (2009). "Managing the health effects of climate change." The Lancet **373**(May 16 2009): 1693 - 1733.
Dalla Zuanna, G. and G. A. Micheli, Eds. (2004). Strong Family and Low Fertility: A Paradox? New Perspectives in Interpreting Contemporary Family and Reproductive Behaviour. Dordrecht, Kluwer.
Dalla Zuanna, G. (2006). "Population Replacement, Social Mobility and Development in Italy in the Twentieth Century." Journal of Italian Modern History **11**(2): 188 – 208
Daly, M. E. (2006). The Slow Failure: population decline and independent Ireland, 1922-1973. Madison, Wisconsin, University of Wisconsin Press.
DaVanzo, J. and C. Grammich (2001). Dire Demographics. Population trends in the Russian Federation. Santa Monica, Rand.
DEEC 2009
DEFRA 2009
Demeny, P. (1997). Replacement-level fertility: the implausible endpoint of the demographic transition. In G. W. Jones et al. (Eds.), The continuing demographic transition (pp. 94 - 110). Oxford: Clarendon Press.
Diamond, J. (2006). Collapse: how societies choose to fail or survive. Harmondsworth, Penguin.
Dumond, D. (1975). "The Limitation of Human Population: A Natural History." Science(28 February 1975): 713 - 721.
Dyson, T. (2005). "On Development, Demography and Climate Change: The End of the World as We Know it?" Population and Environment 27(2): 117 - 149.
Dyson, T. and C. O Grada (eds) (2002) Famine Demography: perspectives from the past and present. Oxford, Oxford University Press.
Economist (2006) 'Incredible shrinking countries' January 5 2006, p. 12.
Eurostat (2009). Data in Focus 31/2009.
Evans, A. (2004). Economics, Real Estate and the Supply of Land. Oxford, Blackwell.
Feser, Edward, and Stuart Sweeney (2003) Out-Migration, Depopulation and the Geography of US Economic Distress. International Regional Science Review, 26, 1, 38-67.
Financial Times (2006). A labour shortage can be a blessing. By Michael Lind, June 8th 2006.
Fosler, R. S. (1990). Political and Institutional Implications of Demographic Change. Demographic Change and the American Future. R. S. Fosler, W. Alonson, J. A. Meyer and R. Kern. Pittsburgh, University of Pittsburgh Press**:** 133 - 253.
Friedrichs, C. R. (1997). The war and German society. In G. Parker (Ed.), The Thirty Years War (2nd edition) London: Routledge. pp 186 – 192.

Frejka, T. and J.-P. Sardon (2004). Childbearing Trends and Prospects in Low-Fertility Countries. A Cohort Analysis. Dordrecht, Kluwer.
Galloway, P. R. (1985). "Long-term fluctuations in climate and population in the preindustrial era." Population and Development Review 12(1 - 24).
Glass, D. V. (1936). The Struggle for Population. Oxford, Oxford University Press.
Glass, D.V. (1940) Population Policies and Movements in Europe. London, Oxford University Press.
Glass, D.V. 1973. Numbering the People. Farnborough, Saxon House.
Goldstein, J., W. Lutz, et al. (2003). "Long-term Population Decline in Europe: The Relative Importance of Tempo Effects and Generation Length." Population and Development Review 29(4): 699 - 707.
Government of Japan, Ministry of Health, Labour and Welfare (2009). Statistical Abstracts on Health and Welfare in Japan 2008. Tokyo, Statistics and Information Department, Minister's Secretariat, Ministry of Health, Labour and Welfare.
Guilmot, Pierre (1976) Demographic Introduction. Council of Europe Seminar on the Implications of a Stationary or Declining Population in Europe. Strasbourg, 6-10 September 1976. Strasbourg, Council of Europe. Sem/PS (76) 9 - E
Hatcher, J. (1996). Plague, Population and the English economy 1348 - 1530. British Population History from the Black Death to the present day. M. Anderson. Cambridge, Cambridge University Press. First published separately by the Economic History Society in 1977.**:** 9 - 93.
Haug, Werner (2005) Policy challenges for emigration countries. Presentation to UNFPA/UNECE/NIDI Training programme on International Migration, Geneva, January 24th – 28th 2005. http://www.unece.org/stats/documents/2005/01/migration/17.e.ppt
Heleniak, T. (2003). Russia's Demographic Challenges. Russia's Policy Challenges. Security, Stability and Development. S. K. Wegren. Armonk, NY., M.E. Sharpe**:** 200-221.
Höhn, C. (1991). International Transmission of Population Policy Experience in Western Europe. Expert Group Meeting on the International Transmission of Population Policy Experience, New York, United Nations.
House of Lords Select Committee on Economic Affairs (2008). 1st Report of Session 2007-08: The Economic Impact of Immigration. Volume 1: Report HL Paper 82-1 pp 84. Volume II: Evidence. HL Paper 82-II pp 514. . London, The Stationery Office.
Jones, G., P. T. Straughan, et al., Eds. (2009). Ultra-low fertility in Pacific Asia. Trends, causes and policy issues. Abingdon, Routledge.
Kennedy, L. and L. A. Clarkson (1993). Birth, Death and Exile: Irish population history 1700 - 1921. An Historical Geography of Ireland. B. J. Graham and L. J. Proudfoot. London, Academic Press**:** 158 - 184.
Kennedy, P. (1988), The rise and fall of the great powers: economic change and military conflict from 1500 to 2000, London, Unwin Hyman.
Keynes, J. M. (1936). "The Economic Consequences of a Declining Population." Eugenics Review **29**: 13 - 17.
Kulu, H., P. J. Boyle, et al. (2009 (in press)). "High Suburban Fertility: Evidence from Four Northern European Countries." Demographic Research.
Lee, R. D. (1985). "Population homoeostasis and English demographic history." Journal of Interdisciplinary History **15**(4): 635 - 660.
Lee, R. D. (1987). "Population Dynamics of Humans and other animals." Demography **24**(4): 443 - 465.
Lesthaeghe, R. and P. Willems (1999). "Is low fertility a temporary phenomenon in the European Union?" Population and Development Review **25**(2): 211 - 228.

Lesthaeghe, R. and J. Surkyn (2004). When History Moves On: The Foundations and Diffusion of a second demographic transition. Brussels, Interface Demography: Free University of Brussels.
Lindh, T. (2005). "Productivity is a System Property and Need Not Decrease with the Age of the Workforce. Vienna Yearbook of Demography 2005: 7 - 10.
Longman, P. (2004). The empty cradle: how falling birthrates threaten world prosperity and what to do about it. New York, Basic Books.
Lutz, W., W. Sanderson, et al. (2001). "The end of world population growth." Nature 412(2 August 2001): 543 - 545.
Lutz, W., B. C. O'Neill, et al. (2003). "Europe's population at a turning point." Science 299(1991 - 1992).
Lutz, W. and Q. Ren (2002). "Determinants of human population growth." Philosophical Transactions of the Royal Society B 357(1197 - 1210).
Lutz, W., V. Skirbekk, et al. (2005). The Low Fertility Trap Hypothesis: Forces that may lead to further postponement and fewer births in Europe. European Demographic Research Papers 4. . Vienna, Vienna Institute of Demography of the Austrian Academy of Sciences.
McMorrow, K. and W. Roeger (2004). The Economic and Financial Market Consequences of Global Ageing. Berlin, Springer.
Malthus, T.R. (1802) An Essay on the Principle of Population...(2nd edition)
Markham, V. D. and N. Steinzor (2006). US National Report on Population and the Environment. New Canaan, CT., Center for Environment and Population.
Meadows, D. H., Meadows, D. L., Randers, J., & Behrens, W. W. (1972). The Limits to Growth. A report for the Club of Rome's project on the predicament of mankind. London: Earth Island.
Meadows, D. H., Meadows, D. L., & Randers, J. (1992). Beyond the Limits. Earthscan. .
Meyerson, F. A. B. (1998). "Population, Carbon Emissions, and Global Warming: The Forgotten Relationship at Kyoto." Population and Development Review 24(1): 115 - 130.
Myers, N. (1998). Population: some overlooked issues. The Environmentalist, 18, 135 - 138.
Myrskylä, Mikko, Hans-Peter Kohler and Francesco Billari (2009) Advances in development reverse fertility declines. Nature 460, 6 August 2009, pp 741 – 743.
NiBhrolcháin, M. and L. Toulemon (2002). The trend to later childbearing: is there evidence of postponement? S3RI Applications and Policy Working Papers, A03/10. Southampton, Southampton Statistical Sciences Research Institute.
Nyce, S. A. and S. J. Schieber (2005). The Economic Implications of Aging Societies: The Costs of Living Happily Ever After. Cambridge, Cambridge University Press.
O'Connor, M. and W. J. Lines (2008). Overloading Australia: how governments and media dither and deny over population. Canterbury, NSW, Envirobook.
Population Panel (1973). Report Cmnd. 5258. London, HMSO.
Porritt, J. (2009), "A Sustainable Population", http://www.jonathonporritt.com/pages/2009/03/a_sustainable_population.html
Postan, M. (1972). The Mediaeval Economy and Society. London, Weidenfeld and Nicholson.
Reddaway, W. B. (1939). The Economics of a Declining Population. London, Allen and Unwin.
Reddaway, W. B. (1977). "The Economic Consequences of Zero Population Growth." Lloyd's Bank Review. reprinted as Economics Reprint no 17, Department of Applied Economics, University of Cambridge(April 1977).

Reher, D. S. (2007). "Towards long-term population decline: a discussion of relevant issues." European Journal of Population 23(2): 189 - 207.
Rockefeller, J. D. (1972). Population And The American Future: The Report Of The Commission On Population Growth And The American Future Washington DC, US GPO.
Roberts, P. (2008). The End of Food. New York, Houghton Mifflin.
Robinson, W.C. (2002) Population Policy in Early Victorian England. European Journal of Population 18, 2, 153 - 173.
Royal Commission on Population (1949). Report Cmd. 7695. London, HMSO.
Russell, C. and W.M. S. Russell (1999) Population Crises and Population Cycles. London, The Galton Institute.
Sauvy, A. (1969). General Theory of Population (Campos, C., Trans.). London: Weidenfeld and Nicholson.
Saville, J. (1957). Rural Depopulation in England and Wales 1851 - 1951. London, Routledge and Kegan Paul.
Schwartz, K. (1998). Gibt es Alternativen zu der für Deutschland erwarteten Bevölkerungsentwicklung? (Are there alternatives to the expected population trends in Germany?). Zeitschrift für Bevölkerungswissenschaft, 23(3), 335 - 341.
Select Committee on Science and Technology (1971). First Report: Population of the United Kingdom. London, HMSO.
Sibly, R. M. and J. Hone (2002). "Population growth rate and its determinants: an overview." Philosophical Transactions of the Royal Society of London. B 357: 1153 - 1170.
Simon, J. (1981) The Ultimate Resource. Princeton, Princeton University Press.
Skirbekk, V. (2005). Population Ageing Negatively Affects Productivity Vienna Yearbook of Demography 2005: 5-6.
Smith, K. (2008). "The population problem." Nature (0806): 72-74.
Sobotka, T. (2009). The Likely Future Increase of Fertility in Europe. Fertility in the Past, Present and Future. Cambridge.
Spiegel, H.W. (1983) The Growth of Economic Thought. Durham, Duke University Press.
Statistisches Bundesamt (2006). Bevölkerung Deutschlands bis 2050. Übersicht der Ergebnisse der 11. koordinierten Bevölkerungsvorausberechnung -Varianten und zusätzliche Modellrechnungen. Wiesbaden, Statistisches Bundesamt.
Stern, N. (2006). The Economics of Climate Change: the Stern Report. Cambridge, Cambridge University Press.
Sugareva, Marta, Tzekov, Nikolay, et al. (2004) Demographic Situation in the most depopulated regions of North-Western Bulgaria. Sofia. (manuscript, pp 18). Published in French as: Sugareva M., N. Tzekov, D. Donev, D. Boshikyov (2006), Le vieillissement demographique dans les regions de dépopulation en Bulgarie du Nord-Ouest, in: Dumont G.-F., D. Argoud, R. Belot, P. Boquet (eds), Les territoires face au vieillissement en Europe - géographie, politique, prospective. Ellipses Marketing. Colection Cerrefours.
Sutter, J., & Tabah, L. (1951). Le notion de l'isolat et du population minimum. Population, 6, 481.
Tai, C. and C.Y.C. Chu (2001) Ecosystem Resilience, specialised adaptation and population decline: a modern Malthusian theory. Journal of Population Economics 14, 1, 7 - 19
Tainter, J. A. (1988). The Collapse of Complex Societies. Cambridge: Cambridge University Press.
Taylor, L. R., Ed. (1970). The Optimum Population for Britain. London, Academic Press.

Teitelbaum, Michael S. (2001) International migration: Predicting the Unknowable. In Weiner, Myron and Sharon S. Russell (eds) Demography and National Security. New York, Berghahn, pp 21 – 37.
Teitelbaum, Michael S. and Jay Winter (1985) Fear of Population Decline. London, Academic Press.
Teitelbaum, M. S. and J. Winter (1998). A Question of Numbers. High migration, low fertility and national identity. New York, Hill and Wang.
Tainter, J. A. (1988). The Collapse of Complex Societies. Cambridge, Cambridge University Press.
Testa, M. R. and L. Grilli. (2006). "The Influence of Childbearing Regional Contexts on Ideal Family Size in Europe" Population 61(1-2): 99 - 127.
United Nations Population Division (2002). Expert Group Meeting on Completing the Fertility Transition . New York, United Nations.
United Nations (2002). World Urbanization Prospects. The 2001 Revision. Data Tables and Highlights. New York: United Nations.
United Nations (2009) World Population Prospects: the 2008 revision. New York, United Nations.
US Bureau of the Census (2004). US Interim Projections by Age, Sex, Race and Hispanic Origin. US Bureau of the Census, 2004.
Vladov, V., Ed. (2007). National Demographic Strategy of the Republic of Bulgaria 2006 - 2020. Sofia, Bulgarian Ministry of Labour and Social Policy.
Walsh, B. M. (1974). Ireland. in Population Policy in Developed Countries . ed. B. Berelson. New York, McGraw Hill for The Population Council**:** 8 - 41.
Wattenberg, B. J. (2004). Fewer: How the New Demography of Depopulation Will Shape Our Future Ivan R. Dee.
Wrigley, E.A. and R.S. Schofield (1981) The population of England 1541 – 1871 – a reconstruction. London, Arnold.
Wunsch, Guillaume (1976) Consolidated Report. Council of Europe Seminar on the Implications of a Stationary or Declining Population in Europe. Strasbourg, 6-10 September 1976. Strasbourg, Council of Europe. Sem/PS (76) 13.