

# World population implosion?

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**O**VER the past several years, some of the world's best demographers have begun a dramatic reassessment of the world's demographic future. They are now seriously proposing the possibility that the world's population rather than continuing to increase will in our lifetimes peak, and then commence an indefinite decline in the generations immediately ahead. This demographic scenario is implicitly reflected in, among other places, the United Nations Population Division's biennial compendium, *World Population Prospects*—the oldest, largest, and most intensive of various contemporary attempts to envision and outline likely future demographic trends. The forthcoming edition of that volume, *The 1996 Revision*, will include "low variant" projections that anticipate zero population growth for the world as a whole by

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the year 2040, and negative growth—that is to say, depopulation—thereafter.

Like two alternative projections (“medium” and “high”) also offered, this “low variant,” as previous editions of the study have explained, is “thought to provide reasonable and plausible future trends.” And the eventual global depopulation envisioned in these projections, one should emphasize, is not calamitous—it does not result from Malthusian, environmental, or any other variety of disaster. Just the contrary: This contemplated stabilization and ultimate decline of world population is assumed to occur under what *World Population Prospects* terms “conditions of orderly progress.” The UN Population Division’s method, in fact, specifically posits that “catastrophes such as wars, famines or new epidemics” will not take place “during the projection period.”

The UN’s new “low variant” projections do not, of course, provide a sure vision of the future. But they do offer a glimpse of one *particular*, and by no means fantastic, version of the future—a version, as yet, whose outlines have scarcely been described and whose ramifications have scarcely been pondered. At a time when all manner of potential “population problems” are regularly accorded official attention by national and international authorities, the neglect that has to date greeted the possibility of a long-term reduction of human numbers is all the more striking.

In the following pages, we will survey the demographic contours of a world in which population has ceased to increase and examine some of the political, economic, and social implications that might flow from a global “population implosion” a few decades from now. (The new UN “low variant” projections will be our backdrop.) Unaccustomed as we may be to thinking about such a world, its advent might not be that far off. The UN projections in question imagine an indefinite demographic descent commencing just over 40 years from now—a time at which most of the earth’s current inhabitants will likely still be alive.

### **The limits of population forecasting**

This is not, to be sure, the first time that population specialists or others have raised the prospect of long-term popu-

lation decline. Some 60 years ago, expectations of an imminent depopulation were widespread in the Western world. In the 1930s, in fact, "the fear of population decline," to use Michael S. Teitelbaum and Jay M. Winter's phrase, was palpable in a number of European countries—or at least in their leading political and intellectual circles. We now know that those predictions of depopulation were far off the mark. Indeed, at the very time when they were supposed to be entering into permanent negative growth due to sub-replacement fertility—the decades of the 1950s and 1960s—Western countries actually turned out to be in the midst of a demographic surge driven by a post-war baby boom.

Thus a few general words of warning about demographic projections and forecasts are in order. The uninitiated sometimes invest unwarranted confidence in the capabilities of population sciences to chart accurately the demographic trends of tomorrow. Those more familiar with the disciplines in question entertain more modest hopes. The paradox of long-term demographic forecasting is that its methods combine superb technique with an almost complete lack of viable predictive theory.

Mathematical demography is an elegant and sophisticated construct; supplied with the necessary assumptions, it can generate detailed and internally consistent population projections. Those assumptions, unfortunately, are precisely the sticking point. For mathematical demography will easily demonstrate that, under non-catastrophic conditions, change and composition within any convened population will be dominated by fertility trends—but the population sciences offer no reliable framework for anticipating the fertility trends of the future.

In the modern era, the defining essence of fertility change has been the emergence and spread of sustained fertility decline. Yet the phenomenon of secular fertility decline has posed unanswerable questions from the beginning. The first country in the world to embark upon long-term fertility decline did so in the late eighteenth century. That country, however, was not industrializing England, as modernization theories would lead us to expect, but rather France—then impoverished, overwhelmingly agrarian, predominantly illiterate, and, by appearances, devoutly Catholic. Charles Tilly of the New School for

Social Research has described the dilemma that European fertility decline continues to pose to historians and social scientists: "The problem is that we have too many explanations which are individually plausible in general terms, which contradict each other to some degree, and which fail to fit some significant part of the facts."

More modern fertility trends have proved no less nettlesome. Despite the almost overwhelming availability of information on social and economic conditions in contemporary industrial societies, demographers were unable to foresee either the transnational postwar baby boom or the subsequent shift to a sub-replacement fertility regimen in every country belonging to the Organization of Economic Cooperation and Development (OECD). As for developing countries, demographers have been unable to forecast either the onset of fertility decline or the trajectory that fertility change follows once it begins.

Complicating any effort at long-range population projections are two additional and highly inconvenient details: Population theory offers no reliable indications as to how far "normal" fertility levels may fall—or whether fertility regimens will tend to converge toward net replacement after a pronounced swing away from it.

For better or worse, our only recourse in addressing these issues is to consult the empirical record. From that record, we know that the fertility level of a fairly large population under "conditions of orderly progress" can be very low indeed: Eastern Germany's post-unification fertility level, if continued, would be less than one birth per woman *per lifetime*. By the same token, we now know that a country's fertility can drop swiftly and dramatically once the process of secular fertility decline begins: Between the early 1960s and the early 1990s, for example, Thailand's estimated "total fertility rate" (TFR) plunged from over six births per woman per lifetime to less than two. We know further that sub-replacement fertility can characterize fairly poor contemporary societies—China, Cuba, and possibly Sri Lanka, among others. Finally, we know that fertility levels can remain below replacement for prolonged periods. Japan, for example, entered into sub-replacement fertility over 40 years ago and has been gradually moving further away from net replacement for the past quarter century. All these par-

ticulars, however, furnish precious little guidance for long-range forecasts of population totals for any given country, much less the world as a whole.

Let us be clear: Demographic techniques are reasonably accurate for some kinds of forecasts. Under ordinary conditions, for example, they are rather good at predicting how many people from a current cohort will be alive a given number of years hence. (This insight is the basis of the modern life-insurance industry.) But no one has yet devised a sound technique for estimating the unborn in advance—and no one is likely to do so, so long as parental preferences determine human fertility patterns.

### **The “low variant” model**

Now, back to the UN “low variant” projections. Since all population projections faithfully and mechanically reflect the assumptions embodied within them, it is worth examining the particular set of assumptions that bring us to the verge of a permanent depopulation 40-odd years from today.

The UN “low variant” model takes estimates of the world’s current population composition (by country, age, and sex) and calculates hypothetical future populations based on three separate sorts of assumptions: migration, mortality, and fertility. For the period 1995 to 2000, the model envisions a net migration of about 1.6 million people a year to the “more developed regions” (meaning the OECD countries of the early 1990s, Eastern Europe, and the predominantly European portions of the former Soviet Union) from the “less developed regions” (everyone else); this stream gradually diminishes, ceasing altogether in 2025. These assumptions are clearly arbitrary; there is no particular reason to think they will be correct. However, given their magnitude, these assumptions exert only a slight influence on population trends for the “more developed regions”—and, of course, none at all on trends for the world as a whole.

With respect to mortality, the UN model assumes that life expectancy at birth will rise in the “more developed regions” from roughly 75 today to 81 in the year 2050. For the “less developed regions,” life expectancy is assumed to increase from the current estimated level of 64 to 76 by 2050; in the “least

developed countries" (a sub-grouping composed mainly of sub-Saharan countries), it is seen as rising from 52 to 72. By the benchmarks of the immediate past, such improvements in longevity seem feasible—and perhaps even modest. In the 55 years between 1995 and 2050, life expectancy at birth for the world as a whole is posited to rise by 12 years (from about 65 to about 77); by contrast, in the 45 years between 1950 and 1995, global life expectancy is thought to have risen by about 20 years (from about 45 to about 65).

The model's most important assumptions concern future fertility trends. By the UN's estimate, total fertility rates for the "more developed regions" averaged about 1.7 in the early 1990s; the "low variant" assumes these to have fallen to about 1.5 today, and estimates that they will stabilize in another decade at about 1.4 (roughly, the level currently characteristic of the nations of the European Union). For the "less developed regions," TFRs averaged perhaps 3.3 in the early 1990s; these are seen as having fallen just below three today, declining further to about two in 2020, and to about 1.6 in 2050. (For the "least developed countries," where the average number of births per woman per lifetime in the 1990s is estimated to have exceeded five, TFRs are posited to drop below four by 2010, below three by 2020, and below two by 2035.)

Another way to look at these fertility assumptions is from the vantage point of net replacement. In the "more developed regions," the "net reproduction rate" (NRR) is already down to about 0.7—*meaning that the next generation, under present patterns of childbearing and survival, would be about 30 percent smaller than the current one.* The UN "low variant" assumes that the NRR will stay close to its current level for the next half-century, registering just under 0.7 in 2050. The "less developed regions," in this vision, fall below replacement around 2010; the "least developed" sub-grouping fall below replacement around 2030. For the world as a whole, the NRR today is placed at over 1.2; global sub-replacement commences around 2010, and, by 2050, it is stipulated to be 0.74—or about the same as the NRR for today's industrial democracies.

What is one to make of these postulated fertility trends? One way to assess them is in historical perspective. Over the next half-century, the "low variant" model proposes a decline

in TFRs of roughly 0.3 for the “more developed regions” and of about 1.5 for the “less developed regions.” By contrast, over the 40 years between the early 1950s and the early 1990s, actual TFRs dropped by an average of about 1.1 in the “more developed regions” and by nearly three in the diverse amalgam of countries within the “less developed regions.”

As we have already seen, there is no possible way of telling today whether or not these hypothetical “low variant” fertility trends will eventually come to pass. Against the mirror of recent history, however, the assumptions of fertility decline built into this particular population model look neither terribly radical nor especially heroic.

### **The arithmetic of depopulation**

The arithmetic consequence of this bundle of assumptions—none of them outlandish—is a world in which population crests and then declines forever thereafter. By these particular computations, the human population would reach its apogee around the year 2040 at somewhat over 7.7 billion—about one-third more than the 5.8 billion thought to be alive today. Between 2040 and 2050, the world’s population would fall by about 85 million. From then on, world population would shrink by roughly 25 percent with each successive generation.

Negative rates of “natural increase”—death rates higher than birth rates—would characterize the “more developed regions” as early as the year 2000, although thanks to modest net immigration, absolute population totals for these regions would not begin to fall until after 2005. For the “less developed regions,” a negative natural increase would begin around the year 2045. Despite sub-replacement fertility in today’s “least developed countries,” population growth would continue for a decade or so beyond 2050. This would be due to “demographic momentum”—in other words, the fact that rising cohorts contained absolutely larger numbers of women of child-bearing age would outweigh the fact that the fertility rate for these new cohorts was dropping.

The trends that would result in an ultimate global population decline would also bring about a significant redistribution of world population. In 1995, the ratio of population between “less developed” and “more developed” regions stood at about

four to one; in 2050, by these projections, it would be seven to one. The balance of population would shift dramatically not only between given countries but even between entire continents. In 1995, for example, the estimated populations of Europe (including Russia) and Africa (including Egypt and the Maghreb states) were almost exactly equal. In 2050, by these projections, Africans would outnumber Europeans by over three to one.

**TABLE 1**  
**World's Most Populous Countries, 1950-2050 (Millions)**

<u>1950</u>		<u>1995</u>		<u>UN "low variant"</u> <u>projections for 2050</u>	
China	555	China	1,222	India	1,231
India	358	India	929	China	1,198
USSR	180	USA	267	Pakistan	306
USA	152	Indonesia	197	Nigeria	279
Japan	84	Brazil	159	USA	272
Indonesia	80	Russian Fed.	148	Indonesia	251
Pakistan	72	Pakistan	136	Brazil	188
Brazil	53	Japan	125	Bangladesh	178
UK	51	Bangladesh	118	Ethiopia	176
W. Germany	50	Nigeria	112	Zaire	146
Italy	47	Mexico	91	Iran	143
France	42	Germany	82	Mexico	127

Note: 1950 reading adjusted to account for actual historical boundaries.

Source: United Nations Population Division

In the world of negative population growth, the profile of the most populous countries would also look rather different from the rankings with which we have become familiar. Only half the largest countries of 1950 would remain on the list for the year 2050. Nigeria, which did not even make the list for 1950, will be the world's fourth largest country in 2050—just edging out the United States. New additions to the big 12 between now and the year 2050, by these computations, would include Ethiopia, Zaire, and Iran. Whereas six of the 12 largest countries in 1950, and four in 1995, come from the "more

developed regions," as currently defined, one—the United States—so qualifies by these projections in 2050. Just how demographically negligible the current industrial democracies would be in this version of the year 2050 may be illustrated with a single comparison: Not a single European state—including Russia—could match the Philippines in total population. Other things being equal—and admittedly, in world politics they seldom are—these trends presage a tremendous shift in the balance of global power.

These same demographic forces of longer lives and falling fertility would also inexorably pave the way for a radical aging of the human population—a shift of a magnitude with no historical precedent. Around 1900, the median age of the world's population may have been about 20 years—not far from what it had been in all earlier eras. Over the second half of the twentieth century, the median age for the world's population rose somewhat: By 1995, it reached about 25 years. By the year 2050, in this "low variant" world, the median age would be over 42.

In the "less developed regions," the median age would almost double between 1995 and 2050, jumping from 23 years to 41 years. To put this in perspective, it would mean that the "average" population from these regions would be more aged than the "greyest" populations in the world today. (In Germany and Japan, for example, median age is currently just under 40.) But the "more developed regions" of 2050 would be older still. In 2050, the median age in this area would exceed 51. In some countries, of course, the population would be even more aged: Japan's median age would be 53; Germany's, 55; Italy's 58.

This tremendous and rather sudden aging process would have subsidiary implications. For the world as a whole the number of children would sharply decline while there would be a population boom among the elderly (or let us say, groups *currently* considered elderly). In 1950, children under the age of five composed just under one-seventh of the global population. Today, they make up about one-ninth of the total. In 2050, by these projections, they would account for less than one-twentieth. Conversely, persons 65 and over made up about 5 percent of the world's population in 1950 and perhaps 6.5

percent in 1995; they would account for over 18 percent of the total in 2050. Where there were two and one-half young children for every older person in the world in 1950, there would, by 2050, be almost four persons 65 or over for every child. In the "less developed regions," there would be three times as many older people as young children; in the "more developed regions," the ratio would be eight to one. In Italy, which serves in these projections as the extreme instance of demographic aging, barely 2 percent of the population in 2050 would be under the age of five, but more than 40 percent would be 65 or older.

This dramatic worldwide aging would especially affect the female population. For the first time in the modern era, and possibly the first time in human experience, "women of reproductive ages" would no longer constitute the norm for humanity. In 1995, an estimated 51 percent of all women on earth were between the ages of 15 and 49. (These are designated as the childbearing years by the conventions of contemporary demography—imprecisely, but not unreasonably.) Although accurate global counts are obviously not available for earlier periods (or even today), demographic technique suggests that one-half or more of the women alive at any given time may have been within those same childbearing years. Under "low variant" assumptions, however, by the year 2050 over 55 percent of the world's women will be outside the childbearing years. In the "more developed regions," nearly two-thirds of all women would not be "of reproductive age."

Finally, consider those between the ages of 15 and 24—the vigorous and exuberant adolescents and young adults who influence fashions and style, exemplify physical beauty, and happen to do most of the actual fighting in times of war. In the "low variant" version of the future, the size of this youthful group shrinks significantly in both relative and absolute terms. In the world as a whole, there would be 100 million fewer youths in 2050 than there were in 1995. While they had comprised 18 percent of the world's population in 1995, they would account for less than 12 percent by 2050. "More developed regions" would be especially without young people: Less than 9 percent of their population would be 15 to 24 years of age. In fact, barely one-half as many young people would be living in these countries as live there today.

### A global nursing home?

It is perhaps difficult to picture exactly how population decline would affect the routines of daily life, or social dynamics, or economic patterns, or the operations of government. Yet a number of issues present themselves immediately—along with a number of still unanswerable questions.

For example, the UN “low variant” projections envision a growth in human numbers between 1995 and 2050 of just under 2 billion; 1.4 billion of this presumed increase is accounted for by the group 60 years of age and older. A significant fraction of the world’s population would, in this vision, be septuagenarians, octogenarians, and nonagenarians; in results calculated for some of the “more developed” countries, in fact, persons between the ages of 75 and 85 would outnumber those between the ages of 0 and 10.

Such a gerontological drift raises basic questions about the health of the societies of this particular future. Would a depopulating planet be a planet of wheelchairs—of increasingly infirm senior citizens whose escalating demands for medical services and care seriously burden the rest of society? Or would the revolution in longevity be accompanied by a revolution in health that effectively extended the boundaries of middle age—and thereby the scope for active, vigorous, and productive existence?

To address such questions, we might begin by examining the available research on health and aging. That literature, as it happens, is inconclusive—or more precisely, it points in opposite and mutually exclusive directions. According to one school of thought, the risk of illness and mortality changes are inversely related: Longer lives mean worse health for the survivors. The other school holds that improvements in life expectancy translate into greater life expectancy free from disability, even for persons in their seventies and early eighties.

Reviewing the points of controversy in these studies, one is inevitably struck by the mischievous ambiguity of the term “healthy life.” “Mortality” is easy to define and thus (in theory) to measure; not so with “health,” which has many gradations and is subjective anyway. It is possible, and indeed likely, that existing data on self-perceived health status are confounded

by the higher expectations of those who are better off: In the United States and elsewhere, despite physical evidence to the contrary, more affluent and better educated people often seem more inclined than their less well off peers to rate their own health as unsatisfactory.

The international data, however, would seem to support the argument that improvements in “disability-free” life expectancy occur nearly as rapidly as improvements in life expectancy itself—at least for the population under 85 years of age and so long as “disability” is carefully and objectively defined. Indeed, proper health habits and appropriate medical help can already offer the great majority of persons the possibility of active and independent life well into their eighties. To this extent, anxieties about the coming of an era of dependent invalids would appear to be misplaced.

At the same time, we should remember that the quality of life for older persons may at times hinge upon discrete, but expensive, medical treatments. Insofar as such services would be more available in rich countries than in poor ones, even in the year 2050, differences in the health status of the elderly might in the future provide the same sort of summary index of “development” that the infant mortality rate is today taken to offer.

### **Economic performance**

In the 1930s, when the specter of “depopulation” haunted Western intellectuals, many of the most eminent economists of the day—including Alvin Hansen, Roy Harrod, John Maynard Keynes, Gunnar Myrdal, and Joan Robinson—argued that low fertility and stagnant or declining population could compromise economic performance. By stifling demand, sluggish or negative population growth could exacerbate, or even precipitate, “underconsumption”—and a crisis of unemployment. At the very least, low fertility would press down the investment rate or slow the allocation of new labor into promising and productive areas.

With the benefit of hindsight, most of these arguments now look surprisingly weak. Depression-era economists were too ready to explain that great international slump—which was

essentially non-demographic in nature—in terms of the fertility patterns and population trends of the day. (Ironically, barely a generation later eminent economists were attributing those same ills to overly rapid rates of population growth.) And the economists of the 1930s underestimated the role international trade might play in linking (and thus expanding) markets and in stimulating a productivity-enhancing division of labor, regardless of the population trends in a given country at a given time.

A careful review of the empirical record suggests that demographic forces, whatever their nature, need be no more than at most a secondary factor in overall economic performance. This empirical record suggests further that well thought-out public policies, in tandem with suitable private arrangements, can capitalize upon the potential opportunities inherent in a country's population trends. In fact, during the modern era nations have prospered even in the wake of seemingly calamitous "population problems." West Germany, Taiwan, and South Korea each flourished economically after their sudden, forced, and tumultuous absorption of millions of refugees; Japan enjoyed rapid and sustained development after World War II even though life expectancy for its men had been driven down to neolithic levels as a result of the war.

By comparison with such trials, the demographic challenges posed by gradual population aging, and eventual population decline, look decidedly modest. Indeed, there are reasons to be guardedly optimistic about the macroeconomic consequences of these trends. Surveying America's demographic prospects, for example, Harvard economist David M. Cutler and his colleagues have made the point that prolonged sub-replacement fertility would actually somewhat lower the country's investment needs and increase its living standards (consumption levels) since so much less capital would be required by new entrants into the labor force. Although expenditures on the care and support of the elderly would naturally rise, these costs would, in Cutler and his colleagues' reckoning, be substantially offset by a reduced need to spend on the young. In all, they conclude, the optimal savings rate in the middle of the next century would probably be slightly lower than the optimal savings rate today.

The demographics of depopulation, however, might well pose one major and heretofore novel economic problem for societies of the future: the education and training of the workforce. In a world where nearly one-half of the population was living to the age of 80 or beyond, the ordinary person's "economically active life expectancy" could quite conceivably be as much as 50 years—or more. Given the arithmetic of sustained below-replacement fertility, moreover, it is not difficult to imagine circumstances half a century hence in which the majority of a country's workers were over the age of 50.

If future educational systems operated by today's principles, most people at work would have received their final formal training over a generation previously; they would be functioning with the knowledge and techniques of an increasingly distant past. One should not overstate the problem: On-the-job training, refresher courses, and the like are already familiar features of the modern workplace. The age-structure changes that negative population growth would bring, however, would considerably intensify the mismatch between an educational system designed to train people when they are young and the desire of workers to enjoy a long and worthwhile career in an increasingly complex economy.

Newly embodied knowledge and newly applied techniques have been a driving force behind material advance in our century. If they are to serve the same role in the coming century, and if the coming century proves to be a time of pervasive population decline, the institutions and routines of higher education will probably have to be fundamentally re-examined and recast.

### **Pressures on the welfare state**

The possible cessation and decline of population growth in coming decades may pose no insuperable macroeconomic problems to future generations, but it stands to create enormous difficulties for the state. In a world like that imagined in the UN's "low variant" projections, governments would be subject to intense budgetary and political pressure to overhaul their welfare systems. Negative population growth would especially threaten the central feature of the modern welfare state: the

nation-wide, tax-financed, pay-as-you-go pension program. Weighed down by unalleviable demographic burdens, it is in fact hard to imagine how these programs could remain viable.

The government-run Social Security and pension programs in virtually all of today's industrial democracies finance their operations by taxing today's workers to fund today's retirees. Since these systems were established in periods of relatively high fertility and relatively rapid population growth, pay-as-you-go pension systems had the political allure of promising generous benefits on the cheap. In an unguarded moment 30 years ago, Nobel Laureate Paul Samuelson captured the reasoning undergirding this approach to public finance:

The beauty about social insurance is that it is actuarially unsound. Everyone who reaches retirement age is given benefit privileges that far exceed anything he has paid in.... Social Security is squarely based on what has been called the eighth wonder of the world—compound interest. A growing nation is the greatest Ponzi game ever contrived. And that is a fact, not a paradox.

With below-replacement fertility and increasing longevity, however, the arithmetic of pay-as-you-go retirement programs changes unforgivingly. As the ratio of employees to retirees falls, a universal pay-as-you-go retirement system has only three options for preventing bankruptcy: reduce pension benefits; raise taxes; restrict eligibility. There are no alternatives.

As Carolyn Weaver of the American Enterprise Institute persuasively demonstrated a decade ago, demographic forces had already brought social insurance programs throughout the Western world to the verge of crisis by the 1980s. By that time, Social Security payroll taxes alone exceeded 20 percent in a number of Western countries and exceeded 30 percent in at least one of them (Netherlands); unfunded liabilities nevertheless continued to mount. But when Weaver was writing, there were almost six persons of working age (as the years 15 to 64 are customarily designated) for every person of retirement age (65 and older) in the "more developed regions." With zero, and then negative, population growth, those ratios would fall precipitously.

The dimensions of that decline are reflected in projected "dependency ratios," for the number of persons 65 and older

per 100 persons between the ages of 15 and 64. In 1995, under the current crisis of the Western welfare state, that dependency ratio comes out to roughly 20—meaning that there are now about five people of working age for every person of retirement age. In 2050, by these projections, the dependency ratio in today's Western democracies would be above 50: The ratio of people 15 to 64 to people 65 and over would be less than two to one. In some countries, these projected ratios for the year 2050 would be still higher: 60 for Germany; 64 for Japan; and an amazing 80 for Italy where there would be only 125 persons in the 15 to 64 group for every 100 senior citizens.

Although populations in the "less developed regions" would not, in these projections, be so very "grey," those countries would likely be less capable of maintaining state-based pay-as-you-go retirement systems in the year 2050 than OECD countries are today. For one thing, the dependency ratio of elderly to working-age population would be higher for the "less developed regions," on average, than it is in any OECD country today. For another, the "less developed regions" half a century hence may not, on average, be nearly as affluent as the OECD countries are today. The calculations of the economic historian Angus Maddison suggest that, even after adjusting for international differences in purchasing power of local currencies, per capita GDP for what the UN terms "less developed regions" was about one-fifth of the "more developed countries" per capita GDP in the early 1990s—and less than one-sixth of the OECD countries. If these regions should enjoy long-term per capita growth rates of 3 percent a year for the next half-century, their average output level would still be nearly 40 percent lower than OECD's today. (To get a sense of what this would mean, think of financing Western Europe's pension burden in the coming decade out of Western European incomes from the late 1960s.)

Already the actuarial status of state-run retirement systems in most OECD countries appears unsustainable. In the United States, according to calculations by economists at the OECD, the net present value of the unfunded deficit in our Social-Security system amounts to only 23 percent of GDP. I say "only" because the unweighted average of that deficit for the

20 OECD countries examined came to 95 percent of GDP. Even were the implicit social contract underlying these systems gutted—by, for example, restricting pension eligibility to cover less than a third of the retirement-age population—over half of these pension systems would still remain underfunded for the foreseeable future.

These OECD calculations, of course, pertain to the net present value of government pension systems *today*—when people of working age outnumber the retirement-age groups by roughly five to one. In 2050—if the ratio of working-age to retirement populations were indeed two to one, or less—the net present value of the deficit in state pension systems as they are currently constituted would be vastly greater.

As an abstract conjecture, it is possible that societies under such circumstances could keep their pre-existing Social Security systems intact—if they were willing to forswear publicly financing practically anything else and to sacrifice a good measure of future economic growth as well. But free electorates today would never opt willingly for such a choice, and it seems highly unlikely that they would do so tomorrow. Under the demographic constraints envisioned in the UN's "low variant" projections, the mounting pressures would likely generate political momentum for a transition to an actuarially viable pension system.

One aspect of such a restructuring would likely be later general retirement ages, as populations made greater productive use of their extended active life spans. No less significant, such a restructuring would almost necessarily presuppose a change from pay-as-you-go financing to self-financing of retirement benefits by individuals over the course of their own lives. Though such a change could involve a full privatization of social insurance, it is also possible to imagine the reformed pension systems operating under the aegis of government. Even under government supervision, however, it is hard to see how self-financed pensions (which explicitly acknowledge the beneficiary's creation of his or her retirement account) could lend themselves as readily to redistributive or other non-market objectives as pay-as-you-go arrangements have done. Declining population growth thus might not suppress the appetite of the state, but it might well check the voting public's willingness to feed it.

### From blood ties to elective affinities?

Nearly 40 years ago, Jean Fourastié, the French sociologist, wrote a vivid and penetrating essay on how family and social life changes under the influence of the modern decline in mortality. The revolution in survival chances, he asserted, had transformed marriage from a binding but temporary contract to a much lengthier, and possibly more tenuous, commitment; it had reduced old age from an almost mystical status to a common and often pitiable physical condition; and it had all but banished the procession of death and suffering that had previously conditioned all family life. Fourastié also noted that the modern revolution in mortality schedules had totally altered the ordinary person's chances of participating in "intellectual life" (which he took to begin at age 12) and "independent life" (which commenced, in his view, around age 20). The scope for "creative intellectual life," he observed, had been hugely expanded by improvements in survival chances: By his calculations, modern man could expect to experience between three and six times as many years of life in his forties and fifties (which Fourastié designated the peak period of creativity) as the "traditional man" of the seventeenth century. (This vast extension of "creative intellectual life," I would add, may have contributed to modern economic growth, which has been so strongly driven by applied advances in knowledge.)

If a revolution in mortality has already recast social rhythms and relations within the family, a revolution in fertility may have a similar impact in the future. More specifically, the magnitudes of the fertility declines envisioned in the UN's "low variant" projections would set the stage for a world never before inhabited: *a world in which the only biological relatives for many people—perhaps most people—will be their ancestors.*

Paradoxically, the great reduction in fertility witnessed in Western societies over the past two centuries has been accompanied by a parallel reduction in childlessness. In the modern world, as the demographer Laurent Toulemon has observed, "very few couples remain childless voluntarily." Under the modern regimen of sub-replacement fertility, it seems, very few parents seek a third child, but almost everyone chooses to have that first baby if they can.

Under such circumstances, prolonged bouts of fertility far below the replacement level would profoundly alter the composition of the typical family. Consider the possibilities for Italy, currently the country with the world's lowest fertility level. At the moment, Italy's TFR is estimated to be less than 1.2; the UN's "low variant" projections anticipate the continuation of this pattern to the year 2050. If Italy's current fertility regimen is extended for two generations, the Italian family will be completely redefined. For, in that future world, under reasonable assumptions about the incidence of childlessness and larger families, almost three-fifths of the nation's children will have no siblings, cousins, aunts, or uncles; they will have only parents, grandparents, and perhaps great-grandparents. Under those same assumptions, less than 5 percent of Italy's children would have both siblings *and* cousins.

Italy's position today is at an extreme within the fertility continuum among contemporary nations. But projecting the fertility rates for the entire European Union forward two generations only slightly alters the Italian scenario: About 40 percent of those European children would have no collateral blood relatives; less than one-sixth would have a brother or a sister and a cousin. Families in the "less developed regions" in the year 2050 would not have moved so far in this direction. But they would in time: Within another generation or two, a family consisting of siblings, cousins, uncles, and aunts would be anomalous throughout the entire world.

While it is possible to describe this new typology of the family, it is almost impossible today to imagine what it would portend. Throughout the remembered human experience, the family has been the primary and indispensable instrument for socializing a people. In the family, the individual found extended bonds of obligation and reciprocal resources—including emotional resources—upon which he could draw. Under the demographic projections considered here, all that would change momentarily. For many people, "family" would be understood as a unit that does not include any biological contemporaries or peers.

How will each person's little tribe be formed in such a future? Who will we play with, learn from, love unthinkingly, and fight with ferociously, knowing all the while that we can

do these things because we are linked together by an indissoluble common tie? If "family," to paraphrase Robert Frost, "are the people who must take you when no one else will," and blood relatives one's own age are no longer the norm, who then will take us in?

The nuclear family may have marked a radical departure from previous sorts of family arrangements. But, as we have just seen, the nuclear family does not begin to approach the limits of social atomization that may await us in a depopulating world. Difficult as the implications of these changes may be to comprehend today, we may yet manage to assess them very carefully. For it is not impossible that we will eventually experience them firsthand.