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Editors

Demographic Transition and Its Consequences

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Participants at this Madrid meeting agreed that publication of a selection of the papers would be a useful contribution to the field. In addition to the authors represented here, those attending the meeting—and equally responsible for its success—include: Tim Hatton, Bobbi Low, Lesley Newson, Héctor Pérez Brignoli, Jan Van Bavel, Gustavo de Santis, Giambattista Salinari, Peter Richerson, Ralph Hakkert, Blanca Sánchez Alonso, Miguel Requena, Juan Antonio Fernández Cordón, Joaquín Arango, Vicente Pérez Moreda, Ignacio Duque, Rosa Gómez Redondo, Leandro Prados de la Escosura, César Molinas, Teresa Castro, Diego Ramiro, and Nicolás Sánchez Albornoz. We would like to take this opportunity to thank all of them. Special thanks are also due to Elisa Muñoz Barba, who coordinated the entire event.

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R.D.L.
D.S.R.

Introduction: The Landscape of Demographic Transition and Its Aftermath

RONALD D. LEE
DAVID S. REHER

The goal of this volume is to discuss the long-term implications of the demographic transition throughout the world. The term "demographic transition" refers to the secular shift in fertility and mortality from high and sharply fluctuating levels to low and relatively stable ones. This historical process ranks as one of the most important changes affecting human society in the past half millennium, on a par with the spread of democratic government, the industrial revolution, the increase in urbanization, and the progressive increases in educational levels of human populations.

During the transition, mortality typically begins to decline first, followed some decades later by fertility decline, leading to a series of changes in population growth rates, size, and age distribution that continues for many decades. This pivotal process started in many European countries and parts of the Americas well over a century ago and is currently underway in most of the world. The presumption is that it will eventually affect all countries.[1] No country has completed this process, since mortality decline will most likely continue, and population aging lies mainly in the future even for countries like Japan that are farthest along this path. The transition transforms the demography of societies from many children and few elderly to few children and many elderly; from short life to long; from life-long demands on women to raise young children to the concentration of these demands in a small part of adulthood; from horizontally rich kin networks to vertically rich ones. The transition made possible the radical change in women's economic and social roles; the invention of retirement as the third stage of life; and a demographic efficiency that fostered heavy investment in the human capital of fewer but longer-lived children. Some of these implications were visible soon after the

transition began, while others only became apparent much later. Some of these effects have been beneficial for the societies involved while others are much less so. Some of the major challenges facing societies today are a direct or indirect consequence of the demographic transition.

From a strictly demographic standpoint, the entire process of transition has generated four changes that have deep and lasting effects for society. (1) As just mentioned, any long-term reduction in fertility will lead to lasting changes in population age structures. Initially these changes affect the relative weight of the very young in society and lead to an increase in the relative importance of working-age populations, generating what has been called the first demographic dividend. Further on, however, low fertility reduces the growth rate of the working-age population and brings about a top-heavy age structure and rising old-age and total dependency.[2] The pace of population aging is particularly rapid whenever there are prolonged declines in the aggregate number of births. The process of aging may be one of the most important effects of the demographic transition as it has multiple and wide-ranging social and economic implications for society. (2) Reductions in fertility coupled with increasing life expectancy have a direct effect on kin groups: the overall size of the network surrounding any given person shrinks, reducing its breadth and lengthening its generational depth. Mirroring the population age distributions, before the demographic transition kin networks were bottom-heavy, and more distant kin (cousins, uncles, aunts, etc.) played an essential role in family life. Once fertility and mortality declined, family size diminished, the number of lateral kin declined substantially, and parents, grandparents, and even great grandparents became increasingly important for family life. (3) By definition, increasing reproductive efficiency leads to a dramatic liberation in the time spent by mothers in bearing and rearing children. This fundamental alteration in women's lives leads to a host of changes influencing women and their role in society, affecting their children and affecting men everywhere. (4) Substantially longer life raises the return to investments in human capital and greatly expands the years spent at older ages, where labor supply is diminished or there is outright retirement.

The nature of the demographic transition and the way it has been experienced does much to explain just how human society got to where it is today. Differences in this process also help explain differences around the world today. Because the transition is a global phenomenon, the fact that various parts of the world are at different stages of the demographic transition helps us chart at least part of the future course among the relative newcomers to it. Forecasting the future is always risky and uncertain, but identifying the transition as a pathway to change enables us to understand more clearly the contexts of change to come for many countries.

The chapters included in this volume address the demographic transition and its consequences from a variety of angles. Part one reviews and analyzes

the medium- and long-term social, economic, and evolutionary implications of the demographic transition. Part two concentrates on the process of aging and how it affects intergenerational transfers. Part three reviews the process of demographic transition from a regional perspective with special reference to several major developing countries. The final part of this volume contains two overarching perspectives on the potential implications of future population decline and on the role of policy for demographic change in both past and future.

In his chapter on the social and economic implications of the demographic transition, David Reher contends that the process of demographic change led to profound social and economic change in society through four key pathways: changing age structures, increased internal and international migration, increased reproductive efficiency derived from declining fertility and childhood mortality, and increased longevity. He argues in favor of demographic change as a cause rather than a consequence of social and economic change and as a central element of modernization. He asserts that the transition opens a window of opportunity for far-reaching social and economic change. The amount of time that this window remains open depends on the speed of changes in vital rates. Reher concludes that for the more recent and rapid transitions, the amount of demographically favorable time available for economic progress before the onset of the negative consequences of the transition in the form of aging and shrinking labor supply will be less, and this fact may prove to be an obstacle for the successful completion of this cycle of change.

In his chapter on urbanization processes past and present, Tim Dyson argues that these processes resulted from the way in which societies experienced the demographic transition. In his view, the orthodox explanation of urbanization as based on economic factors (such as industrialization, higher incomes, etc.) and the ability of cities to attract immigrants only identifies subsidiary causes: the prime mover was rapidly growing surpluses in rural populations caused by the intrinsic dynamics of the demographic transition. Following on his reasoning, the faster pace of demographic transition in the developing world, accompanied by far higher population growth rates than in the historic transitions, should lead to an accelerated pace of urbanization, as indeed appears to be the case. Dyson also argues that sustained economic growth can more reasonably be considered the consequence of urbanization rather than its cause. In short, he suggests that mainstream accounts of both the demographic transition and urbanization have often wrongly considered effects to be causes.

Michael Murphy assesses the impact of changing vital rates on kin networks, using a microsimulation model to reconstruct the changing dimensions of kin groups in Britain from 1850 to the present day. He considers how the family and kinship networks change in a population that moves from a re-

gime of high fertility and mortality to one with low fertility and mortality and distinguishes between those aspects of kinship networks that are sensitive to short-term changes in demographic rates and those that are persistent. Different age groups in society are affected differently. Although the childhood experiences of cohorts over the past 150 years, as reflected in ever-born sibship size, are very different, the adult experiences, as reflected in living sibship size, are much more similar, especially from about age 65 onward, as a result of mortality improvement. A similar pattern holds for more distant kin. One of the main conclusions of this chapter is that changing fertility and mortality patterns associated with the demographic transition have effects that may take up to a century to manifest themselves within the kinship system. The changing demographic regime that causes the aging of populations also entails an aging of generational relationships: events that formerly occurred early in life are now being delayed, such as the death of one's parents, and some, such as becoming a grandparent, vary substantially for different cohorts.

The changing frequency and availability of kin have many consequences for society. Rebecca Sear and David Coall consider the consequences for fertility and for child survival and well-being, drawing on a literature in anthropology and human evolution for both pre- and post-transitional populations. They conclude that family does indeed matter for child outcomes, notably survival. The evidence for an effect on fertility is less clear, but they demonstrate that children in contemporary societies receive care from a different set of individuals than was typical earlier. These findings lend support to the view that humans are "cooperative breeders," evolved to rely on others besides parents for reproductive success. The comparative importance of particular relatives varies from population to population.

Part two of this volume contains three chapters addressing aspects of population aging, one of the most visible implications of the demographic transition. Ronald Lee and Andrew Mason use data from National Transfer Accounts, a large international project they direct, to measure changing economic behavior over the life cycle and changing economic relations among generations. Income is reallocated from the surplus generated in the working years to rear children and to support the elderly, either through the family or through the public sector, leading to upward and downward income flows across the age distribution. After averaging out these flows, the direction of the *net* income flows shifts from downward (from older to younger) in low-income countries to upward (from younger to older) in many of the rich industrial countries. Lee and Mason show that this shift in direction is mainly due to population aging in the rich countries, and therefore is rooted in the demographic transition. Family transfers ("wealth flows") are strongly downward in all countries.

Luis Rosero-Bixby also uses data from the National Transfer Accounts to examine the profile of intergenerational transfers in five Latin American

countries. He concludes that in this region consumption by children is financed fundamentally by the family and to a lesser extent by governments, while at older ages consumption is financed mostly by individual assets and, again to a lesser extent, by public transfers. When combining these expenditure profiles based on recent experience with the probable course of population aging over the coming decades, he argues that the perception that the elderly will be a burden for their children is largely a myth because they are relatively well-off, receive substantial governmental transfers, and in some cases may even have labor income. The generational transfer system in Latin America will make the national treasury the most important (and perhaps the only) casualty of population aging in the region. This view is further supported by the relatively high levels of coresidence between the elderly and family members (normally children). Eventually, families will have to come to terms with the requirement of providing long-term care for their elderly relatives.

Tommy Bengtsson and Kirk Scott discuss the case of population aging in Sweden. Long one of the world leaders in aging, the share of the elderly in Swedish society is slated to approach one quarter of the total population by 2040. This process will impose critical challenges for society, and it is not clear whether Sweden will be able to handle this next stage of aging as successfully as it did the initial one characterized by an expansion of the welfare state and rising living standards for all age groups. The pension system was overhauled in the 1990s to make it more robust, but this step will not be sufficient to meet the challenges in the coming years. The authors discuss the options available to Swedish society, including increasing taxes, raising productivity, encouraging higher migration, raising fertility, and prolonging the working life.

The next two chapters contain regional perspectives on the demographic transition. Wang Feng analyzes the current situation and probable future course in China, which he considers an "overachiever" in the global demographic transition. China's exceptionality is related to its sheer magnitude, the drastic speed of change, and in particular the prominent role of the state. He argues that there are also many similarities between the Chinese experience of transition and that of other countries, not the least of which is that fertility had already fallen significantly before the advent of the one-child policy. As an overachiever in the global demographic transition, China also faces a faster unfolding of many of the consequences. These include rising social risks for Chinese families, as exemplified by a large share of the elderly without children or other relatives at the last stages of their lives, an outcome in part due to the Chinese state's three-decade-long one-child policy.

Geoffrey McNicoll undertakes a comparative analysis of the demographic transition in two resource-rich and culturally diverse countries that are relative newcomers to fertility decline. A half century ago, Indonesia and Nigeria appeared to be similarly placed in development level and both had

high fertility and high mortality. Their subsequent economic and demographic performance, however, has been radically different: Indonesia moved toward an East Asian style of growth accompanied by a progressive reduction of poverty, whereas in Nigeria growth stagnated, the economy became increasingly dominated by oil and natural gas revenues, and poverty remained undiminished. The demographic transition in these countries also contrasted sharply: while Indonesia currently has a life expectancy close to 70 years and fertility averaging little over two births per woman, Nigeria's life expectancy is still below 50 and its fertility is above 5. McNicoll explains these divergences by differences in governance and policy choice, in inherited resources and institutions, and in external conditions. With respect to fertility, he argues that differences in institutional inheritance have been especially important, putting significant obstacles in the way of a Nigerian fertility decline that were not present or could be fairly readily overcome in Indonesia.

David Coleman and Robert Rowthorn examine the prospect of long-term population decline, considered by some to be one of the ultimate consequences of the demographic transition. Decline, if indeed it takes place, can be a response to environmental, economic, or political distress or, as in the case of Southern Europe and East Asia, may take place even in relatively benign situations and have more subtle causes. The authors argue that the implications of population decline need not be catastrophic and, especially when rates of decline are modest, may be manageable and scarcely perceptible. Smaller population size may be irrelevant to most aspects of political, social, and economic welfare and beneficial for environment and sustainability. In the future, adaptation to smaller size may in any case become unavoidable.

In the volume's final chapter, Paul Demeny provides a sweeping overview of more than three centuries of government policies affecting reproduction. The onset of the fall of fertility in Europe and elsewhere, which brought fertility to eventual low levels in many countries, reflected the aggregate consequences of individual initiative and behavior rather than deliberate policies. During the interwar years, the prospect of eventually declining population generated discussion of policy measures that might increase fertility. But the post–World War II baby boom rendered such interest temporarily moot. The main policy concern of the second part of the twentieth century was focused, instead, on the question of how to moderate the unprecedentedly rapid population growth in the less developed world. The resulting attempts to shape reproductive behavior have met both success and failure; the agenda, despite ubiquitous fertility decline globally that can be observed today, is still unfinished. By the turn of the millennium, low fertility once again became a policy issue in places where the optimistic outcome—a convergence of fertility to close to replacement levels, either spontaneously or nudged by mild fertility-stimulating policies—seems highly uncertain. The alternative prospect, fertility settling deeply below that level, bringing eventual rapid

population decline and extreme population aging, may be real enough not only in numerous developed countries but also more widely on the global scene. Demeny suggests that the emergence and persistence of very low fertility would pose difficult challenges for societies. It would require thinking "outside the box" of familiar policy tools and the development of innovative policies. He concludes by outlining possible new policy approaches.

Notes

1 In his seminal article on the demographic transition, when referring to those countries with "high growth potential," Frank Notestein (1945: 52) stated: "If, on the other hand, a period of peace, order, and rapidly rising production were to be accompanied by a thorough and balanced modernization, we could expect the same or even faster immediate growth but a different termination. If such developments brought urbanization, industrialization, rising levels of living, popular education, and popular participation in political life, the same forces that eventually induced a declining fertility in the West would probably come into play. The population would then undergo transitional growth, perhaps tripling in the process. If events marched swiftly and studied efforts were made to induce declining fertility, perhaps only a doubling of present populations would be involved." (Frank W. Notestein, "Population—The long view," in Theodore W. Schultz (ed.), *Food for the World*. Chicago: University of Chicago Press, 1945, pp. 36–57.)

2 Youth dependency refers to the ratio of children to the working-age population, and old-age dependency to the ratio of the elderly to the working-age population, where the age boundaries used to define these categories vary. Total dependency refers to the sum of youth and old-age dependency, indicating the total number of dependents per working-age person.

IMPLICATIONS OF THE DEMOGRAPHIC TRANSITION PAST AND PRESENT

Economic and Social Implications of the Demographic Transition

DAVID S. REHER

In its original formulations, demographic transition theory was a detailed description of the mechanisms of change in mortality and fertility with considerations on how this would affect the demographic development of the world in the future (Notestein 1945; Davis 1945; Chesnais 1986). From the outset, research has seen the transition as a byproduct of a larger process of social and economic change. Ansley Coale's pioneering paper on the dynamics of fertility change and its causes was pivotal for this line of research (Coale 1973). An underlying purpose of the Princeton European Fertility Project was to see fertility change as the consequence of social and economic change (see, for example, Coale 1986). Even though the results of these efforts were not conclusive and have led to often contradictory explanations of fertility change, the effort to explain fertility change as the result of social change continues to be the subject of myriad publications in the field of historical demography.

The reason for this ongoing interest is wholly understandable given that at the same time the demographic transition was taking place, Europe, and the West at large, were undergoing a massive process of social and economic transformation. Living standards and educational levels were rising, society was becoming increasingly urban, the industrial and services sectors of the economy were surpassing agriculture both in production and in social relevance, time off was becoming an expected compensation for jobs, consumer society was beginning to emerge, and women were about to the enter labor market *en masse*. It was arguably the most important social and economic change to take place in Europe in centuries. It is only natural that students of the demographic transition would want to see it as part of the larger process of economic and social modernization, with demographic change largely guided by social and economic change. Rather less attention has been given to the demographic transition specifically as a cause rather than as a consequence of this process of change. Ultimately, historians and social scientists tend to

conceptualize demographic realities as determined by economic forces rather than the other way around.

I argue here that in many ways demographic change can and should be seen as an essential factor of change. The demographic transition will be considered as a largely autonomous process that ended up having profound social, economic, and even psychological or ideational implications for society (Demeny 1972: 154). Demography will be seen an independent variable. It is clear, of course, that history is never unilateral, and it is undeniable that this period of enormous change had many constituent causes. I will show that demographic change was one of them and by no means an insignificant one. This chapter seeks to contribute to a more balanced interpretation of the social and economic modernization that occurred in Europe and elsewhere between 1850 and 1975. Many of the arguments will refer to the transition among the forerunners of the process, the historic demographic transition. It will also evaluate the extent to which this same process is underway in the developing world and how the way these societies undergo their own transitions might condition the effects these processes have for development and social change.

The demographic transition: When, where, and how

The strictly demographic components of the demographic transition are fairly clear. The origins of the historic transition, which affected much of Europe together with certain non-European societies with deep European roots (Argentina, Uruguay, the United States, Canada, Australia, New Zealand), are subject to debate. In most of these countries mortality had been declining since the mid- to late-eighteenth century, and there is some indication that fertility had also declined, although in most cases only slightly. The result was a period of increased population growth. During the second half of the nineteenth century, vital rates in many countries reversed course and increased slightly. This process, often referred to as the "ski-jump effect," was the immediate precursor to dramatic declines in both mortality and fertility starting toward the latter part of the nineteenth century or the beginning of the twentieth. It is this last process that is generally considered to be the demographic transition, although its origins date from much earlier.[1]

Nearly everywhere mortality decline preceded fertility decline. Child mortality was the first to decline, followed somewhat later by declines in infant mortality (Reher 1999). There was also a more gradual reduction of mortality among adults. The response of fertility to these changes took place within marriage in the form of conscious birth control. It has been shown that marital fertility began to decline shortly after the decline in childhood mortality had started, with women of relatively late reproductive ages being the ones who appeared to have controlled fertility first and most effectively. Women's declining ages at last birth are generally considered to be the hall-

mark of fertility control within marriage, although other mechanisms such as birth spacing may have been at work as well (Anderton and Bean 1985; Van Bavel 2004; Van Bavel and Kok 2004; Reher and Sanz-Gimeno 2007). For several decades, the pace of mortality decline surpassed that of fertility decline. As a result, completed family size tended to increase as did population growth rates. A hallmark of this process is that changes in vital rates were fairly gradual, with the resulting population growth rates seldom much above 1 percent per year. When viewed from the perspective of the present, these transitions appear to have taken place in slow motion.

The second wave of fertility transition began between the 1950s and the 1980s. The countries initially leading this wave were regional leaders or countries with close ties to Europe. Eventually, however, the vast majority of the world's population ended up being affected. The basic dynamics of this second wave of change have great similarities to the historic transitions with three relevant exceptions: (1) the pretransition vital rates tended to be higher; (2) the pace of decline of vital rates was considerably faster than in the historic transition; (3) population growth rates far surpassed those reached during the first transition (Reher 2004).

Reproductive change did not take place in a social and economic vacuum. Improvements in child health were related to increased knowledge of the importance of child care and feeding practices. The ability of mothers to implement these ideas emanated from the work of scientists and physicians such as Louis Pasteur and others and benefited from increased living standards and nutritional levels in the population as a whole (Schofield and Reher 1991; McKeown 1976; Biraben 1991). Physicians also played a role in guiding public health initiatives such as the *gouttes de lait*[2] or the contribution of midwives in mediating child health, but physicians accomplished little from a strictly therapeutic standpoint (Kunitz 1991). Ultimately, health improvements took place with a relatively low level of technological sophistication (Riley 2005a,b,c). Birth control itself was based largely on abstinence or withdrawal, traditional but technologically unsophisticated methods of preventing births. There is a large literature on the underlying reasons for fertility decline during this period, but no consensus explanation has emerged (Szoltysek 2007). All of this changed during the demographic transition in the developing world as antibiotics and artificial contraception teamed to provide an important technological component. In both transitions, education aimed preferentially at mothers, initially with respect to infant care and later regarding reproductive decisions, was important.

Reproductive transitions and economic and social change: A framework

The demographic changes outlined above set in motion processes that led directly or indirectly to social and economic changes (depicted diagrammati-

cally in the Appendix). These processes involved population age structures; migration; familial investments in education, health, and consumption; and adult health. Some of these played out at a societal level while others worked individually. While some of these processes had immediate effects, for others the effects were only felt over the medium or long run. These different effects will now be discussed with respect both to the way the demographic transition set them in motion and the way they led to social and economic change.

Age structures

Any prolonged decline in fertility leads to changes in population age structures. Initially these changes affect the base of the population pyramid, as the relative size of younger cohorts begins to decline. For some time, the initial decline at younger ages is not compensated by increases at older ages, and so by implication the relative size of populations of working age tends to increase. This process continues as long as the size of birth cohorts continues to rise. This was the case in most of the forerunners of the demographic transition until some time between the late 1950s and the early 1980s when birth cohorts for the first time began to decrease in size. In most European countries the period of more youthful population age structures lasted for many decades, perhaps as long as a century. In the future, this will no longer be the case, as shrinking birth cohorts lead to shrinking populations of both working age and reproductive age in many countries. While it lasted, however, this window of opportunity had profound economic implications for society, as long as the economy was able to generate enough jobs to accommodate the growing population of working age.

This fortuitous situation, often called the "demographic dividend," also appears to have been instrumental for the economic takeoff of numerous countries whose economic development occurred in the more recent past, including the Asian tigers and, more recently, such countries as Iran and Brazil (Bloom, Canning, and Sevilla 2003; Bloom and Canning 2001; Kelley and Schmidt 2001, 2007; Mason and Lee 2006). This dividend is also unquestionably a pertinent concept for the economic growth of the societies affected by the historic demographic transition. Most authors insist that the magnitude of the demographic dividend appears to depend on the ability of the economy to absorb and productively employ the growing labor force. When this happens, the economic effects can be profound and lasting. Because the window of opportunity cannot last indefinitely, it is imperative that recently developing countries move forcefully to take advantage of these optimal demographic conditions while they last. Economically advantageous age structures have also been shown to have stimulated increases in labor productivity among economically developed countries over the past half century (Lindh and Malmberg 1999).

Another positive implication of the changes in age structure put in motion by the demographic transition was that they led to the establishment of national pension schemes in which ever-increasing populations of working age paid for the pension benefits of the as-yet relatively small group of elderly. These pension systems, which would have been inconceivable without the transition of vital rates and age structures, contributed to changing the basic way these societies functioned. Pensions were and are an essential component of social welfare and also the basis for the relative social harmony that has existed in these countries over much of the past century.

Eventually these same age structures will lead to rapidly aging populations that pose a major challenge to all social systems based on the intergenerational transfers of income. This is currently happening in the earlier transition countries where population age structures are no longer conducive to generous public transfer systems or continued increases in wealth (Samuelson 1975). Mason and Lee (2006) have maintained that this negative effect can be neutralized or at least limited by the fact that life-cycle savings in situations of low fertility and low mortality will lead to an increased capital–labor ratio (called the "second demographic dividend"), which can offset, at least in part, the growing burden of old-age dependency. In a recent paper, these same authors have extended their argument by modeling the possibility that the accumulation of human capital in times of slow or negative labor force growth may lead to living standards that rise despite seemingly unfavorable age structures (Lee and Mason 2010; Lee et al. 2008). In any case, these authors also caution that the positive effects will exist provided that old age is not too generously supported through public or familial transfer programs.

Migration

The increased population growth that characterized the demographic transition proved to be a powerful stimulus for migration. Everywhere the key period for the transition of vital rates was also a period for migration. Much of this was overseas migration, but some of it was also interregional and rural-to-urban migration. The population pressure created by higher population growth rates was an unmistakable push factor for this process. Had this pressure not existed, massive migration would probably never have taken place, at least not on the scale that it did during the period 1850–1930, and then again during the second half of the twentieth century. The social and economic implications of migration are enormous for societies both in countries of origin and countries of settlement.

Migration is a more or less efficient form of redistribution of labor. During the early decades of the twentieth century it took place basically among countries that were already experiencing their own demographic transitions,

with the difference being that the sending countries were crowded and the receiving ones had an abundance of space and opportunities that required additional population. In more recent times, the direction of flows has been from underdeveloped regions with overcrowded labor markets toward the rich countries that could benefit from the inputs for their own depleted labor markets. In both periods, population pressure in the sending countries has played a major role in conditioning the potentially available supply of migrants; and in the more recent flows the demographically induced labor shortages in the host countries have also played an important role in the process.

From an economic standpoint, the major flows of migration to the Americas, South Africa, and Australia between the second half of the nineteenth century and the 1930s played a significant role in the economic growth and expansion of the host societies, mostly by furnishing the labor power and skills necessary to fuel expanding economies. With regard to the sending countries, these flows were in most cases also beneficial because: (1) outmigration reduced population pressure on available resources and created job opportunities for those remaining behind; (2) migrant remittances contributed to growth, at least at local and regional levels; and (3) when former emigrants returned home, as they often did, they brought with them higher levels of human capital than when they departed, as well as their savings. These migration flows have had a demonstrable impact on economic convergence and on the income distribution in both sending and receiving countries (Hatton and Williamson 1998, 2006). The migration of capital from older to younger countries has enhanced the economic effects of labor migration.

In more contemporary contexts, international migration plays many of these same roles, although there are differences. One such difference relates to the role of skewed age structures, much greater in contemporary migratory flows than historically. Migration today largely involves the movement of younger workers from still rapidly growing countries to those countries whose populations are aging. With regard to the sending societies, remittances, despite the difficulties inherent in managing them, continue to be an important source of income and investment. As host countries increasingly implement policies that make the entry of immigrants more difficult, the incidence of return migration in the future may become lower than it was earlier.

While the contribution of migration to economic change appears to be straightforward, its effects on society are complex, often conflictive, long lasting, and possibly much wider than those of a strictly economic nature. Everywhere migration became an important stimulus for the social mobility of first-generation and in particular second-generation migrants. The impact of the great transatlantic migration flows between 1850 and 1930 proved to be indelible in most of the host societies. Countries like the United States, Canada, Australia, Argentina, Uruguay, South Africa, and Brazil not only

have large populations who descend from nineteenth- and twentieth-century immigrants, but they continue to see themselves as immigrant societies. Sending societies were also affected, although not so deeply, as transnational families became an ongoing source of exchange and contact. It is impossible to know whether the current migration flows will have as great an impact on host societies as in the past. Nevertheless, considering the volumes of immigration involved, immigrants' cultural and religious differences vis-à-vis the host societies, and the fact that the immigrants' desire to remain in the host country appears to be very high, we may surmise that here too the effects will be lasting. In a recent article David Coleman (2006) has said as much with respect to Europe, calling its changes in population composition a third demographic transition.

The economic and social implications of rural-to-urban and interregional migration have probably been just as important as those of international migration. As a result of this internal migration, societies urbanized and the labor force was positioned where it was most needed economically. The risks, and possibly the rewards, of internal migration may have been lower than those of international migration, although the net effect on both sending and receiving areas was similar.

Reproductive efficiency

By definition, the demographic transition led to noteworthy increases in reproductive efficiency. People's reproductive goals were met with fewer childbirths and fewer childhood deaths. At first the potentially transformative effects of this change were masked by increasing population growth, as mortality declined more swiftly than fertility. Within families, adjustments to declining mortality were visible from the outset but were not always efficient because of lags in recognizing the implications of ever-faster improvements in child health. During the initial period when mortality was declining faster than fertility and net family size was increasing, child dependency ratios also rose substantially. Like population aging at the end of the demographic transition, this is a kind of negative dividend that goes largely unnoticed. Eventually, at a more advanced stage of the demographic transition, the original goal of maintaining net family size in the light of improving childhood health became one of reducing net family size (Reher and Sanz-Gimeno 2007). As childhood mortality became very low and fairly predictable, reproductive decisions could be made with a high degree of certainty. These changes and their implications are visible only gradually over time, although on a historical time scale everything appears to take place quickly. These changes had multiple effects on family life and eventually on fundamental aspects of social organization.

Before the demographic transition, when childhood mortality was high, familial investment in a child was frequently lost. At the outset of life, this parental investment was contributed mainly by mothers and can be best measured in terms of parental time. As mortality declined, so did the importance of these wasted investments (Reher 1995). This effect was enhanced by the fact that the number of births also diminished, so mothers went from a situation in which they invested widely—and perhaps inadequately—in many children with low levels of return on their time, to one in which investments were concentrated on fewer children and tended to last longer. Because the number of very young infants in families also declined, women were progressively liberated from the type of intense dedication that infants demand. Once net family size began to decline, the reduction in the number of very young people in the household led to increased family living standards and a more efficient use of women's time. Ronald Lee has estimated that women went from spending 70 percent of their adult lives bearing and rearing young children before the demographic transition, to spending only about 14 percent more recently (Lee 2003: 167).

Fewer births also led to increasing parental investments in surviving children. It has been shown that human capital expenditures per child are substantially higher when fertility is lower (Lee and Mason 2010). At first these investments were ones involving time and care. Parents were aware that chances of survival were directly related to the quality of care, both in terms of feeding practices and ultimately in terms of the attention they bestowed upon their children. These were investments in what has been called "high quality" children that are well known to parents everywhere today but were radically new at a time when parents were accustomed to having high percentages of children die early in life. One implication of these new investments was parents' increased attention to the education that their children received. Much of this education was provided at home, but the role of institutional schooling should not be underestimated. In fact, much of the enormous growth in schooling that took place during the latter part of the nineteenth century and the first half of the twentieth may well have occurred at the behest of families, whose growing interest in the matter was an important accompaniment to the general move in favor of public and private education during this period. Parental insistence on the quality of children, coupled with the generalized increase in educational levels in society—with its corollary, the removal of children from the workplace—ended up increasing the costs of children substantially. Lower fertility has also been shown to be a significant factor for the social mobility of children, especially once fertility began to fall (Van Bavel 2006). At more advanced stages of the transition, however, the direction of causality is reversed as the concern of parents for the social mobility of their children, often called "status anxiety," itself becomes an important cause of the persistently low fertility characteristic of most developed countries (Dalla Zuanna 2007).

All of these factors were critical for the eventual entry of women into the work place. Women had time available for work outside the home, the costs of children combined with the consumption expectations of families created an economic need for additional income, and women's educational levels had increased to the point where they could be gainfully employed in a wide variety of occupations (Reher 2007). Other factors were at work as well—among them the aftermath of World War II and its high levels of female employment, the opening up of economic opportunities in the services sector that had heretofore been also dominated by men, the increasing participation of public institutions (especially schools) in the care and rearing of children, and the rise in the importance of consumer society. The demographic transition created a situation in which employment after marriage had become a feasible option for many— even most—women.

The movement in favor of increased educational attainment of children has been a hallmark of developed societies for over a century and is increasingly becoming a goal for governments and families in the developing world as well. The widespread transformation of the role of women in society is perhaps the most important social change of the past half century. There is every indication that these processes are underway in the developing world as societies increasingly adopt the "developmental idealism" of the highly industrialized countries (Thornton 2001, 2005). Both increased educational attainment of children and the transformation of women's roles have their roots in the demographic transition. They are also components of what has come to be known as the second demographic transition, thus suggesting that extremely low fertility may be here to stay (van de Kaa 1987; Lesthaeghe 2010). In the long view, this process of ideational change affecting many aspects of contemporary life in the developed and in parts of the developing world appears to be rooted in the dramatic decline of fertility and increased length of life that began with the demographic transition.

Finally, the reduction in the importance of marriage as a life-long partnership can be traced indirectly to the demographic changes taking place during the transition and very directly to some of their implications. Diminished fertility limited the importance of marriage as a necessary context for reproduction, and increasing longevity changed the time scale of many life-course strategies, including those affecting partnership and marriage (Keyfitz 1987). Marriage as an institution was also adversely affected as women became better educated, increasingly able to generate income outside the household, and ever-less willing to tolerate relationships that were considered dysfunctional and increasingly able to end them. In this sense, a diminished institution of marriage was both a consequence and a cause of the profound changes affecting the role of women in society, as well as a hallmark of the ideational changes taking place in society.

Adult health and the quality of human capital

Often lost amid the spectacular improvements in childhood health during the demographic transition is the fact that adult health also improved, albeit at a more modest pace. In France, for example, the annual risk of death among persons over age 30 years decreased by approximately 25 percent between the late eighteenth century and 1913 (Vallin 1991). There were many reasons for this reduction. For Thomas McKeown (1976) it was mainly the result of improved nutritional levels and, to a lesser extent, of public health innovations. This period also saw a progressive lessening of the impact of epidemic disease (Livi Bacci 2000: 50–54).

Somewhat later, this improvement in adult health received additional stimulus from parental investments in "high quality" children. Children who are better nourished and who live in relatively benign disease environments tend to grow up fitter (Lunn 1991). As increasingly large percentages of the population lived in these sorts of environments, upon reaching adulthood they were taller and healthier than ever before. It is well known that heights, measured routinely among military recruits, increased substantially during the period of the demographic transition, especially after the beginning of the twentieth century. Heights, a convenient proxy measure of health and physical human capital, were determined both by nutritional levels and by the earlier experience of childhood disease. Heights are also good predictors of health later in life (Fogel 2004; Fogel and Costa 1997).

The gains in education, in part in response to parental demand, were also important for other dimensions of human capital among adults. In this way, the labor force became healthier, better nourished, and better educated. The net gain in the quality of human capital enabled people to lead longer and more productive working lives and to prolong their good health into later ages. All of these factors contributed to the economic growth characteristic of this period.

Beyond the strictly economic implications of increased longevity, the increased duration of life and the ever-greater chances of living to old age have had a profound effect on the way people think, the way life-course strategies are formulated, and the way life is lived. This effect, only partially reflected in the framework presented here, is perhaps the most pervasive of all of the effects of the demographic transition and one of the hallmarks of modern life. While increasing reproductive efficiency also contributes to this effect, the primacy here of longevity is unquestionable.

Other factors at work

In this stylized framework, it is useful to bear in mind a few qualifications. (1) This entire process of change is not based solely on demographically induced

factors. These factors are part of a multifaceted process of modernization that includes economic forces, government, technological advances, and expectations. Nonetheless, the role of these demographic factors is substantial, and many parts of the framework were set in motion initially by demographic change. (2) Even though the framework used sets out causality along different lines (age structures, migration, etc.), a considerable amount of cross-fertilization occurs. The most evident is that of human capital formation, which receives inputs from all of the processes described above. (3) In some cases fertility decline and mortality decline team up to set change in motion, while in other cases they act almost independently.

Demographic transitions in perspective: Vicious or virtuous circle?

In historic Europe evidence suggests that we are looking at a largely virtuous circle of demographic change leading more or less directly to economic and social modernization. The framework presented earlier appears to be widely pertinent to Europe and certain countries on other continents. Yet in many other parts of the world, where the demographic transition took place much more recently, demographic change has often appeared to be related to economic hardship, massive displacement of individuals, and social and political instability. Is this framework only valid for Europe and for the forerunners of the demographic transition? Or is it useful too as a roadmap for the future of the developing world?

The demographic transition opens a window of opportunity for economic and social change. It is a period in which demographic change can work in favor of economic and social change, rather than against it as was often the case in earlier periods. Just how beneficial its effects will be and how long they will last depend upon the size of this window. These benefits are constrained by three factors: (1) the speed of demographic change; (2) the population growth rates that are reached during the key period following initial mortality declines; and (3) the mechanisms available for population regulation. On all of these points, the earlier demographic transitions appear to have been much better situated than the more recent ones to take full advantage of the implications of demographic change.

The *speed of change* has been far faster in more recent transitions. This was the case with both fertility and mortality decline. At times the rate of change in these countries was as much as twice what it was during the earlier transitions. This can be seen in Table 1, where the rate of change in crude birth and crude death rates is shown at different intervals (ranging from 20 to 35 years) after their peak values were attained. In every case, the rate of change of developing countries is far faster than in the two developed countries used for this example (Spain and Sweden). The faster rates of decline in

TABLE 1 Pace of decline in vital rates in selected countries indicated by the proportion of the peak value recorded in given number of years elapsed since peak

Country (onset CBR, CDR decline)	Years elapsed since peak value							
	Crude birth rate				Crude death rate			
	20	25	30	35	20	25	30	35
China (1968, ±1950)	0.64	0.51	0.43	0.38	0.25	0.27	0.29	0.30
Costa Rica (1962, 1927)	0.68	0.65	0.56	0.48	0.58	0.57	0.50	0.43
Ethiopia (1988, ±1950)	0.80				0.69	0.66	0.70	0.64
India (1978, ±1950)	0.77	0.70	0.64		0.60	0.51	0.47	0.44
Iran (1982, ±1950)	0.44	0.42			0.58	0.51	0.47	0.36
Morocco (1973, ±1950)	0.67	0.57	0.49	0.43	0.61	0.51	0.42	0.34
Senegal (1977, ±1950)	0.84	0.80	0.79		0.86	0.76	0.66	0.58
Sri Lanka (1960, 1938)	0.73	0.66	0.57	0.52	0.62	0.49	0.40	0.32
Tunisia (1965, ±1950)	0.73	0.65	0.52	0.40	0.54	0.45	0.35	0.31
Turkey (1958, ±1950)	0.70	0.67	0.56	0.52	0.49	0.43	0.40	0.37
Venezuela (1962, 1919)	0.71	0.67	0.60	0.54	0.71	0.67	0.55	0.41
Spain (1902, 1892)	0.86	0.82	0.79	0.63	0.73	0.79	0.68	0.60
Sweden (1877, 1877)	0.88	0.86	0.84	0.77	0.84	0.83	0.78	0.74

NOTE: The date for the onset of fertility or mortality decline is defined as the five-year period in which peak values are achieved just prior to a minimum 5 percent drop in the next five-year period, with no subsequent rebound to earlier levels. The dates of the onset of fertility and mortality decline in each country are provided in parentheses. In many countries mortality decline likely began before 1950–54, the earliest period for which data are available.
SOURCES: For the post-1950 period: United Nations, *World Population Prospects Database, The 2008 Revision* «http://esa.un.org/unpp/»; for the pre-1950 period: Mitchell (1998a, b, c).

more recent transitions are due mainly to the intervention of elements foreign to those societies. In historic Europe, the demographic transition was largely endogenously driven, the product of the education of mothers, public health initiatives, increases in living standards, and more general social changes. It was carried out with fairly low levels of technological sophistication. Mothers learned to feed their children more safely and nutritiously than before, and control of births was initially achieved for the most part by withdrawal or abstinence. In more recent transitions, these factors have also come into play. Yet there were other forces as well, most of which were, at least initially, foreign to those societies and involved considerable levels of technological sophistication. The instruments of change for these transitions were efficient contraceptive techniques, antibiotics, international vaccination programs, and public health measures related to water quality and sewage disposal, all of which were aggressively promoted both by local governments and by international organizations (Reher 2004). Once they began to be used widely, they were much more efficient than the techniques (affecting both fertility and childhood health) implemented by earlier populations. Exceptions to this pattern are the two African countries included in the table—Ethiopia and

Senegal—where the rate of decline of vital rates has been much slower than that of other more recent transitions.

The *rate of population growth* has also been much higher during the more recent transitions. By their very nature, all demographic transitions lead to accelerating growth rates because mortality tends to decline earlier and, initially, more quickly than fertility. If growth rates spiral out of control, many of the virtuous mechanisms linking demographic transition to social change can be short-circuited or at least delayed and muted. The positive effects forecast for age structures will not take place if rates of population growth overwhelm available opportunities for migration and the ability of local economies to create jobs. Rapid growth in net family size can also neutralize many of the positive effects of increased reproductive efficiency. Here the difference between historic and recent transitions has been enormous. In earlier transitions population growth rates rarely exceeded 1 percent per year and often were lower. In more recent transitions, growth rates have been extremely high, often in excess of 2.5 percent or even 3 percent per year, with net family sizes nearly doubling in just a few years (Table 2). For two or three decades, the population of working age (15–64) in many of these countries was increasing by 15 percent or more at five-year intervals.

There are two mechanisms behind this reality: (1) Pretransitional growth rates were invariably higher in societies with more recent transitions. (2) The gap between mortality decline and fertility decline was far larger in more recent transitions (25–35 years, as opposed to less than ten years in

TABLE 2 Natural growth rates (per year per thousand) in selected countries with respect to the number of years before or following the onset of fertility decline

Country/ Onset of decline	Years				
	–10	–5	0	5	10
China 1968	15.4	20.9	26.0	22.3	14.8
Costa Rica 1962	31.1	33.3	34.1	28.0	23.8
Ethiopia 1988	26.4	28.9	30.1	28.7	27.1
India 1978	21.5	22.1	23.1	22.4	21.4
Iran 1982	29.3	32.0	34.8	30.6	22.4
Morocco 1973	27.7	30.5	30.8	29.9	26.4
Senegal 1977	27.6	28.8	30.0	30.2	30.3
Sri Lanka 1960	22.6	17.7	23.3	23.0	23.1
Tunisia 1965	23.8	26.4	28.6	26.3	24.8
Turkey 1958		27.3	28.4	27.4	26.7
Venezuela 1962	34.1	34.2	35.8	32.4	28.6
Spain 1902	4.3	5.7	8.3	9.1	8.8
Sweden 1877	12.0	11.8	12.6	10.6	11.2

SOURCES: See Table 1.

most historic cases).[3] In many developing countries, for years after childhood mortality began to decline fertility actually tended to increase. The reasons for this disparity are not fully understood, although three of them are worth mentioning here. (1) In societies with more recent transitions, marriage and reproduction appear to have been less closely linked to available economic resources than in historic Europe. (2) The fact that in more recent transitions the reduction in vital rates was closely linked to technological advances imported from other societies may have delayed their acceptance among native populations. This was especially the case with artificial birth control, where resistance to measures proposed by international organizations was often widespread (Reher 2004). (3) The coincidence in many countries of the period of mortality decline with that of the baby boom cannot be discounted as a possible explanation for persistently high, even increasing, fertility in those countries. Ultimately, these growth rates overwhelmed any positive effect of the demographic transition for social and economic change. Not until rates began to diminish did the salubrious effect of the transition become manifest.

In historic transitions, apart from marriage and fertility control, the principal *mechanism for population regulation* was migration. The ready availability of significant migration options for potentially surplus population was an important part of the success story of the demographic transition in Europe. Migration was encouraged by both the sending and the receiving countries. While migratory options have also been used in more recent transitions, this mechanism has not been nearly so efficient. The potential demand for emigration appears to be far greater than in historic Europe, mostly because of extremely rapid population growth rates in sending countries. Complicating matters, the international environment for migration has worsened considerably, as host countries adopt increasingly anti-immigration policies.

These differences have implications for the effects of the demographic transition. The pace of the transition in Europe was leisurely when compared to the breakneck pace in much of the developing world. Unquestionably in Europe, too, it was a period of social and political conflict, caused in part by society's inability to adequately accommodate increasing numbers of persons, especially in urban areas, and it constituted a critical challenge for governments. Yet in light of the experience of countries in the developing world, its pace was indeed leisurely, as population growth rates were moderate and international migration was both an effective safety valve and a major source of investment and creation of human capital. The transition led to a prolonged period of highly beneficial contributions of population to the creation of wealth and the modernization of society.

Is the demographic transition underway in much of the rest of the world also a factor contributing to social change and modernization? Certainly it is, yet in many countries all of this is happening against a backdrop of over-

crowded cities and the persistent inability of economic growth to significantly improve living standards.[4] The recent decrease in population growth rates may, for the first time in the past half century, allow for the possibility of significant increases in living standards in developing societies. Rapid population growth rates in these more recent transitions have delayed the positive effects of the demographic transition but have not stopped them. Ultimately all countries undergoing the transition will benefit from a demographic dividend, as a result of their age structures and the ability of demographic change to stimulate other kinds of social change.

Just how long can one expect the beneficial effects of the demographic transition to last? In Europe and much of the rest of the developed world, rapid population aging has altered the trend toward increasingly positive age structures that characterized national populations for over a century. Population growth is no longer conducive to social and economic change, but has become a principal obstacle to many aspects of social and economic well-being. This change is also inherent in the demographic transition as people's expectations become increasingly at odds with the high rates of population reproduction and fertility has declined to levels once difficult to imagine (Reher 2007).

In recent transitions something similar may be taking place. In a wide range of countries there are many positive signs. Population growth rates have declined sharply and promise to continue along this line in the future. Nearly everywhere child dependency ratios are also down significantly. In nine of the 11 developing countries referred to in this chapter, over the past 30–40 years ratios have declined by more than 50 percent in five of them (China, Costa Rica, Iran, Morocco, and Tunisia), by 40 to 50 percent in another three (Sri Lanka, Turkey, and Venezuela), and by over 30 percent in India. Equally important, nearly everywhere adult health continues to improve, educational levels are increasing, and the female labor force population is rising. In these countries, apart from periodic, often severe recessions, economic growth also appears to be outstripping population growth by a wide margin. In China this growth is in the process of completely reshaping Chinese society and the world economy. Elsewhere growth is more modest but is still strikingly different from the situation holding only 10–20 years ago in these same countries. These hallmarks of change are similar to those seen in earlier transitions. The exception to this pattern is sub-Saharan Africa, where the decline in population growth has been very limited and no improvement in age structures can yet be seen.

Negative processes are also at work, however. Population aging will be far faster in the developing world than it ever was in Europe. This fact is implicit in the pace of reduction of vital rates, which far exceeds the pace found anywhere among the historic transitions. In nearly every country in our sample, the number of births has been declining steadily for the last two or three decades. In the past 15 to 20 years, aggregate numbers of births in

China have declined by 31 percent, in Costa Rica by 8 percent, in Iran by 33 percent, in Morocco by 19 percent, in Sri Lanka by 14 percent, in Tunisia by 31 percent, and in Turkey by 14 percent. Only in India and Venezuela have these declines been negligible (around 2 percent).[5] Should this trend persist—and there is every reason to expect it will do so—the result will be a rapid acceleration in population aging. In a very few decades these countries will be faced with a decrease of population of working and reproductive age that will have implications both for the labor market and for future numbers of births. At that stage, the situation of these countries undergoing more recent demographic transitions will no longer be so bright, as they too will be confronted by rapidly aging populations.

TABLE 3 Estimating the window of opportunity for countries undergoing the demographic transition

Country	Onset of fertility decline (year) A	Date natural growth <2.0% B	Date natural growth <1.5% C	Date number of births starts to decline D	30 years after births start to decline E
China	1968	1975	1979	1987	2017
Costa Rica	1962	1994	2005	1989	2019
India	1978	1995	2005	1992	2022
Iran	1982	1995	1998	1990	2020
Morocco	1973	1993	2002	1983	2013
Sri Lanka	1960	1980	1990	1981	2011
Tunisia	1965	1991	1996	1986	2016
Turkey	1958	1985	2001	1985	2015
Venezuela	1962	1986	2009	1991	2021
Spain	1902	1902	1902	1976	2006
Sweden	1877	1877	1877	1966	1996

	Estimated duration (years)			
Country	D–A	E–A	E–B	E–C
China	19	49	42	38
Costa Rica	27	57	25	14
India	14	44	27	17
Iran	8	38	25	22
Morocco	10	40	20	11
Sri Lanka	21	51	31	21
Tunisia	21	51	25	20
Turkey	27	57	30	14
Venezuela	29	59	35	12
Spain	74	104	104	104
Sweden	89	119	119	119

How long does the window of opportunity afforded by the demographic transition last? The answer can be estimated, at least in a general way. Table 3 contains three key dates and two conditions for the sample of countries used in this chapter.[6] The dates correspond to the onset of fertility decline (A), the date at which the aggregate number of births begins to decrease (D), and 30 years after that date (E). The second date reflects a turning point when the entire process of population aging—underway from the outset—accelerates rapidly. The last date, situated arbitrarily 30 years later, represents the moment at which shrinking numbers of births lead to cohorts of decreasing size in the population of working and reproductive age. At this last stage many of the positive social and economic effects of the demographic transition are likely to have disappeared, as rapid aging with its attendant demands becomes the main challenge facing these societies. Ideally, the window of opportunity for economic and social change should last during the period spanning the first and second dates (D–A) or the first and third dates (E–A). I have introduced an important caveat in this very simple model, by making the window of opportunity dependent on the existence of moderate population growth rates. The contention is that excessively high rates of population growth will tend to overwhelm most or all of the beneficial effects set in motion by reproductive change. The levels of growth considered tolerable for positive social change have been set at 1.5 percent and 2 percent per year. The higher rate is rather optimistic because it is difficult to imagine positive effects in contexts of such high rates of population growth. The lower rate is closer to what is probably tolerable growth, although here also the suspicion is that it might be too high.

Using these criteria, the duration of this window of opportunity has been estimated in the lower panel of Table 3. The results are striking and hardly lead to optimistic conclusions. For the two examples of historic transitions, this window lasted well over a century and is now closed. For the other countries in the sample, even though all of them have finally entered into this hypothetical window of opportunity, it is unlikely that it will last very long. Depending on the criteria used, this benign period of demographically assisted social and economic change should last between 10 and 30 years, far less than it did in the European examples. Only in China will the window of opportunity last slightly longer (perhaps 40 years) thanks largely to the dramatic decline of fertility that took place in the 1970s, for the most part prior to the government's establishment of the one-child policy in 1979. Even in China, however, the window of opportunity promises to be short as the reality of rapid population aging looms large, with the population of working age slated to begin to decline within the next 5–10 years.

Ultimately, the demographic transition in much of the developing world has been highly compressed, while in areas where it occurred earlier it was much more gradual. In the first case, rates of improvement in dependency

ratios tend to be higher but the window of opportunity closes much earlier, while with historical transitions rates of improvement were slower but the window remained open longer. From the standpoint of long-term social, economic, and institutional change, I have argued in this chapter that the more gradual pace of change was ideal because it afforded countries the time to take advantage of this context in a stable and lasting fashion. It is not clear whether there will be time enough for countries undergoing more recent transitions to reap the full benefits from these momentous demographic changes.

Concluding remarks

With the possible and only partial exception of the United States, with its relatively high fertility coupled with substantial immigration, the historic transition countries are about to enter a prolonged period in which the effects of population aging on economic growth and social systems are likely to be negative. The cycle of beneficial effects of the demographic transition appears to have run its course in these countries, and a darker side of the process has begun, accompanied by increasingly public concerns for the long-term social stability of many developed countries. Despite this, the demographic transition has facilitated the existence of a society that is entirely different from the past, with high living standards, educated and informed populations, consolidated pension and other income redistribution systems in place, and a stable institutional context. Many of these achievements will prove to be lasting, even in the difficult times that undoubtedly will come in the future. In other words, in these societies, the transformation has been complete.

Most countries with more recent demographic transitions are just now seeing their own window of opportunity. After having many of the potentially positive effects of the demographic transition thwarted by extremely high population growth rates over several decades, they are now positioned to reap some of the benefits of this growth in reproductive efficiency. Will there be time enough in these countries to fully transform their societies, as was done in Europe and elsewhere? The answer is uncertain. Important disparities characterize this group of countries, with some having fully modernized in past decades (including several countries of East Asia), while others continue to be mired in underdevelopment and poverty. It is unquestionable that these countries will have far less time to revamp their social structures than those countries experiencing earlier demographic transitions, although it is also true that the pace of economic and social transformation in at least some of these societies is far faster than it was in historic Europe. One cannot help but suspect that levels of social, economic, and institutional development may continue to be insufficient in many countries when their window of opportunity closes. This is, of course, highly speculative and it is still far too early to forecast the results of these trends with any confidence. Even so, it

seems clear that the demographically benign period will be brief. It behooves these societies to embark on and, if possible, complete their development processes quickly.

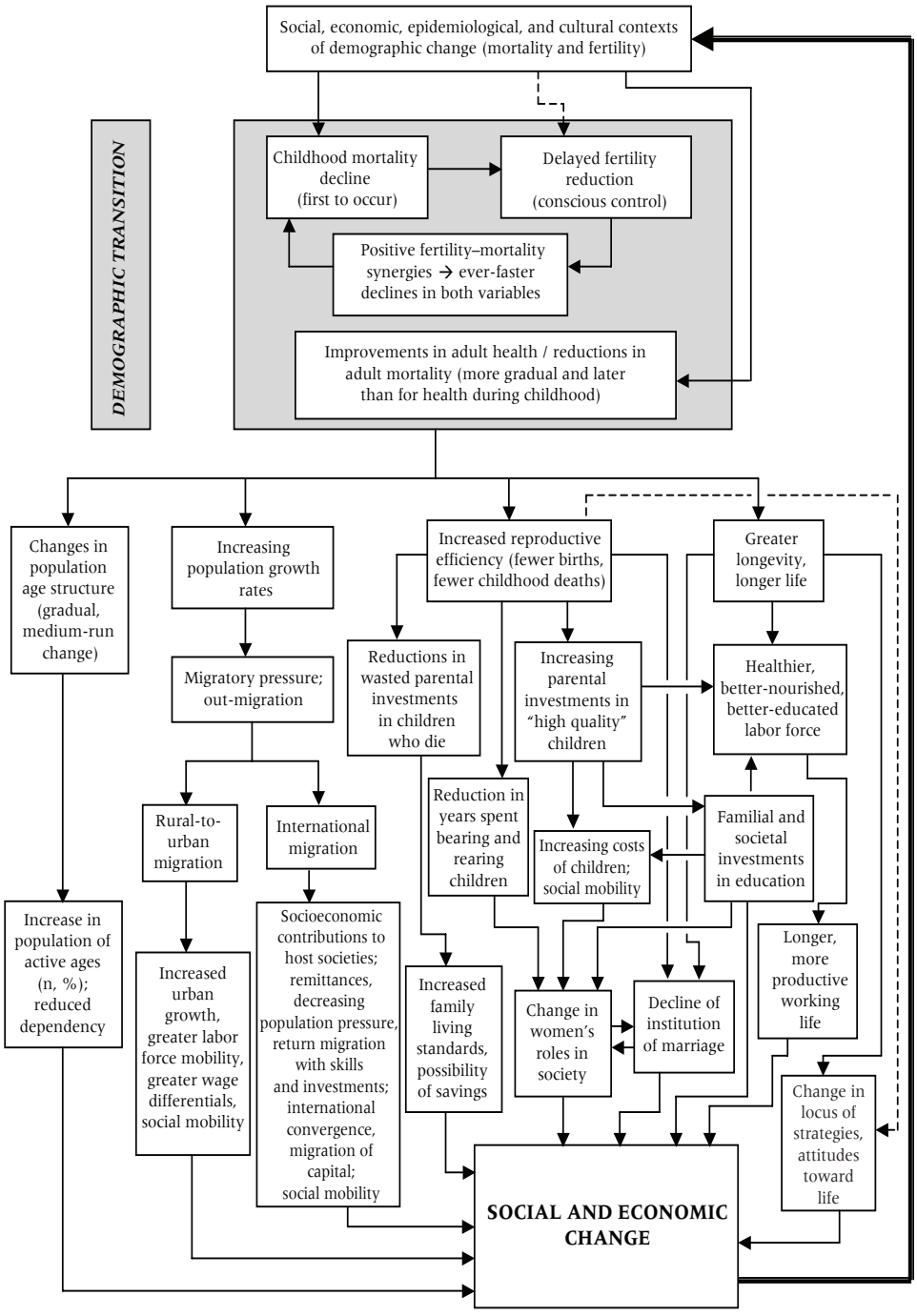
It is impossible to forecast the way this transition will take place in sub-Saharan Africa, where the transition is in its initial stages. The gradual declines in vital rates visible so far, however, suggest that in this region the demographic transition, when it does take place, will have different characteristics from those of other developing countries and may well last considerably longer.

In countries with early demographic transitions, the challenges posed by economically disadvantageous population age structures and a shortage of labor may be compensated, at least in part, by a second demographic dividend mentioned earlier (Lee and Mason 2010), as well as by government policies encouraging higher labor force participation rates, later retirement, and reduced pensions and social welfare systems. The growing presence of immigrants in these societies also promises to continue, even intensify, in the future. These migrants come from countries with more recent transitions where at present the labor markets are flooded with people looking for jobs. In this sense, migration to Europe and the United States will be useful for both the sending and the receiving societies. Migration is a socially and politically contentious but economically efficient way of responding to insufficient or over-abundant labor supplies. This situation of balance in which the overcrowding in some areas compensates the shortages in others by means of migration is bound to be relatively short-lived as well. Should present trends continue, within a fairly short time most of the countries exporting labor will begin to suffer labor shortages of their own, as cohorts of decreasing size reach working age. It is a sad irony of history that while for these countries the demographic transition (fertility decline) began 60–80 or even more years after it did in many of the historic transitions, the period of labor shortage will begin only 20–30 years later. The gap between the earlier and the more recent transitions is indeed being narrowed, but only at the expense of a reduction in the time available to the newcomers for economic growth and social consolidation.

The implications of these observations are difficult to forecast, but it is likely that the best-educated members of these emerging societies will continue to be attracted by the higher wages of the more developed societies and will follow in the steps of earlier emigrants. The extent to which this movement of people solves the problems of either the sending or the receiving countries remains to be seen. The intrinsically positive effects of migration on both sending and receiving societies that existed historically are likely to persist in the future. The severely skewed age structures in both sending and receiving countries, however, pose problems and challenges on a scale unimaginable in the past.

Appendix

Demographic transition, human capital formation, and social and economic change— A framework



Notes

The final version has greatly benefited from the helpful suggestions of Ronald Lee, Tim Dyson, and Héctor Pérez Brignoli.

1 See Wrigley (1985a and b) for an analysis of this two-stage process in France.

2 Otherwise known as milk stations, the *gouttes de lait* first appeared in Paris 1892 and were designed to provide mothers with advice as well as quality milk for their young children.

3 With respect to the historical transitions, here I refer to the period when rates of decline in fertility and mortality accelerated, not to the very gradual declines that had characterized earlier periods.

4 The degree of overcrowding in the cities of the developing world appears to exceed that reached during the historic transition in Europe, although those cities had their own well-documented problems (Hohenberg and Lees 1994).

5 In Ethiopia and Senegal the number of births continues to increase and seems likely to do so for many years to come.

6 Ethiopia and Senegal have not been included in Table 3 because it is impossible to estimate many of the revelant variables.

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The Role of the Demographic Transition in the Process of Urbanization

TIM DYSON

> The next observation is, that … there are far more burials than christenings. This is plain.… From this single observation it will follow that London should have decreased in its people, the contrary whereof we see by its daily increase.… It is therefore certain that London is supplied with people from out of the country, whereby not only to repair the over-plus difference of burials above-mentioned, but likewise to increase its inhabitants—John Graunt, *Natural and Political Observations made upon the Bills of Mortality.* (1662/1964: 35)

As the title suggests, this chapter examines the relationship between the demographic transition on the one hand, and urbanization with its attendant urban growth on the other. The chapter is written from the viewpoint that, to their cost, demographers have made rather little out of the demographic transition. After all, this is an incredibly important phenomenon that is affecting all of humanity. It has been described, with justification, indeed perhaps with understatement, as "one of the best-documented generalizations in the social sciences" (Kirk 1996: 361). Yet this transition is something that demographers seldom study as a whole. Little research specifically tries to link the phenomenon with its many consequences. Indeed, demographers seem rather uneasy about wandering too far from their familiar terrain. And one symptom of this is that the urban sector usually enters accounts of the demographic transition only as a determinant of mortality and fertility.[1]

If one turns to urbanization, again there are major problems with how it is usually approached by social scientists. Once more, no one can doubt the great importance of the subject. For example, almost every country in the world is currently urbanizing, and many countries are experiencing unprecedentedly rapid rates of urban growth. However, these facts are usually taken as the starting point for analysis. Inasmuch as research addresses anything further back in the causal chain, it tends to give most attention to the role of (net) rural-to-urban migration in bringing about urbanization. Indeed, migration probably receives undue weight in this respect. As others have observed, the causes of urbanization have received relatively little attention (see Preston 1979; Woods 2003a).

In addition, demographers and other social scientists often place too much weight on the interpretation of early experience in their attempts at explanation. This inclination can be especially strong if the early experience relates to their own culture and history. Relatedly, there is a tendency to frame explanations in terms of features that eventually turn out to be relatively superficial. Such problems have affected research on both the demographic transition and urbanization. Thus, the fact that in European societies in the nineteenth and early twentieth centuries industrialization and modern economic growth *accompanied* the demographic transition and urbanization has encouraged the idea that the former sorts of economic processes are the *causes* of the latter. However, such economic interpretations have faced difficulties in recent decades, because processes like fertility decline and urbanization have been occurring in settings where sustained economic growth and industrialization are largely absent.

With this as background, the aim of this chapter is to provide an *integrated* explanation of urbanization (and urban growth) within the context of the demographic transition. To put the matter differently: any account of the demographic transition that fails to include urbanization as one of its major components is seriously incomplete. It is taken for granted here that the process of urbanization has wide-ranging implications for societal development in general (e.g., see Dyson 2001). I should note at the outset that the present account of urbanization is far from being original. Indeed, as the quotation at the head of the chapter shows, several pieces of the explanation are contained in John Graunt's statistical analysis of 1662. Nevertheless, that account remains unknown to many social scientists and policymakers today.

The chapter has six sections. The first introduces some basic concepts. The second criticizes mainstream economic explanations of both the demographic transition and urbanization. The third introduces the stylized sector-specific model of the demographic transition that has been advanced by Jan de Vries to help explain the process of urbanization (de Vries 1990). The fourth presents empirical examples of how the transition has actually unfolded in urban and rural Sweden and Sri Lanka. These examples support and extend the sector-specific demographic account of urbanization. The fifth section considers a corollary of this account—namely that because more recent demographic transitions have involved faster population growth and have occurred over shorter time periods than those that applied in developed countries historically, the contemporary experience of urbanization should also be faster. This hypothesis appears to be upheld. That is, and in contrast to what is often asserted, the general pace of urbanization in contemporary developing countries seems to be relatively fast by historical standards. Finally, the chapter summarizes the conclusions and discusses some of their implications.

Preliminary considerations

The term "urbanization" is used here to refer to an increase in the proportion of a population living in areas that are defined as urban. Although different countries use different criteria to classify areas as urban, a key aspect of an urban area is usually that it exceeds a given population size (e.g., 10,000 inhabitants). The full process of urbanization typically involves the movement of a society from being 10 percent urban or less, to being 70 percent urban or more. The term "urban growth" is used here to refer to growth in the number of people who live in urban areas (i.e., the towns). While it is possible for urban growth to happen without urbanization, in the modern world the two processes usually occur together. It is rare, however, for a country's urban rate of natural increase to greatly exceed the rural rate of increase. Indeed, usually the urban rate of natural increase is similar to, or slightly lower than, the rural rate. Under these conditions, of course, urbanization requires rural-to-urban migration. This migration reduces the rural rate of population growth and raises the urban rate of growth. Therefore it produces faster population growth in the urban sector than in the rural sector—that is, urbanization. Accordingly, it is reasonable to say that rural-to-urban migration has been and remains the immediate cause of urbanization in most situations.

Clearly, the fact that different criteria are employed to define areas as urban can complicate matters of comparison—both between different populations and sometimes within the same population over time. For the most part, however, this fact does not constitute a major problem in what follows. Another preliminary point is that—even using a fixed set of criteria—in all countries rural areas are reclassified as urban areas from time to time. This reclassification occurs mainly to reflect changes brought about by natural increase and migration—factors that can effectively be regarded as the "real" causes of urban growth. Notice, however, that because such reclassification is a periodic administrative process, by its very nature it tends to be lagged on changes brought about by these changes.

Conventional economic accounts

Some comments are required regarding conventional explanations of both the demographic transition and urbanization.

The demographic transition

Until fairly recently, explanations of mortality decline and fertility decline within the transition were heavily influenced by the presumed experience of European countries (and their offshoot populations) during the nineteenth and early twentieth centuries.[2] In particular, classical demographic transition

theory, as formulated by Frank Notestein (1945, 1953) and others, explained the fertility transition mainly in terms of the emergence of urban-industrial society. This account tended to emphasize the role of economic factors, like rising incomes and the growth of factory employment, in fertility decline. It did not concern itself much with why these societies were becoming increasingly urban in the first place—this was seen as being largely due to industrialization. Moreover, classical demographic transition theory addressed the urban sector mainly insofar as that sector tended to be associated with relatively low levels of fertility, and tended to experience fertility decline somewhat earlier than rural areas.

In recent decades this classical body of transition theory has had to confront the fact that declines in mortality and fertility have been occurring in poor settings that are neither very urban nor very industrial. Perhaps the most important consequence of this has been the growing recognition—perhaps now a consensus among demographers—that mortality decline is the remote (i.e., underlying) cause of fertility decline.[3] This means that the cause of one major demographic process—fertility decline—ultimately lies in another major demographic process—mortality decline. All other considerations that may produce fertility declines in different societies are seen as essentially secondary to this.

Urbanization

It is commonly believed that urbanization results chiefly from shifts in employment that occur as a result of economic growth. For instance, addressing the specific causes of urbanization, it has been stated that "The underlying explanation for urbanization involves changing employment opportunities as structural change takes place in the economy" (Jones 2003: 952). This explanation emphasizes the shift of the labor force out of agriculture into industry and the service sector that accompanies economic development. In short: economic growth takes off and is sustained in the towns; urban factories offer higher wages than rural farms; this attracts people from rural areas; and technological changes resulting from economic growth further reduce work opportunities in agriculture.

Again, this classical explanation of urbanization has been heavily affected by what happened in Europe and North America during the nineteenth and twentieth centuries (e.g., see Easterlin 1996; Williamson 1988). Countries in these regions experienced industrialization and urbanization at around the same time. Their economies changed from being largely agricultural and rural to being largely industrial and urban. There is no doubt that economic growth in urban areas accelerated out-migration from rural areas. And a similar combination of processes has occurred in many developing countries—notably in East Asia—during recent decades. Accordingly, there has been a propensity to

think that what is being observed is cause (i.e., economic growth) and effect (i.e., urbanization).

Perhaps the most important difficulty with this explanation is that in recent decades urbanization has been happening in places where there is little or no economic growth—in particular, sub-Saharan Africa. As a result, economists have found themselves addressing the "puzzle that Africa urbanized rapidly despite protracted negative [economic] growth" (Fay and Opal 1999: 22). Other observers of the region note that "rapid urbanization has preceded industrialization; indeed, the African experience seems to imply that it is completely independent of it" (Oucho and Gould 1993: 275). Sub-Saharan Africa has sometimes seen some movement out of employment in agriculture, but this has occurred mainly because people have physically moved out of rural areas. Instead of taking people into a growing industrial sector, migration to the towns has often led them into dire conditions of unemployment and underemployment. Indeed, accounting for such migration in the face of these conditions has been the subject of particular attention (e.g., Todaro 1981). Moreover, in recent decades a significant number of countries in other parts of the world have also experienced urbanization during periods of economic stagnation or decline (Fay and Opal 1999: 28). The idea that urbanization is often divorced from economic growth also finds echoes in earlier research—for example, work on Latin America in the 1920s and 1930s (e.g., Davis and Casis 1946; Hoselitz 1957).

A stylized model of urbanization and the demographic transition

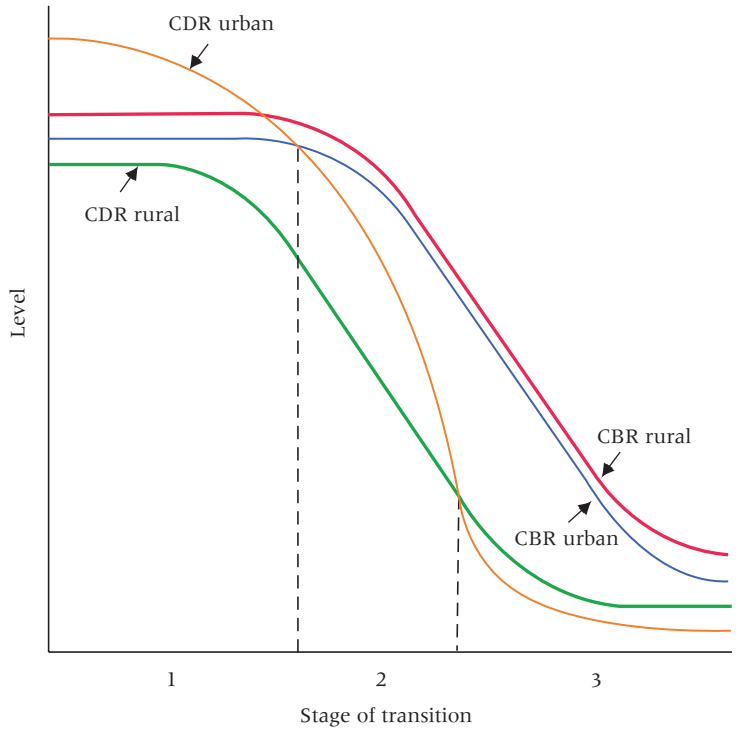
Ultimately, a population can only experience the process of urbanization as a result of demographic processes.[4] In other words, the composition of a population can only change from being predominantly rural to being predominantly urban through the operation of mortality, fertility, and migration. With rare exceptions, however, migration and the economic conditions that influence it tend to receive most of the attention. This is particularly true in research on urbanization (and urban growth) in the contemporary developing world. There is a widespread tendency to see migration as the principal cause of urban growth and to neglect the often large or even dominant contribution made by urban natural increase. There is also a tendency to view rapid urban growth in isolation from the occurrence of rapid population growth more generally (for more on this, see Preston 1979).

The stylized sector-specific model of urbanization provided by Jan de Vries (1990) was proposed on the basis of the historical experience of Europe. It was also prompted by the failure of theory on the "mobility transition" to take due account of the demographic transition.[5] Key features of the model are found elsewhere—for example, in the work of Bairoch (1988) and Wrig-

ley (1987). But de Vries seems to be the first scholar to have drawn things together within the framework of the demographic transition. Although he notes that fertility tends to be lower in urban areas than in rural areas, most of the explanation is made in relation to mortality, which probably plays a more important role, and about which more is known. The stylized model is reproduced as Figure 1. What follows is a sketch of the causal chain that it represents.

In pre-transitional circumstances the crude death rate (CDR) in urban areas is very high (see Figure 1). Infectious diseases dominate the causes of death. These diseases generally thrive in towns, where people live at relatively high densities and interact at comparatively high rates. Moreover, the urban death rate is not just very high, it is also higher than the urban crude birth rate (CBR). Therefore, the urban sector is a demographic "sink"—that is, in the long run its population would not exist without rural-to-urban migration.[6] In these circumstances urban growth is limited, and, as Graunt clearly recognized, to the extent that it occurs it is because of migration "out of the country." However, the high urban death rate means that there is actually a

FIGURE 1 A stylized sector-specific model of the demographic transition



SOURCE: Based on de Vries (1990: 58).

restriction (i.e., a ceiling) on how "urban" any population can become. For example, it is thought that the population of the Netherlands was about 30 percent urban during the eighteenth century. This was a high level of urbanization, which cannot have been too far from the ceiling that then applied in the countries of northwestern Europe (e.g., see de Vries 1974; Keyfitz 1980; Wrigley 1987).

To a large degree, the process of mortality decline within the demographic transition happens because of the reduction of deaths from infectious diseases. Therefore the urban death rate falls more rapidly than the rural death rate. A crucial point occurs when the urban death rate falls below the urban birth rate. Thus stage 2 in Figure 1 begins when urban natural increase becomes positive, that is, the urban population begins to grow partly as a result of its own natural increase. There is no longer a ceiling on the level of urbanization. Rural-to-urban migration is initially the main contributor to urban growth. But as the overall level of urbanization in the population rises, so urban natural increase is likely to become the main contributor. It appears that urban natural increase is likely to become the chief cause of urban growth well before the overall population is 50 percent urban (Keyfitz 1980: 149–156). Notice that stage 3 in Figure 1 begins when the urban death rate falls below the rural death rate. This raises the theoretical possibility of what de Vries terms "autonomous urbanization"—in which the rate of natural increase is greater in urban than in rural areas. Of course, should this unlikely situation arise, then urbanization would occur even without migration.[7]

In reality, however, net rural-to-urban migration takes place throughout the demographic transition. Initially, such migration is required for the urban sector to exist. Then, in the early stages of the transition—when the urban sector is still small—it is the main source of urban growth. Migration may also be the main source of urban growth toward the end of the demographic transition, when the urban rate of natural increase is again low (or negative). Of course, mortality decline and natural increase in rural areas also generate various socioeconomic pressures—like reductions in the availability of cultivable land per person, and downward pressure on agricultural wages—that lead to an increase in the number of people who migrate out of the rural sector to live in the towns. Furthermore, there are reasons to believe that the net rural out-migration rate may rise as the demographic transition proceeds (Preston 1979).

The causal chain sketched above provides only an outline of what may actually happen. There is ample scope for variation around this basic theme. Note too that the work of others has been referred to in order to elaborate the basic account provided by de Vries. Nevertheless, the role of the urban death rate in initially impeding the process, and then causing the urban natural increase that contributes so greatly to urban growth, is crucial. In addition, particularly during the transition's earlier phases, the decline of the rural death rate plays an important role by producing a rise in rural-to-urban migration.

Although the data tend to be fragmentary and scattered, many signs from research in economic and demographic history are consistent with this basic demographic account of urbanization. The largest body of evidence relates to Europe, where there are strong reasons to believe that the urban sector was a major "sink" in pre-transitional conditions. For example, research on cities like Amsterdam and London indicates that the prevailing death rates were extremely high and very much higher than the birth rates. Moreover, the conclusion that the urban sector was once a major demographic sink is not altered much by complications introduced by migration between urban and rural areas (e.g., see de Vries 1984; Wrigley 1987).[8]

Scattered evidence for populations elsewhere in the world is also consistent with the forgoing account—again, especially in relation to urban areas having very high death rates and being sinks in the past (e.g., see Bairoch 1988; Woods 2003b). A particularly impressive body of data exists for Bombay (now Mumbai) in the decades around 1900. The city's infant mortality rate was roughly 50 percent (Dyson 1997). Essentially, the population of about 900,000 was sustained only because of migration. Census data for 1911 show that 80 percent of the city's residents were born in rural districts (Bairoch 1988: 449).

Sector-specific illustrations of the transition

It is almost impossible to find a full set of published vital rates for the whole of the demographic transition for any country outside of northwestern Europe. Even within northwestern Europe there appears to be only one—Sweden—where for most of the transition death rates and birth rates were published separately for urban and rural areas from an early time. Beyond Europe, probably no data set even begins to approach that of Sweden. However, in 1907 P. Arunáchalam, the then Registrar General of Ceylon (now Sri Lanka), stated with considerable justification in the *Reports of the Registrar General of Ceylon on Vital Statistics* that the country's vital registration system was "unique in the East, and has few parallels in the West" (see Ceylon 1907, *Administration Reports*, p. O21). And, fortunately, the published vital registration data for Sri Lanka also throw light on the validity of the basic stylized model.

Sweden

For Sweden, Table 1 gives average urban (Städer) and rural (Landsbygd) vital rates relating to the period 1750–1960. The figures come from two sources. The first is the *Statistical Abstract of Sweden* (see Sweden, various years). The editions of this publication contain ten-year averages of death and birth rates based on annual vital rates for urban and rural areas for the period 1821–1960. The annual figures themselves end in the 1960s—mainly because of changes in the definition of urban and rural areas (made necessary, in part,

TABLE 1 Average annual crude vital rates and crude rates of natural increase per 1000 population for urban and rural Sweden, 1750–1960

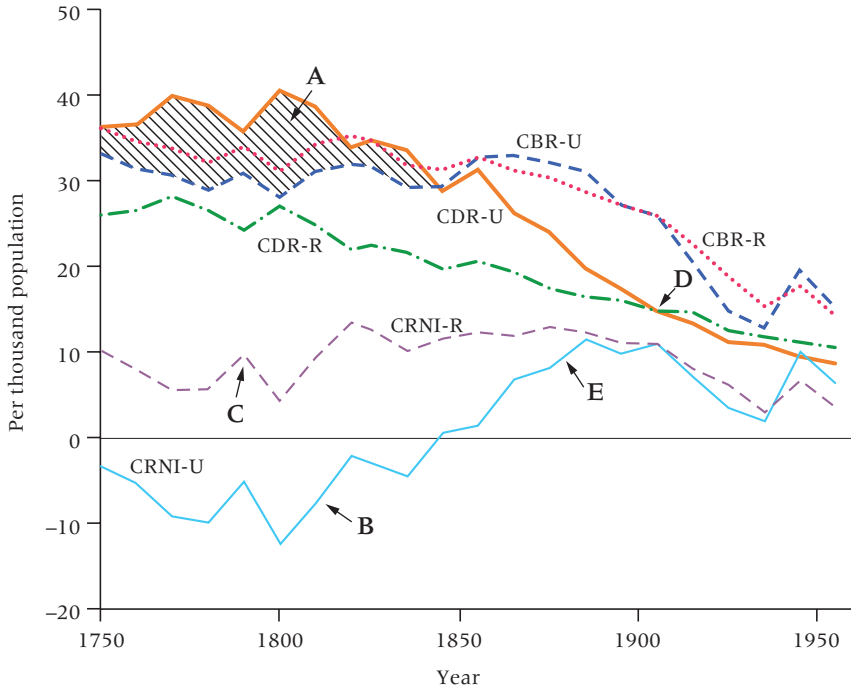
Year/period	CDR (U)	CBR (U)	CDR (R)	CBR (R)	CRNI (U)	CRNI (R)
1750	36.4	33.2	26.2	36.3	–3.2	10.1
1760	36.7	31.4	26.5	34.6	–5.3	8.1
1770	39.9	30.6	28.1	33.7	–9.3	5.6
1780	38.8	28.9	26.5	32.1	–9.9	5.6
1790	35.9	30.8	24.2	33.9	–5.1	9.7
1800	40.5	28.0	26.8	31.1	–12.5	4.3
1810	38.7	31.0	24.8	34.2	–7.7	9.4
1820	34.0	31.8	21.9	35.2	–2.2	13.3
1826	34.7	31.6	22.4	35.0	–3.1	12.6
1836	33.7	29.1	21.6	31.7	–4.6	10.1
1846	28.8	29.4	19.7	31.3	0.6	11.6
1856	31.2	32.6	20.6	32.8	1.4	12.2
1866	26.2	32.9	19.3	31.2	6.7	11.9
1876	24.1	32.1	17.3	30.2	8.0	12.9
1886	19.7	31.1	16.4	28.7	11.4	12.3
1896	17.4	27.1	16.1	27.2	9.7	11.1
1906	14.9	25.9	14.9	25.7	11.0	10.8
1916	13.4	20.5	14.6	22.7	7.1	8.1
1926	11.2	14.7	12.5	18.8	3.5	6.3
1936	10.8	12.9	12.1	15.3	2.1	3.2
1946	9.5	19.5	11.1	17.7	10.0	6.6
1956	8.8	15.2	10.6	14.2	6.4	3.6

NOTES: CRNI denotes the crude rate of natural increase, i.e., the birth rate minus the death rate. U denotes urban and R denotes rural. The rates shown for 1826 onward are ten-year averages of figures published in various editions of the *Statistical Abstract of Sweden*. The rates for 1826 pertain to the years 1821–30 inclusive, and thus the rates for 1956 pertain to 1951–60. The birth and death rates shown for 1750–1820 come from a reconstruction undertaken by Friedlander (1969). Their precise derivation is unclear, but for present purposes they are consistent with the figures presented here for 1826 and 1836 in showing urban natural decrease. While Friedlander's figures provide greater time-depth, they are not required for the argument made in the text.

by the growth of suburbs). Therefore the most recent figures in Table 1 pertain to the 1951–60 decade. The second source of the average vital rates is a reconstruction undertaken by Friedlander (1969). This provides the averages for 1750–1820. It is unclear whether these figures are based on registered vital rates for the urban and rural sectors, or whether they result from some form of backward extrapolation. Nevertheless, in reconstructing these rates Friedlander was chiefly concerned with explaining the country's fertility transition, not its process of urbanization. Furthermore, Bairoch presents average rates of natural increase for the rural areas of Sweden and for Stockholm for the period 1751–1840 that are consistent with Friedlander's reconstructed rates (see Bairoch 1988: 240–242). More importantly, however, the basic message of the figures in Table 1 remains unchanged even if the figures for 1750–1820 are not used.

With this as background, Figure 2 plots the Swedish vital rates. It shows that until about 1850 the urban death rate was higher than the urban birth rate (see the shaded area indicated by the letter "A"). Therefore the urban rate of natural increase was negative (see letter B). Indeed, before the 1850s the urban birth rate was lower than the urban death rate by about 6 per thousand—that is, there was appreciable natural decrease. But the rural rate of natural increase remained positive throughout (see C). So it was rural natural increase, through migration, that maintained the urban population and provided the basis for whatever limited urban growth occurred. Note too that before about 1850 the urban birth rate was consistently lower than the rural birth rate. Therefore lower urban fertility also helped to explain why the urban sector was a sink. The urban death rate behaved as would be expected. It began to fall from about 1800, and it fell much faster than the rural death rate. Indeed, not until around 1900 did the urban death rate fall below the rural death rate (see D). After about the 1890s the urban and rural rates of natural increase were approximately equal, and they fluctuated in similar manner (see E).

FIGURE 2 Crude death and birth rates and crude rates of natural increase for urban and rural Sweden, 1750–1960



SOURCE: See Table 1.

According to official figures, Sweden's level of urbanization remained constant at about 10 percent in the decades before 1850. However, as we have seen, positive natural increase was established in the country's urban sector from about that time. And this and rural-to-urban migration meant that the level of urbanization rose steadily throughout the second half of the nineteenth century—reaching 21 percent in 1900 and 47 percent by 1950 (Sweden 1955).

So the Swedish data reveal a picture that is in close agreement with the stylized model. It is worth noting that before 1950 the urban population had a low sex ratio (m/f) that was usually in the vicinity of 0.86. It seems reasonable to suggest that this may have contributed to the relatively low level of the urban birth rate—inasmuch as adult women may have had difficulty in finding marriage partners (Thomas 1941).

Sri Lanka

The case of Sri Lanka is more complicated. The *Reports of the Registrar General of Ceylon on Vital Statistics* (henceforth *Reports on Vital Statistics*) published in the country's annual *Administration Reports* (see Ceylon, various years) provide most of the data used here. The *Reports on Vital Statistics* for 1891–1907 are the first to provide vital rates for each of the country's towns. Weighted averages of these town rates form the basis of the urban rates used here. Then, starting in 1908, annual vital rates were published for the island's "urban" areas—a series that extends up to the mid-1960s. However, rates for the rural areas were not provided. Therefore for 1908 and later years it was necessary to derive the rural rates from those given for the country as a whole (using the corresponding proportion of the total population that was urban). The rates obtained in this way suggest that the urban areas were a "sink" before about 1920. Thus the average urban death and birth rates for 1891–1920 were 35.5 and 29.5 per thousand—implying a negative rate of natural increase of –0.6 percent per year. There is frequent discussion of this matter in the early *Reports on Vital Statistics*.

Because of a major malaria epidemic in 1935, the vital rates published for the country's urban areas become biased from about the mid-1930s onward. The death rate had been falling in the 1920s and the early 1930s. But the epidemic caused it to rise sharply from about 22 deaths to 37 deaths per thousand. This shook the colonial administration. Accordingly, efforts were made to increase the hospitalization of birth deliveries (see Langford 1996). As a result, the "urban" birth rate rose from about 39 per thousand in 1930–34, to reach 60 per thousand in the years around 1945, and about 70 per thousand by 1955. It is clear that the urban birth rate was rising to these unrealistically high levels simply because rural women were increasingly having their births in hospitals and health centers that were located in the towns.

Fortunately, as early as the 1890s the *Reports on Vital Statistics* show a remarkably sophisticated appreciation of the factors that can influence statistical measures of mortality and fertility, potential errors in the registration data, and the steps required to improve the data. One aspect of this was the concern expressed regarding the degree to which the urban death rate was being influenced by the presence of certain institutions in towns—especially hospitals, but also prisons. Therefore from 1908 onward the urban deaths of urban residents were distinguished in the published data. As a result, it is possible to calculate the urban death rate of urban residents. This provides a basis—albeit an imperfect one—on which to adjust the total urban death rates for earlier years (i.e., 1891–1907) so that they can be compared with the urban death rates of urban residents from 1908 onward. Urban births to urban residents were distinguished from 1927 onward, and similarly this provides the basis for adjusting the urban birth rate for earlier years.[9] Notice, however, that the resulting adjusted vital rates for urban residents do *not* involve an upward adjustment for the deaths and births occurring to urban residents in rural areas, since vital events in rural areas were not differentiated by place of residence. Accordingly, the adjusted urban vital rates summarized in Table 2 are underestimates to some degree, while the rural rates are slight overestimates.[10]

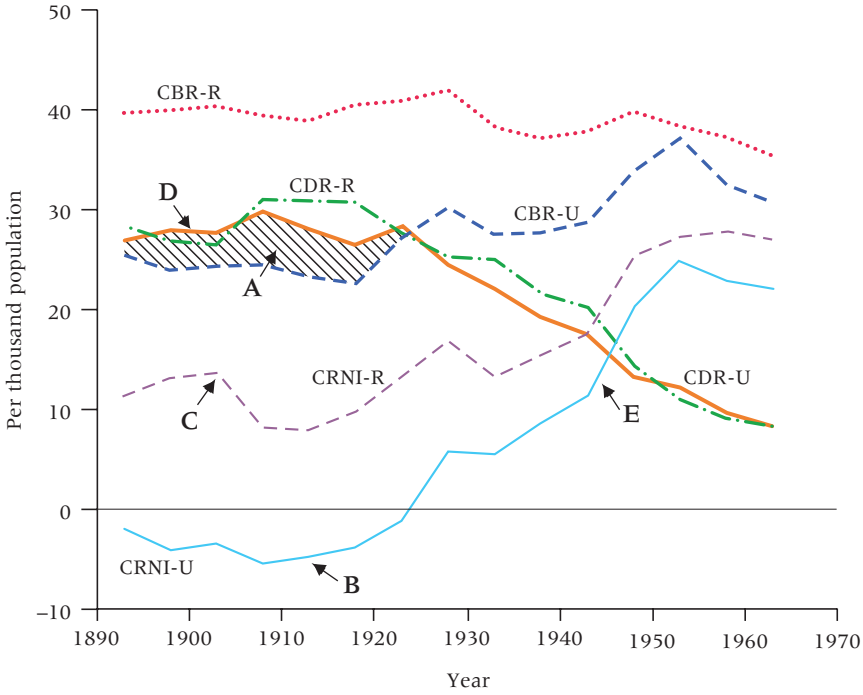
With this as background, Figure 3 plots the adjusted sector-specific vital rates for Sri Lanka. Essentially, it reveals another version of the same basic

TABLE 2 Average annual crude vital rates and crude rates of natural increase per 1000 population for urban and rural Sri Lanka, 1891–1964

Period	CDR (U)	CBR (U)	CDR (R)	CBR (R)	CRNI (U)	CRNI (R)
1891–95	27.1	25.4	28.4	39.7	–1.7	11.3
1896–00	28.1	24.1	26.9	40.1	–4.0	13.2
1901–05	27.8	24.3	26.6	40.3	–3.5	13.7
1906–10	29.8	24.5	31.0	39.3	–5.4	8.3
1911–15	28.1	23.3	30.9	38.9	–4.8	8.0
1916–20	26.4	22.6	30.7	40.5	–3.8	9.8
1921–25	28.4	27.2	27.7	41.0	–1.2	13.3
1926–30	24.5	30.2	25.2	42.0	5.7	16.9
1931–35	22.2	27.6	25.0	38.3	5.4	13.3
1936–40	19.2	27.7	21.7	37.1	8.6	15.4
1941–45	17.5	28.8	20.3	37.9	11.3	17.6
1946–50	13.4	33.8	14.5	39.8	20.4	25.4
1951–55	12.4	37.0	11.0	38.3	24.6	27.3
1956–60	9.8	32.5	9.4	37.3	22.7	27.9
1961–64	8.7	30.8	8.4	35.5	22.1	27.1

NOTES: See note 9 and the notes to Table 1. The average rates for 1961–64 relate to four (rather than five) years. The full time series are available from the author upon request (t.dyson@lse.ac.uk). As is mentioned in the text, the original source of the data underlying these figures is *Reports of the Registrar General of Ceylon on Vital Statistics* contained in the annual *Administration Reports* (see Ceylon, various years).

FIGURE 3 Crude death and birth rates and crude rates of natural increase for urban and rural Sri Lanka, 1891–1964



SOURCE: See Table 2.

story. The adjusted rates suggest that until about 1925 the urban death rate was higher than the urban birth rate (see the shaded area indicated by A). Therefore the urban rate of natural increase was negative (see B). The adjusted urban death and birth rates for 1891–1920 average 27.9 and 24.0 per thousand—implying a negative rate of natural increase of about –0.4 percent per year. So, once more, it was rural natural increase that maintained the urban sector and provided the basis for what limited urban growth there was.[11] Again, the rural rate of natural increase was positive throughout (see C). Notice that the urban birth rate was much lower than the rural birth rate. Interestingly, the *Reports on Vital Statistics* for 1916 attribute this to "a far smaller proportion of females in the towns" (see Ceylon 1916, p. L7). In this context it is worth noting that the sex ratio (m/f) of the urban population across the censuses from 1891 to 1946 was high, averaging 1.29 (Ceylon 1951). The adjusted rates suggest that the urban death rate was only slightly higher than the rural death rate during 1896–1905 (see D). However, these urban rates do not reflect the deaths of urban residents that took place in rural areas (deaths that are necessarily included in the rural rates here, biasing them upward). Therefore there are compelling reasons to think that in these

early years the urban death rate exceeded the rural death rate by appreciably more than is shown in Figure 3.[12] Finally, from the late 1940s onward the urban and rural rates of natural increase fluctuate in a similar way—rising initially, and then starting to fall. However, the urban rate of natural increase remained lower than the rural rate because the birth rate was lower in the urban areas (see E).

Turning to the statistics on urbanization, the *Reports on Vital Statistics* indicate that in 1891 the country's 18 towns contained about 11 percent of the island's population. By 1925 the figure had risen slightly to around 13 percent. The 1963 census put the level of urbanization at 19 percent (Ceylon 1967). Therefore the changed mortality conditions in urban areas from about the mid-1920s onward appear to have facilitated a distinct rise in the level of urbanization. Moreover, mortality decline in rural areas led to an increase in landlessness and probably a rise in rural-to-urban migration (Sarkar 1957: 208–225). The 2001 census put Sri Lanka's level of urbanization at just 16 percent (see Sri Lanka 2009), but this decline reflects a change in definition. In this context it is noteworthy that when in 1898 the number of towns on the island was increased to 27, the *Reports on Vital Statistics* noted that several of the new towns were "little more than villages" (see Ceylon 1898, p. F24). There can be no doubt that if the criteria used to define settlements as urban during the period 1898–1963 were applied in 2001, then the country's level of urbanization would be far higher than 16 percent.

So the Sri Lankan data imply a variant of the stylized model. In particular, although the urban death rate was higher than the urban birth rate, it may not have been exceptionally high in itself. On the other hand, it should be recalled that the adjusted urban death rates here are underestimates. It is almost certain that if more adequate data were available for the 1890s and before, they would reveal significantly higher urban death rates. Again, however, there are signs that a sex ratio imbalance in the urban population—in this case a shortage of women—may have contributed to the lower birth rate in urban areas.[13] And the urban rate of natural increase—which may well lie between the two figures of –0.4 and –0.6 given above—again suggests appreciable natural decrease in the urban sector.

The speed of urbanization—past and present

Urbanization is both an integral component and an outcome of the demographic transition. One reflection of this is contained in the assertion that the speed of urban growth in contemporary developing countries is unprecedented by historical standards. Thus rapid urban growth in recent decades must be seen in the context of the rapid population growth that has characterized more recent examples of the demographic transition (Preston 1979).

Of course, both of the main proximate causes of urban growth—namely, natural increase and rural-to-urban migration—are usually strongly related to a country's overall rate of population growth.

A more problematic assertion is that the speed of urbanization in contemporary developing countries (i.e., the rate of change in the proportion urban) is not exceptional by historical standards (e.g., see Preston 1979; United Nations 1980; Brockerhoff and Brennan 1998; Cohen et al. 2004). This claim is usually made on the basis of estimates of historical and contemporary change in the level of urbanization produced within the United Nations system—in particular, the historical estimates provided by Grauman (1977) and the contemporary estimates produced biennially by the United Nations (e.g., United Nations 2008).[14] An early example of this assertion, using these sources, is that of Preston who states:

> [U]rbanization in developing countries did not proceed with unusual speed in the quarter-century from 1950 to 1975. In this period the percentage urban grew from 16.7 to 28.0 in developing countries. While this is a rapid increase, it is very similar to the one that occurred in more developed countries during the last quarter of the nineteenth century. Between 1875 and 1900, the percentage urban of countries now more developed grew from 17.2 to 26.1. (Preston 1979: 196)

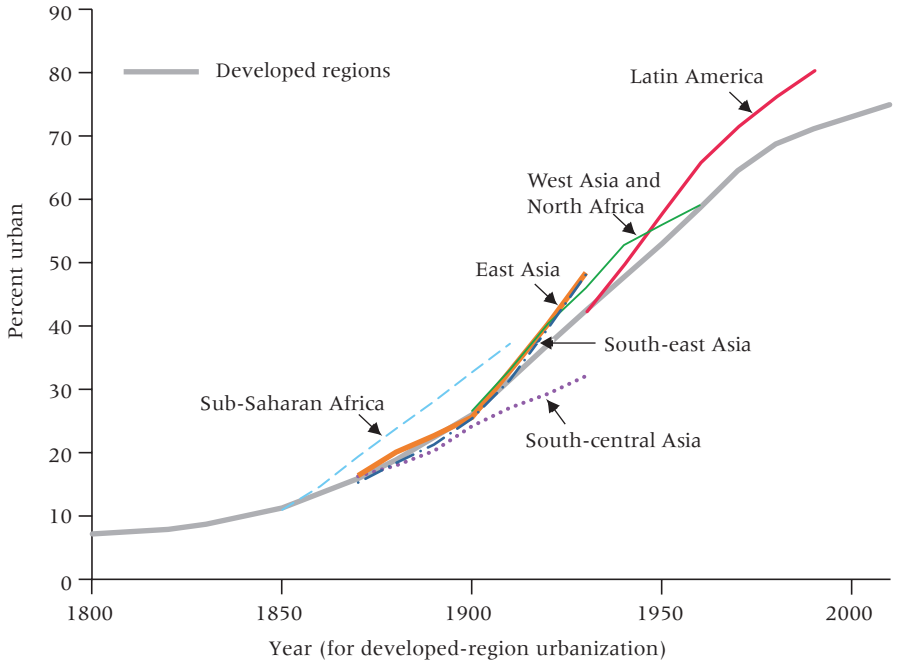
More recently, Brockerhoff and Brennan have used these same estimates to state that between 1950 and 2000 the level of urbanization in developing countries rose from 17.3 to 40.7 percent; whereas between 1875 and 1925 the level of urbanization in developed countries increased from 17.2 to 39.9 percent (Brockerhoff and Brennan 1998: 78).

Of course, the claim that the speed of contemporary urbanization is similar to that experienced by developed countries historically is complicated by matters of definition. In particular, the assumption is made that one can compare historical and contemporary estimates of urbanization, despite differences in the definition of urban areas and in the procedures employed to reclassify rural areas as urban. Moreover, it is important to note that the same assumption is used in what follows below. Nevertheless, that difficulty aside, those who make the claim do not support it with an argument as to why such a similarity might exist. Furthermore, if urbanization results from the demographic transition, then one might expect that the speed of urbanization in recent decades would be somewhat faster than applied in the past. This is because more recent transitions appear to be occurring over shorter time scales than generally applied historically.[15] Moreover, the pace of population growth in contemporary transitions tends to be much more rapid than in the past. Therefore, given any threshold size for a settlement to be classified as urban, other things equal we would expect a country to urbanize faster under conditions of faster population growth.

In fact, the assertion that the speed of urbanization experienced by developing countries is similar to that experienced by developed countries historically depends rather a lot upon the particular comparison that is made. Thus the estimates of Grauman (1977) and the United Nations (2008) can also be used to support the following statement: between 1920 and 2010 the level of urbanization in developing countries increased from about 8.7 to 45.3 percent; while between 1830 and 1920 the level of urbanization in now-developed countries increased from 8.8 to 37.1 percent. This contrast, relating to a period of 90 years, suggests a speedier pace of contemporary urbanization.

Figure 4 supports a similar conclusion. The bold line shows how the level of urbanization in the countries of the world's developed regions is estimated to have risen since 1800. The UN estimates of urbanization in each of the world's main developing regions during 1950–2010 are then compared with this line—in each case beginning the comparison at the level of urban-

FIGURE 4 Estimates of urbanization, developed regions 1800–2010, and the comparative experience of individual developing regions 1950–2010



NOTE: The bold line relates to urbanization in the more developed regions. Here it acts as a reference standard. Thus although the trends for the individual developing regions all relate to the period 1950–2010, they have been plotted at the same starting (i.e., 1950) level of urbanization as applied in the more developed regions. Therefore the speed of urbanization can be compared.
SOURCES: Grauman (1977); United Nations (2008).

ization that corresponds to the level found in the historical experience of the developed regions.

In the world's most populous developing region, South-central Asia, the pace of urbanization seems to be appreciably slower than applied in developed regions in the past (see Figure 4). In this context it is notable that India—by far South-central Asia's most populous country—has been uncommonly slow in reclassifying rural areas as urban. This is at least partly explained by the fact that people living in municipal (urban) areas of India tend to be subject to higher levels of taxation than people living in rural areas—a consideration that leads to some reluctance to be reclassified as municipal (see Dyson and Visaria 2004: 115). With respect to West Asia and North Africa, the increase in urbanization during 1950–2010 is comparable to that experienced by developed countries between 1900 and 1960. However, Figure 4 shows that in each of the remaining developing regions the speed of urbanization seems to have been significantly faster than was the case in developed countries historically. This is particularly true for sub-Saharan Africa and Latin America (including the Caribbean). Also, East Asia and South-east Asia experienced an almost identical increase in urbanization during 1950–2010, from around 16 percent to about 48 percent—an increase that was significantly faster than the historical trend experienced in the developed regions.

Discussion

This chapter has argued that urbanization and urban growth are best comprehended as resulting from the demographic transition. Naturally, the expansion of towns also requires increased supplies of food and—especially in cold climates—energy from rural areas. But the most important requirement is neither food nor energy, but people.

There are compelling reasons to suppose that urban populations play a major role in stimulating increased agricultural production in rural areas, as the related processes of urban growth and urbanization get underway. Relatedly, while many scholars see the process of urbanization as resulting from sustained economic growth, there is probably at least as much reason to see sustained economic growth as resulting from urbanization. Of course, it is impossible to neatly disentangle the independent influence of each process on the other. Nevertheless, in trying to account for urbanization social scientists have often gotten the basic direction of causation wrong. Thus, as was intimated above, shifts in the structure of employment are perhaps better seen as resulting from the demographic processes that bring about urbanization, rather than urbanization being seen as resulting from shifts in the structure of employment as a result of economic growth. In short, mainstream accounts of both the demographic transition and urbanization have often wrongly considered effects to be causes.

As was stated above, there is growing agreement that mortality decline is the remote cause of fertility decline. Of course, mortality decline also brings about population growth. And fertility decline causes population aging. With the exception of the initial process of mortality decline, the cause of each of these other demographic processes essentially lies in another *demographic* process. The point of this chapter has been to argue that this also applies in relation to the process of urbanization. In each case, economic and other considerations are essentially secondary influences.

The urbanization and urban growth that are occurring in developing countries are first and foremost outcomes of the demographic transition. In general, modern transitions tend to be faster than those that occurred historically. Therefore it is unsurprising that the contemporary experience of urban growth—and, it appears, urbanization—tends to be faster too.

The present approach to these two processes also has implications for policy. For example, Preston made the very important point that developing-country governments, which for understandable reasons are often concerned with slowing rapid urban growth, should consider the provision of family planning services as the most palatable means of helping to do so (Preston 1979: 210–211). However, urbanization is a somewhat different matter. As we have seen, it is an inevitable outcome of the demographic transition. Moreover, in contrast to rapid urban growth, urbanization is largely a good thing.

Notes

Figures in this chapter are available in color in the electronic edition of the volume.

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1 To elaborate some of these points: in contrast to demographers and the transition, economists have made a great deal out of modern economic growth; demographic research, like research more generally, tends to be overly compartmentalized; there appears to be no book written in English other than this one that has the demographic transition as its title, although, of course, in French there are the major works by Adolphe Landry (1934) and Jean-Claude Chesnais (notably 1992).

2 The term "offshoot" here is as used by Maddison (2007), the main offshoots being the United States, Canada, and Australia.

3 The position has a long history (e.g., see Davis 1963). But for recent work consistent with this view see, for example, Chesnais (1992); Hirschman (1994); Kirk (1996); Mason (1997); Galloway, Lee, and Hammel (1998); Wilson and Airey (1999); Cleland (2001); Dyson (2001); Livi Bacci (2001); Casterline (2003); Reher (2004); Ní Bhrolcháin and Dyson (2007).

4 Naturally this statement does not cover a change brought about by a purely arbitrary reclassification of rural areas as urban.

5 Zelinsky's (1971) proposal of a "mobility transition" saw this transition as paralleling the demographic transition. However, both of these transitions were attributed to "modernization." There was little attempt to integrate them—for example, as regards how the composition of internal migration changes from being mainly rural-to-rural to being mainly urban-to-urban.

6 See Sharlin (1978) for the idea that deaths exceeded births in the towns only as a

result of the presence of temporary migrants—among whom it is suggested there was especially high mortality (and low fertility). This raises the possibility that urban populations might not have fallen in the absence of in-migration. However, there is little evidence to support the idea (e.g., see de Vries 1984: 182–197). In short, the position that urban areas were demographic sinks has not been overturned.

7 Autonomous urbanization is more a theoretical possibility than an established fact because, as I have noted, the urban rate of natural increase is usually similar to or lower than the rural rate; moreover, migration is almost always rural to urban.

8 See also note 6.

9 In the first decade in which the urban death rate of urban residents can be differentiated (i.e., 1908–17) it averaged 80 percent of the total urban death rate. In the first decade in which the urban birth rate of urban residents can be differentiated (i.e., 1927–36) it averaged 83 percent of the total urban birth rate. Therefore, these figures were used to adjust the total urban vital rates for earlier years—the assumption being that these percentages had remained constant. Other smaller adjustments were made to the early registration data, but are of little consequence for present purposes.

10 Even in 1925 only about 13 percent of the population lived in urban areas. So the transfer back of events occurring to urban residents in rural areas would have a disproportionately large upward effect on the urban rates, and a much smaller downward effect on the rural rates. Discussing circumstances in Colombo in the *Reports on Vital Statistics* P. Arunáchalam states that "the density of population in the town, and the presence of hospitals, lunatic asylums, and prisons, tend to raise the death rate of the town, while a counterbalancing influence is exercised by the retirement of the sick from the town to their homes in the country to die" (see Ceylon 1891, p. F14). Also notice here his mention of population density.

11 However, immigrant Tamil labor brought in from southern India to work on the tea estates also made a contribution.

12 In this context, for the period 1891–1905 inclusive, the *unadjusted* urban and rural death rates are 34.6 and 26.5—a difference that probably overstates the true urban/rural differential because of the inclusion in the urban rate of deaths occurring, for example, to rural residents in urban hospitals. See also note 10.

13 In this context P. Arunáchalam refers to "the adult females probably being in a small proportion," the issue being especially acute in relation to the Tamil population in urban areas (see Ceylon 1891, p. F14).

14 It should be noted that Cohen et al. (2004: 92–93) also make use of historical data for seven high-income countries and 17 low- and middle-income countries.

15 Whether this statement will be supported by future events in sub-Saharan Africa remains to be seen.

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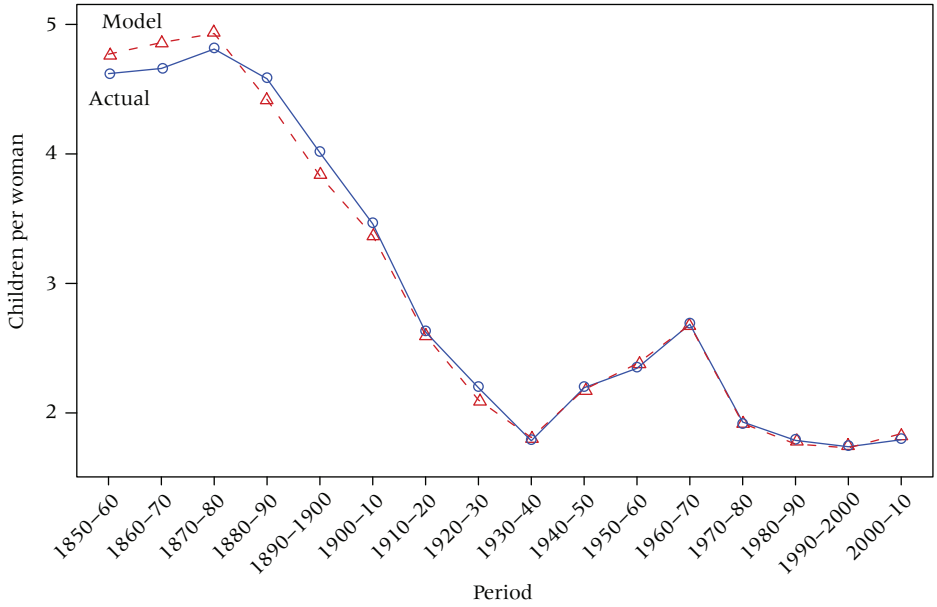
Long-Term Effects of the Demographic Transition on Family and Kinship Networks in Britain

MICHAEL MURPHY

The first demographic transition started in many Western industrialized societies around the latter part of the nineteenth century with steady mortality improvement. Expectation of life at birth, about 40 years at the start of the transition, has now doubled (Riley 2001). Fertility declined from a level of about five children to under two children per woman over the same period (Coale and Watkins 1986; Chesnais 1993; Dyson 2010). This decline was interrupted in many industrialized countries by the baby boom and associated marriage boom in the post–World War II period, peaking in the early 1960s. The decline resumed to such an extent that some countries experienced ultra-low fertility, with total fertility rates below 1.3, together with very low rates of marriage (Billari and Kohler 2004; Frejka et al. 2008). Widespread signs of stabilization or reversal from these historically unprecedented low fertility levels only started to appear in the early twenty-first century (Goldstein, Sobotka, and Jasilioniene 2009). These widespread fertility declines have led to population aging, initially resulting from reductions in fertility and more recently compounded by mortality improvement at older ages. While countries have shown some variations in the timing and magnitude, broadly similar trends are observed. Trends in fertility and life expectancy for the country that is the subject of this chapter, England and Wales (hereafter Britain), are shown in Figures 1a and 1b.

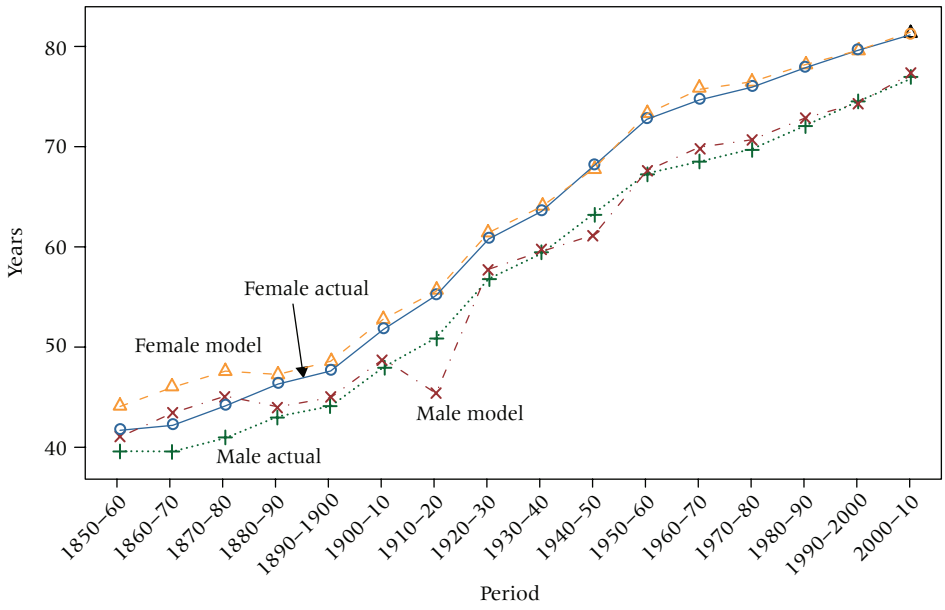
This resumption of fertility decline in the second half of the twentieth century was associated with changes in partnership behavior in many countries that some consider to be a second demographic transition (van de Kaa 1987; Lesthaeghe 1995), although this contention has been challenged, (e.g., Coleman 2005). These changes included substantial reductions in marriage and increases in marital breakdown. Nonmarital cohabitation

FIGURE 1a Total fertility rate, Britain, 1850–2010



SOURCES: Office of Population Censuses and Surveys (1987) and SOCSIM model (see Appendix and note 1).

FIGURE 1b Life expectancy at birth, Britain, 1850–2010



NOTE: Actual includes civilian deaths; Model includes all deaths.
SOURCES: Unpublished Government Actuary's Department estimates and SOCSIM model (see Appendix and note 1).

became more common and increasing proportions of births occurred within cohabiting unions: by 2008, over half of births in countries such as Bulgaria, France, Norway, Slovenia, and Sweden were outside marriage. Cohabiting unions tend to be more fragile than marriage; consequently increasing proportions of partnerships are ended by divorce or separation rather than death, leading to larger numbers of living former partners. Some of these changes in living and partnership arrangements are closely bound up with fertility developments. For example, availability of effective and acceptable contraception is an important factor in both fertility and partnership trends (Murphy 1993).

Although the first demographic transition occurred in all Western industrialized societies, the magnitude and timing varied. Many countries experienced the first indications of fertility decline around the period 1880–1910, with the notable exception of an early starter, France (Coale and Watkins 1986). This decline was often followed by a period when marriage rates fell substantially, especially for women, which combined with the low fertility of marriages of the time (and relatively few extramarital births) meant that the family life of these groups differed substantially from that of cohorts on either side of them. For example, 16 percent of women married in England and Wales in 1923–25 were still childless in 1946, and a further 25 percent had only one child (Anderson 1998). Because an additional 15–20 percent of women born around the end of the nineteenth century had not married by the end of their reproductive period, well over half of these cohorts had either one child or none (i.e., an average of less than 0.25 daughters per woman in this group).

These changes in fertility, mortality, and partnership clearly determined national population structures (e.g., Lee 2003; Mason and Lee 2007), but the implications of these changes at the levels of families and kin groups have not been widely studied. In particular, demographic transition is usually analyzed in terms of period effects rather than cohort or generational effects, but period changes in demographic regimes may act differently across generations: for example, reduced fertility and mortality will simultaneously tend to increase the number of living grandparents a child has through improved survival, but reduce the number of living grandchildren older people have through lower fertility. Demographic transition leads to certain types of kin becoming more common and others less so, with the emergence of a "beanpole" family structure (Bengston, Rosenthal, and Burton 1990) in which individuals have more vertical links with their primary kin as they grow older but fewer links both with close horizontal kin such as siblings and with extended kin of all types. Even individuals and families who were not directly involved in a particular demographic regime may nevertheless be affected by it. For example, persons born in the 1940s will have fewer grandchildren because of the recent very low fertility levels.

In this chapter, I describe how the family and kin constellations of cohorts in Britain have changed between 1850 (just before the onset of the first demographic transition) and 2010—a date by which the consequences of the second demographic transition are affecting the wider demographic system. While information on co-resident groups, including families and households, is available from surveys and censuses and has been analyzed in detail (e.g. Wall 2001; Ruggles 2009), much less is known about non-co-resident kin. However, the increased propensity of people to live in separate households and the greater instability of family life mean that some types of family members outside the household are becoming more common and potentially more important. This chapter is concerned with such wider kinship and family networks, whether co-resident or not. The main indicator used is the estimated average number of people's living kin of various types at different ages and over the whole lifetime. I illustrate these estimates primarily through contour charts showing the ages at which the same average numbers of kin are found.

Apart from information on marital status available in decennial censuses of England and Wales since 1851, there are no direct estimates of any other type of living kin over extended time periods. As in most other countries, such estimates can be produced only by demographic modeling (although detailed information is beginning to emerge from sources such as the Dutch kinship reconstitution project: Van Poppel, Monden, and Mandemakers 2008). The next section describes the microsimulation approach used, and subsequent sections present the results obtained and discuss the implications of the findings.

Methods and data

Microsimulation is the principal method used to investigate long-term kinship patterns in demographic studies (Wachter 1987, 1997; Ruggles 1987; Wolf 1994; Reher 1997; Hammel 2005).[1] In this application, an initial population of 40,000 with the population distribution of England in 1751 obtained from Wrigley and Schofield (1981, Table A.3.1) is modeled up to 2010. This population (excluding migration, although the demographic rates used here include overseas-born people) is subject to appropriate rates of fertility, mortality, and nuptiality (including divorce from 1850 and cohabitation from 1950) for the period since 1751. Over time, a full set of kinship links is constructed as the individuals marry, procreate, and die, so that any kinship relationship through blood or partnership (married or cohabiting) may be traced through living and/or dead kin. The entire kinship network of any group of people depends only on their own and their ancestors' fertility, mortality, and nuptiality; hence, if these values are known exactly, their kin universes can be determined precisely.

For each type of kinship relationship, the relevant kin of each living member of the simulation population ("egos") at various time points were identified. It is then possible to calculate summary measures such as the average number of various types of kin by blood or marriage and the proportion of those in a given age group who have one or more of the relevant kin type according to measures such as generational relationship (older, same, or younger) and genetic closeness to a particular individual. I concentrate on close kin including grandparents, aunts and uncles, and first cousins. The networks of living kin of people at every age for each five-year cohort over the period 1850–2010 were estimated (as summarized in Table 1). Such estimates cannot replicate the exact patterns over this period since they do not model the fine detail of population inter-relationships: for example, the rates used are ten-year averages and the probability of divorce in this model depends on duration of marriage, but does not depend on number of children born or age at marriage, both of which affect divorce propensity (Ruggles 1987).

TABLE 1 Summary of simulation parameter values, Britain 1850–2010

	Size of population[a]			Life expectancy at birth (yrs.)		Average age at first marriage (yrs.)	
Period	Living	Total	TFR	Males	Females	Males	Females
1850–60	94,957	238,565	4.77	41.0	44.1	27.0	24.2
1860–70	107,537	273,027	4.86	43.4	46.0	26.9	24.2
1870–80	123,668	313,061	4.93	45.1	47.6	26.8	24.3
1880–90	142,733	358,458	4.42	44.0	47.3	26.6	24.3
1890–1900	158,563	405,245	3.83	45.0	48.6	26.6	24.2
1900–10	175,905	453,338	3.37	48.8	52.8	26.3	24.4
1910–20	196,336	502,820	2.60	45.4	55.6	27.3	24.7
1920–30	206,098	544,526	2.10	57.8	61.4	26.8	24.6
1930–40	216,931	580,587	1.81	59.5	64.0	26.9	24.6
1940–50	221,992	613,104	2.18	61.2	67.8	26.1	23.5
1950–60	230,142	649,911	2.38	67.6	73.3	24.8	23.1
1960–70	238,578	686,512	2.68	69.9	75.7	24.0	22.8
1970–80	253,089	728,780	1.92	70.7	76.5	24.8	22.4
1980–90	255,255	761,494	1.76	72.9	78.2	27.4	24.4
1990–2000	256,901	793,526	1.73	74.3	79.6	29.2	26.9
2000–10	258,590	825,375	1.84	77.2	81.4	30.1	27.9
2010	261,711	855,417	—	—	—	—	—

[a]Value at start of the period. "Total" population includes deceased members.
SOURCE: SOCSIM model applied to 1751 population of 40,000.

Changing patterns of kin availability, 1850–2010

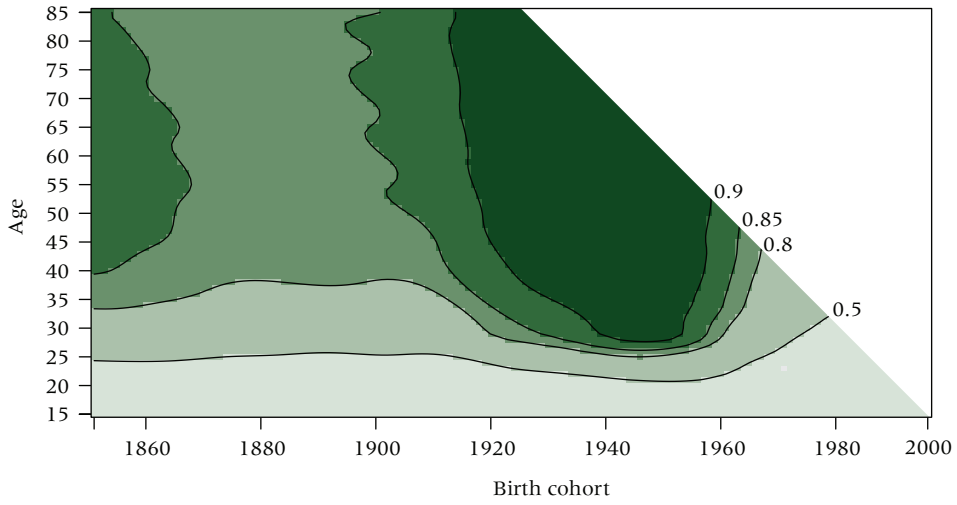
Marriage

Historically in Northwestern Europe, marriage was relatively late and high proportions never married. Over 20 percent of persons aged 40–44 in most cohorts born in England in the seventeenth century had not married (Wrigley and Schofield 1981, Table 7.28), although marriage was more common in Southern and Eastern Europe (Coale and Watkins 1986; Coleman 1996; Sklar 1974; Ehmer 2002).

In analyses of the number of living children, little information is lost by combining males and females, but men and women have exhibited different partnership patterns over time. Direct information on marital status, available from Censuses of Population since 1851, are used here.[2] Two key indicators of marriage are shown: whether the individual is currently married or has ever been married (information on cohabitation is not available in censuses before 1991). The proportions of men and women *currently married* at a given age are broadly similar (as would be expected given the relatively small average spousal age difference) apart from the early twentieth century when sex ratios were particularly unbalanced. However, the experience of being *ever-married* has differed substantially between men and women. Marriage rates for women were particularly low in the 1920s and 1930s, for reasons including shortages of men following World War I and poor economic conditions at the time. By contrast, in the period from 1945 to about 1970 many countries experienced an unprecedented marriage boom, with higher proportions marrying and at earlier ages than in any earlier or later period in history. The highest proportions of women ever- and currently married are found among the cohorts born circa 1940, who were in the prime ages for marriage when marriage rates peaked in the late 1960s (see Figures 2a and 2b). In this age group, 13 out of 14 women had been married by age 30, and two thirds were still married at age 65 (see Figures 2c and 2d).[3] In contrast to women, the experiences of marriage for men born around 1940 were not substantially different from those of men born earlier. The highest proportions married among working-age men were found for those born about 1910, with over 85 percent currently married between their late 30s and early 60s. Historically, the proportion of males who never married was lower than that for women; and while men also experienced the 1960s marriage boom, the variability in experience of marriage has been much greater for women than for men over time.

This marriage boom was followed by a sharp decline in the propensity to marry and to remain married, and the proportions currently married at young ages are much lower for the youngest cohorts shown. Of all cohorts

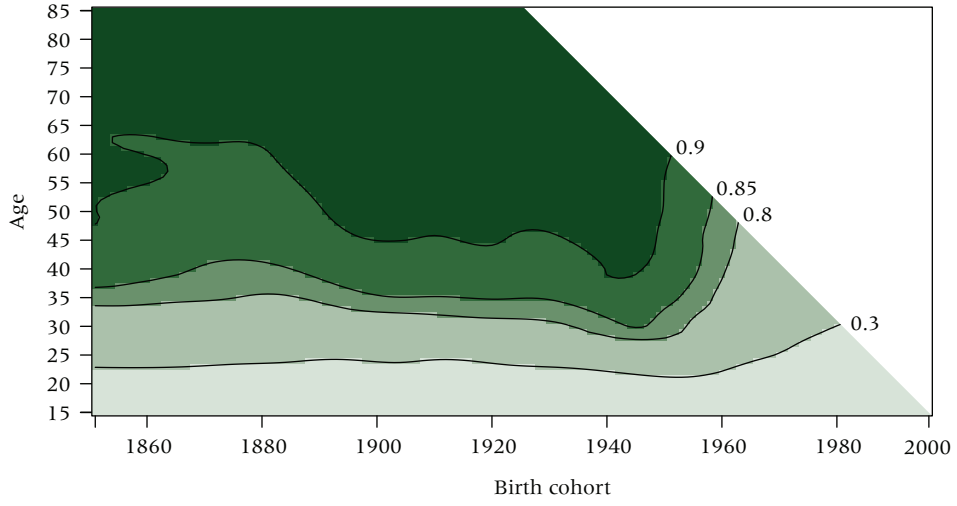
FIGURE 2a Proportion of native-born ever-married females by birth cohort and age: Britain, birth cohorts 1850–2000



SOURCE: Censuses of Population, England and Wales.

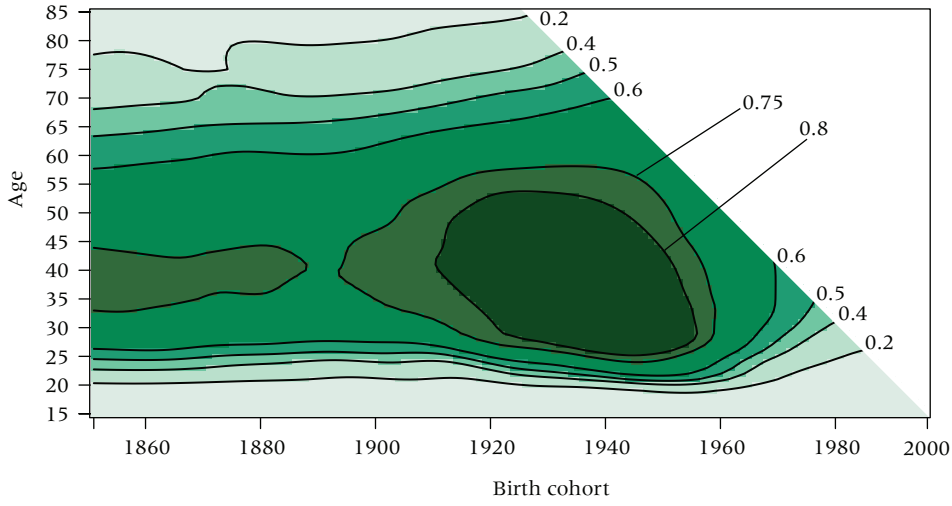
born since at least the start of the nineteenth century, and very probably in all earlier periods as well, those born around 1940 are likely to be the most advantaged in terms of having a living partner at ages beyond 60, because their higher marriage rates and improved mortality have not been offset by

FIGURE 2b Proportion of native-born ever-married males by birth cohort and age: Britain, birth cohorts 1850–2000



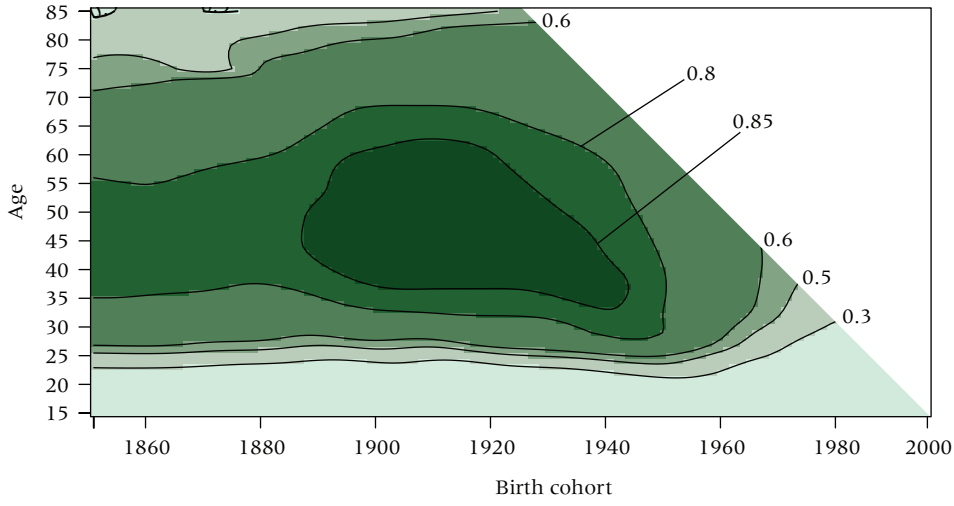
SOURCE: Censuses of Population, England and Wales.

FIGURE 2c Proportion of native-born currently married females by birth cohort and age: Britain, birth cohorts 1850–2000



SOURCE: Censuses of Population, England and Wales.

FIGURE 2d Proportion of native-born currently married males by birth cohort and age: Britain, birth cohorts 1850–2000



SOURCE: Censuses of Population, England and Wales.

the much higher divorce rates found among later cohorts. In the past, the proportions married at older ages differed substantially between the sexes since men experienced higher mortality and were older on average than their wives, but these differences are lessening. Reduced mortality, recently most

marked among men, has an increasingly prominent impact on the likelihood of having a spouse at older ages, especially for women. Consequently the proportion of women who are widowed is decreasing, a trend that is expected to continue (Kalogirou and Murphy 2006).[4]

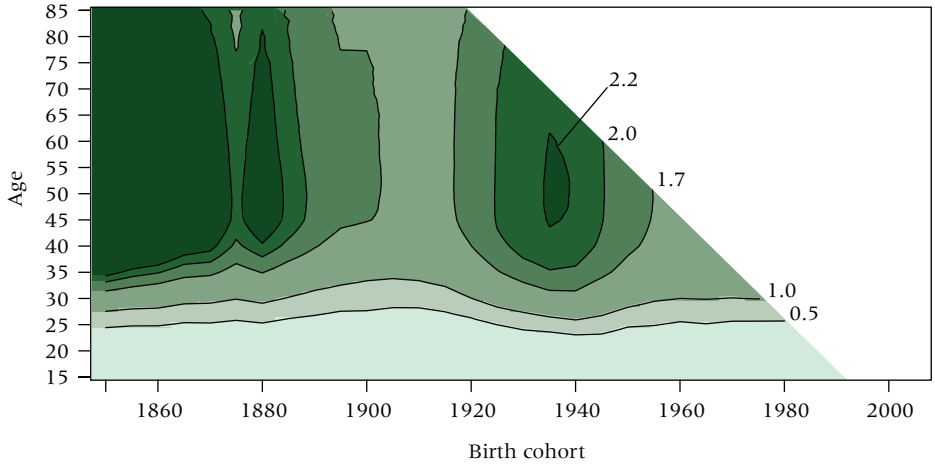
Vertical kin: Natural parents and children, and grandparents and grandchildren

Together with partners (who, by definition, are likely to live together), the most important kin relationship is that of parents and children, who often provide the most contact and support for each other (Segalen 2003; Grundy and Murphy 2006). Half of those providing care to older people are children, compared with just under half who are spouses/partners (EUROFAMCARE consortium 2006, Table 59). Although there must be at least one child and one parent in any parent–child relationship, the overall trends for average number of living children and living parents differ (see Figures 3a and 3b). Infant and child mortality had a considerable impact in the past, but mortality in contemporary developed societies, especially among young adults, is so low that the number of surviving adult children remains relatively constant once childbearing is complete. Therefore a cohort's average number of surviving children largely reflects its own fertility patterns (Murphy, Martikainen, and Pennec 2006). The highest values are found among cohorts who were bearing children in the higher-fertility period before World War I, with a secondary peak among cohorts born around 1940 whose childbearing was centered in the mid-1960s baby boom, but with lower values for cohorts born in the early decades of the twentieth century and from the 1950s (Figure 3a).

The trend for adults having living parents is much steadier for these cohorts than for the reverse relationship. There was only a comparatively small increase over time in the average number of parents alive at any given age for cohorts born in the first half of the period covered (Figure 3b)—all that matters is the parental age at childbearing and parental survival beyond that age. Mortality at older ages showed little improvement initially, but a steady improvement was seen for cohorts in the second half of the period, and the average number of parents alive started to increase substantially. About one quarter of persons born circa 1860 had lost at least one parent by age ten, whereas this fraction was not reached until over age 30 for persons born a century later.

The median age for having at least one living parent (i.e., the age at which 50 percent have a living parent) increased nearly as much in the last 25 years, from 49 to 55 years, as in the previous 100 years, from about 43 to 49 years (Murphy 2010a). Mortality improvement has been the most significant determinant of increased numbers of living parents, although this trend is likely to be reversed in decades to come as the effect of increasing ages at

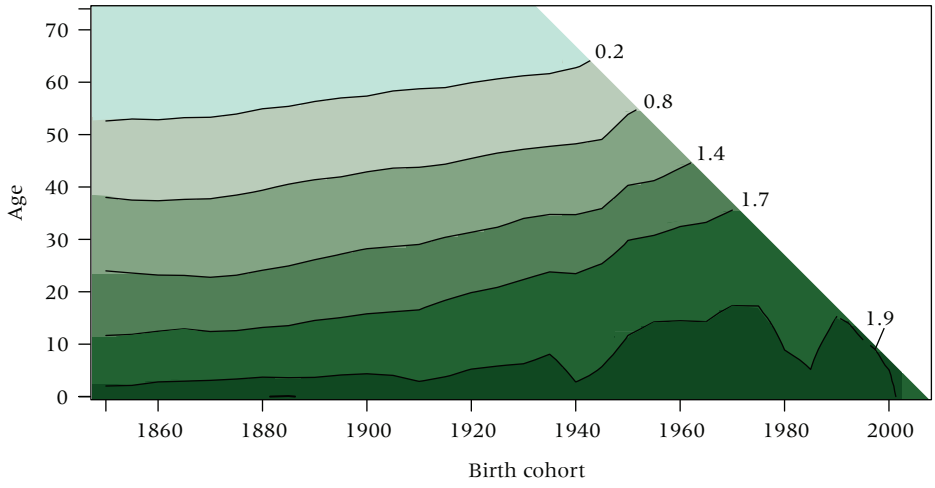
FIGURE 3a Mean number of living children of cohorts born in Britain 1850–1990, by cohort and age



SOURCE: SOCSIM model applied to 1751 population of 40,000.

childbearing outweighs likely improvements in mortality (Murphy, Martikainen, and Pennec 2006). The average number of living parents of young children has been more variable over time: apart from different mortality experiences, another reason is that children born outside of a partnership in this model do not have a known father, so they have a maximum of one pos-

FIGURE 3b Mean number of living parents of cohorts born in Britain 1850–2010, by cohort and age



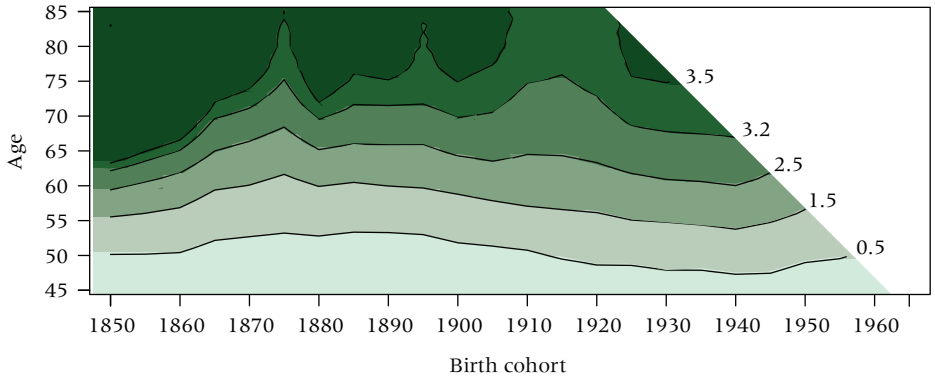
SOURCE: SOCSIM model applied to 1751 population of 40,000.

sible living parent.[5] Therefore the increase in adult mortality in the World War II period, together with the sharp rise in extramarital births around that time, led to the smaller average number of living parents of the 1940–45 cohorts, and the latter factor is responsible for lower average numbers of living parents in the most recent cohorts.

The importance of grandparents for family functioning, especially in areas such as provision of childcare, has recently been emphasized (Segalen 2003; Department of Health 2010). Many of the points made regarding the patterns and determinants of trends in parent/child kinship ties are also relevant to discussion of grandparent/grandchild kinship trends, possibly magnified since links across two generations rather than one are involved. Cohorts born at the start of the nineteenth century[6] had an average of just under ten living grandchildren around age 75 (when their children's fertility was largely complete), but this number fell steadily as the lower fertility of the two generations involved reduced the number to just under four at present for the 1930s cohorts. Persons born in the middle of the nineteenth century had only six living grandchildren on average since they and, in particular, their children had lower fertility than earlier cohorts (see Figure 4a). However, a temporary reversal occurred for the early 1940s cohorts. Although completed fertility of both generations has the major effect on age at grandparenthood, changing age at parenthood is also significant: for example, to be a grandparent at age 60 requires that the ages at first birth averaged over two successive generations are under 30 years. The 1940s cohorts had the youngest average age at first birth of all cohorts considered here, and maternal grandmothers have the lowest ages of attaining grandparenthood given women's younger average age at birth of children than that of men. The median age of grandparenthood (the age at which half of parents had at least one living grandchild) was just over 55 in 2000, nearly ten years lower than in 1950, but this lower age is likely to become less common, especially for men, and grandparenthood will occur later in the future (Murphy 2010b).

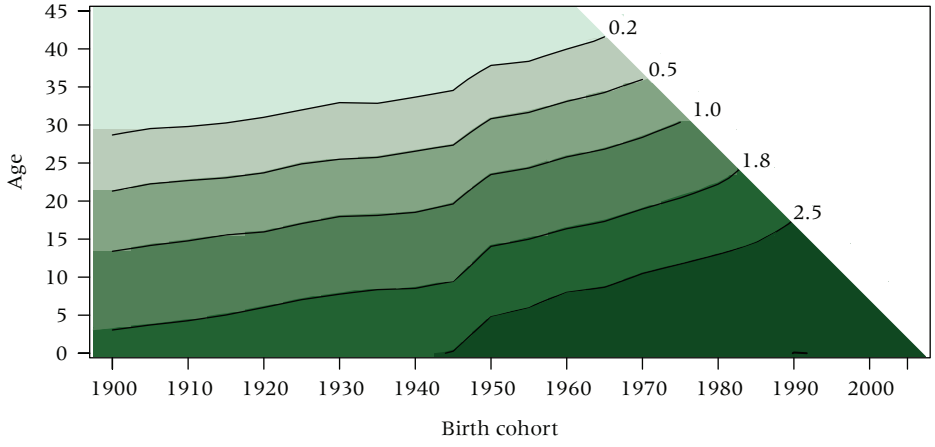
One of the consequences of mortality improvement is that intergenerational relationship ties spanning more than one generation become more common. In the first half of the period considered, a child aged under five was likely to have an average of just over two grandparents alive (mainly grandmothers), but this had risen to about 3.5 by 2010 (see Figure 4b). Children today have an average of at least three living grandparents for most of their childhood. The implications of mortality improvement for adults having grandparents alive are even more substantial. Up to 1950 half of those at age 20 had no living grandparent, whereas in 2000 this 50 percent level was not reached until after age 30, at which age the proportion of people with at least one grandparent alive was double the proportion even 25 years earlier.

FIGURE 4a Mean number of living grandchildren of native-born persons by cohort and age: Britain, birth cohorts 1850–1965



SOURCE: SOCSIM model applied to 1751 population of 40,000.

FIGURE 4b Mean number of living grandparents of native-born persons by cohort and age: Britain, birth cohorts 1900–2010



SOURCE: SOCSIM model applied to 1751 population of 40,000.

Brothers and sisters

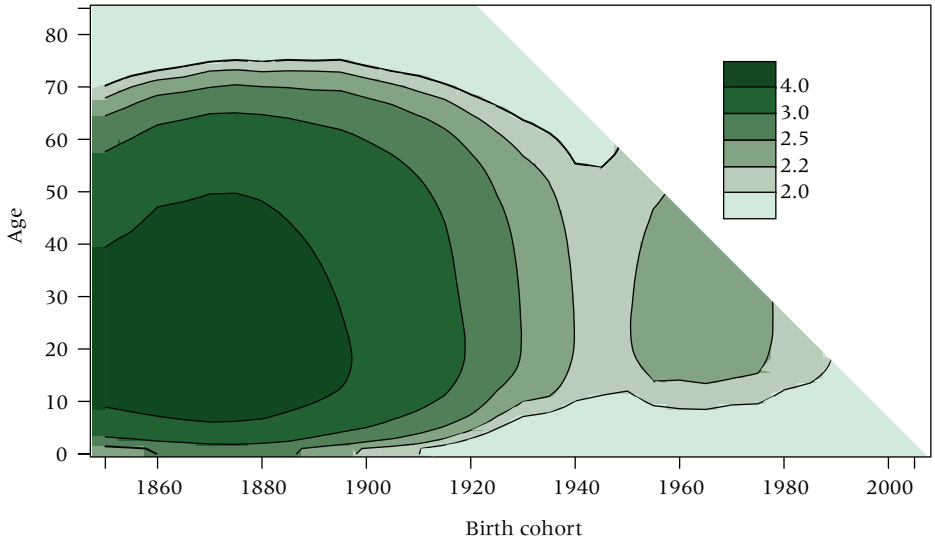
Siblings are the next most important blood kin relationship after parents and children, with the same genetic relationship between full siblings as between parents and children, and usually an extended period of co-residence in childhood. Figure 5 shows the number of living siblings (both full, i.e., those with both natural parents in common; and half, i.e., those with only one in common). Changes in numbers of siblings indicate some of the most

substantial consequences of the progression of the first demographic transition. Numbers of ever-born siblings remained high through the nineteenth century, and even cohorts born around 1880 had eight ever-born siblings on average, but the number of living siblings was reduced substantially because of death (Murphy 2010a). The decline in fertility from the end of the nineteenth century led to a sharp drop in average number of ever-born siblings, but this was offset by mortality improvement in the twentieth century, with about two thirds of the siblings of persons born around 1900 still alive at age 50.

The figure of around eight ever-born siblings for persons born in the second half of the nineteenth century is considerably higher than the total fertility rates for this period (Figure 1). This sibship size reflects the fact that there were relatively high proportions of childless women, and average family size was therefore higher among the childbearing population, Also, in the calculation of average sibship sizes, the size is computed for each child, hence giving greater weight to large families—unlike the case for calculations of average family size[7] (Preston 1976; Lam and Marteleto 2008). Preston (1976, p. 111) pointed out that, to keep fertility rates constant, people must always bear on average substantially fewer children than were born into their own family of orientation. But in the past the number of their *living* siblings was much smaller than their number of *ever-born* siblings, so the social consequences arising from being from a large family may be much smaller than numbers of ever-born siblings suggest. At the start of the period analyzed, the average number of living siblings of a new-born child was about one third of the ever-born figure; all of the cohorts shown had fewer than three living siblings on average at birth. The reasons for this are that the average birth order will be only about half of final sibship size, and the high mortality of the period (about 15 percent of children died before their first birthday and 27 percent by age five in the mid-nineteenth century in Britain) meant that some of the previously born siblings would have died before the birth of later-born children. The largest average number of living siblings, just over five, was found among teenagers for the 1850s to 1870s cohorts, and that figure remained relatively stable for the early working-age years because mortality among young adults was relatively low. Because average family sizes of women in the nineteenth century were four to five children (but higher for married women), women did not have fewer children on average than the number of siblings they were brought up with (i.e., their own average number of living siblings).

The number of living siblings is determined by two factors: the distributions of fertility and cohort mortality. Although the childhood experiences of these groups over this 160-year period, as reflected in ever-born sibship size (and to a lesser extent in number of living siblings), are so different, living sibship sizes are much more similar at older ages. At about age 65,

FIGURE 5 Mean number of living siblings of native-born persons by cohort and age: Britain, birth cohorts 1850–2005



SOURCE: SOCSIM model applied to 1751 population of 40,000.

all cohorts have an average of about two living siblings, declining to about one at age 85 (Figure 5). Therefore the improvement in mortality over this period means that by age 85 all cohorts have similar average numbers of living siblings in all time periods, even though those born later had much smaller average numbers of siblings when they were children. Half of those in their early 80s have at least one living sibling, considerably more than have a living spouse. Only children are clearly the sole group who cannot potentially have a living sibling, and the frequency of such families will affect the proportions without siblings. Although information on family size distributions in Britain for persons born before the 1920s birth cohorts is sparse, relatively few children were brought up in one-child families (Anderson 1998).

Other close relatives: Nephews and nieces, aunts and uncles, and first cousins

The diminishing role of extended kin has been a major topic in the debate about modernization and changing family roles (Murphy 2008). Around the time of the onset of sustained mortality decline in the mid-nineteenth century (Murphy 2010c), the contribution of non-nuclear kin became greater as industrialization and urbanization stimulated migration, especially among young adults, who would often look to relatives for assistance and accom-

modation (Anderson 1971). Changing demographic patterns reinforced this trend, which resulted in a substantial increase in the proportion of extended-kin households (Ruggles 1987). Wall (2001, Table 2) shows that the average number of relatives other than members of the nuclear family living in households remained largely constant for the next century before falling substantially only in the second half of the twentieth century.

I now consider the closest types of non-nuclear (or "secondary") kin—nephews and nieces, aunts and uncles, and first cousins. The number of such kin depends on variables such as sibship sizes and number of children, and on the correlation in fertility between both spouses and children and their parents. Children are disproportionally born to kin groups who have higher fertility in general (Murphy and Wang 2001; Murphy and Knudsen 2002). The number of ever-born nephews and nieces dropped sharply following fertility decline, so that the number of living nephews and nieces among adults around age 60 has fallen by about one half to a value of six over the period covered here, even though later cohorts experienced lower mortality.

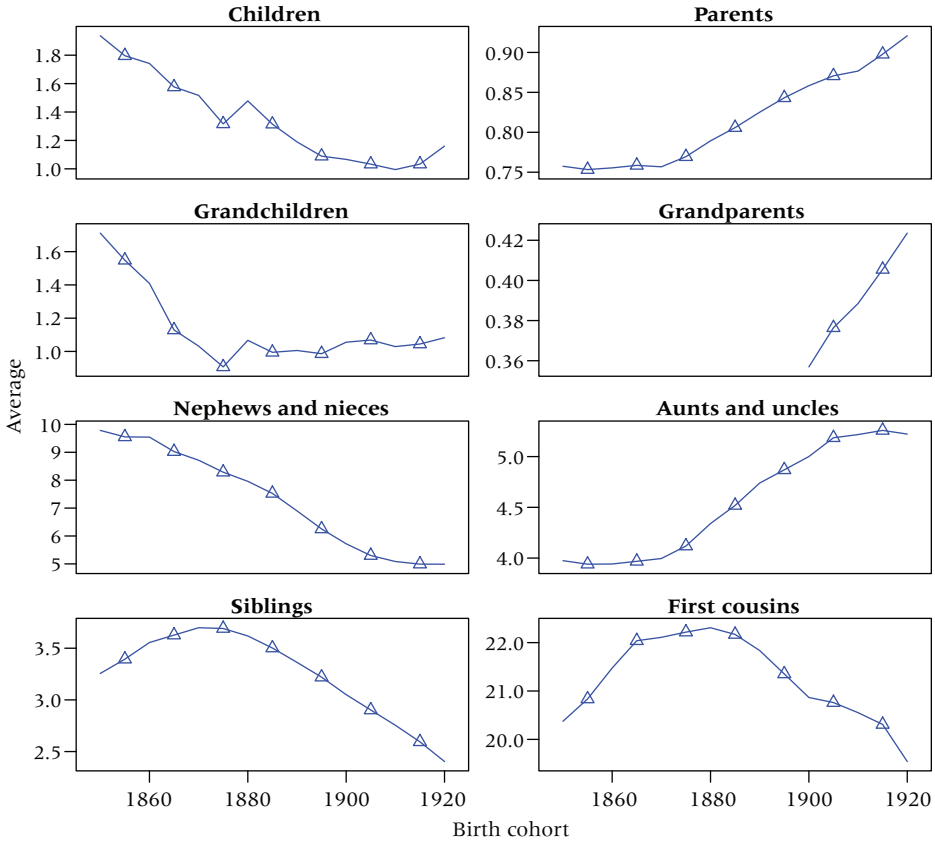
While cohorts have increasing average numbers of parents alive over time as mortality improves, the number of their living parents' siblings—aunts and uncles—shows divergent patterns with age since fertility is also important. Among people aged over about 45 years, the average number of living aunts and uncles generally increases over time; but at around age 40, the value of about four aunts and uncles remains relatively constant over the whole period, and it declines at younger ages. Until the cohorts of the 1940s, a child had an average of about ten aunts and uncles at birth, whereas the figure for those born at the start of twenty-first century is about one third less.

Of the types of living relatives discussed here, the highest average numbers are of first cousins. Persons born in the nineteenth century had more than 25 first cousins for most of their working lives, but this number had fallen by two thirds for the youngest cohorts shown. However, this change only starts to have a substantial impact for those born after about 1930.

Conclusions and implications

A convenient way of summarizing the changing kinship ties of various cohorts is to show the average number of kin people have throughout their lives. Figure 6 shows the average number of kin from birth (age 15 in the case of marriage data, children, and nephews/nieces; and age 45 for grandchildren since values are close to zero below these ages) to age 85 for persons who had typical kinship networks consistent with the cohort's mortality experience. Over time, the average number of kin among older generations (including aunts and uncles) increased, but numbers of the same or later generations declined, apart from number of grandchildren which remains relatively constant for cohorts born from around 1870.

FIGURE 6 Mean number of living kin up to age 85 of persons born in Britain, by birth cohort 1850–1920



NOTE: Lower age limit as for corresponding relative in Figures 2–5.
SOURCE: SOCSIM model applied to 1751 population of 40,000.

Figure 7 presents information on the experience of selected cohorts over the century 1850–1950 by showing the total numbers of kin subdivided into various major types. Two main dimensions are presented. The first is whether a relative is a member of an older generation (parents, aunts, etc.), same generation (siblings, first cousins, etc.), or younger generation (children, nephews, etc.) than the individual ("ego") concerned. The second is the closeness of the relationship. In practice, more-distant kin play a less important role in family functioning than closer kin, although numerically first cousins are by far the largest group considered here. Therefore the relationship results were weighted by genetic closeness to give a measure of "equivalent close kin." The weighting is based on the degree of genetic relatedness between the ego and the relative. For the closest set of relatives considered—mothers,

parents, children, and siblings, who have half of their genes in common with ego on average—the weight is set at one. Egos have one quarter in common with aunts, uncles, nephews, nieces, grandparents, and grandchildren; and one eighth in common with first cousins. While this weighting is arbitrary, it reflects the greater importance of close kin, so weights are 0.5 and 0.25 respectively. The maximum total weighted number of kin analyzed here occurs around age 40 for all cohorts. The value for persons born in 1850 is about 22 "equivalent close kin," but this figure drops to 15 for those born in 1950 (see Figure 7a). The balance of kin types of by generation also changes over time. A 40-year-old in the 1950 cohort has approximately equal numbers of kin in the older, same, and younger generations. For the 1850 cohort, in contrast, about half of kin at this age were in a younger generation, and relatively few were in an older generation.

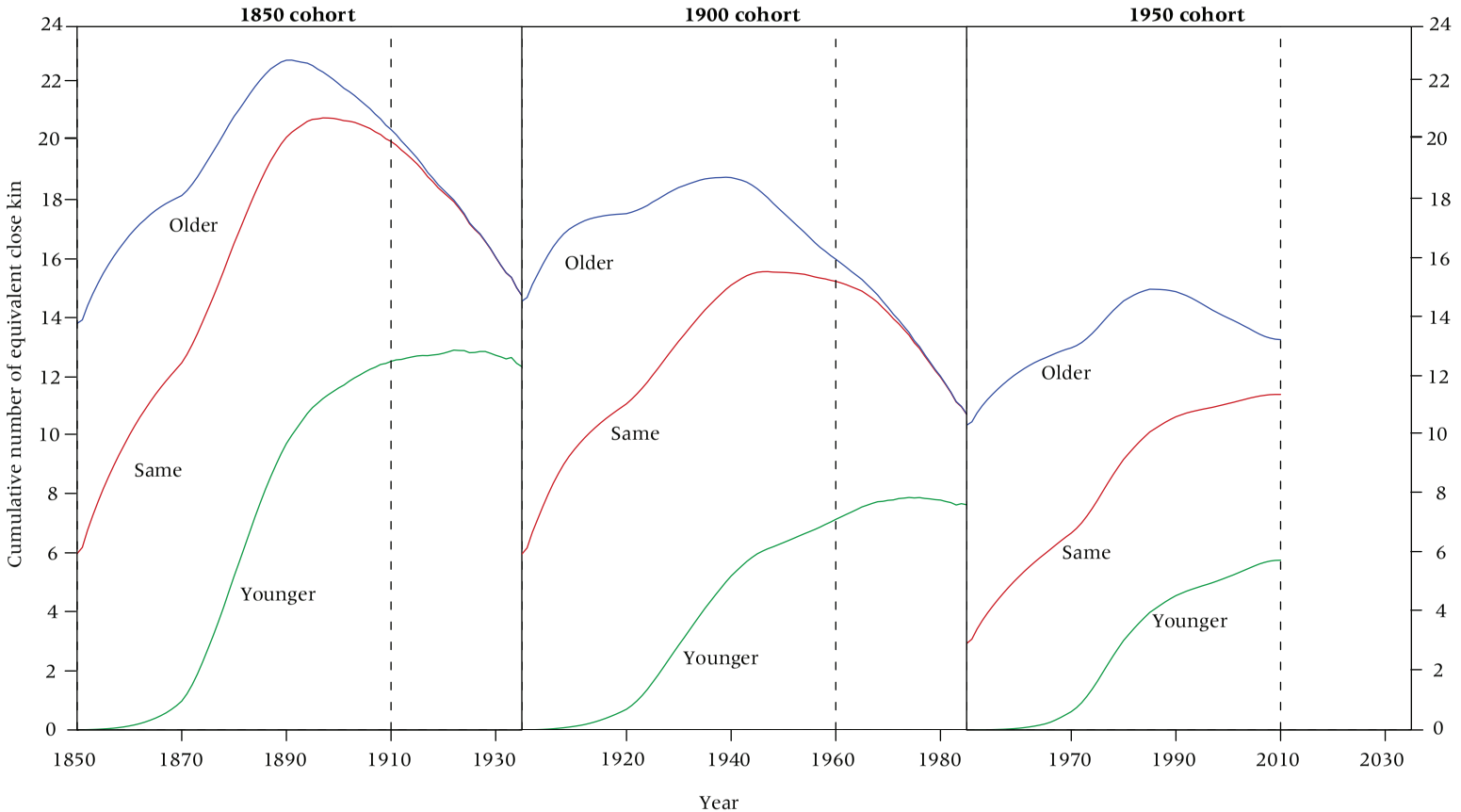
Turning now to the numbers of close and more-distant kin, the number of primary kin—referring here to parents, children, siblings, grandparents, and grandchildren—dropped by just under one third, slightly less proportionately than the overall value (see Figure 7b). The distributions by type of relative in the first half of the study period tend to be similar, but for those born around 1950, grandparents form a larger fraction of kin of young people and siblings form a much smaller fraction, whereas for the middle age ranges, the increase in numbers of living parents starts to become substantial.

Numbers of secondary kin decline somewhat more than primary kin over this period, but even so, the decline is less than 40 percent at most ages. In the first half century considered, the main change was a reduction in numbers of such kin, but in the second half the distribution of kin changed, with nephews/nieces and first cousins forming a much smaller fraction of the total number of (weighted) secondary kin (see Figure 7c).

As in Figure 6, these data show some reductions in the proportions of kin of the same generation and increases especially in older generations,[8] as suggested by the image of the beanpole family. While this pattern is beginning to emerge, the proportions of kin who are of the same generation do not appear to have changed greatly over the period, and the main feature shown is an increase in the number of kin in older generations compared to those in younger generations.

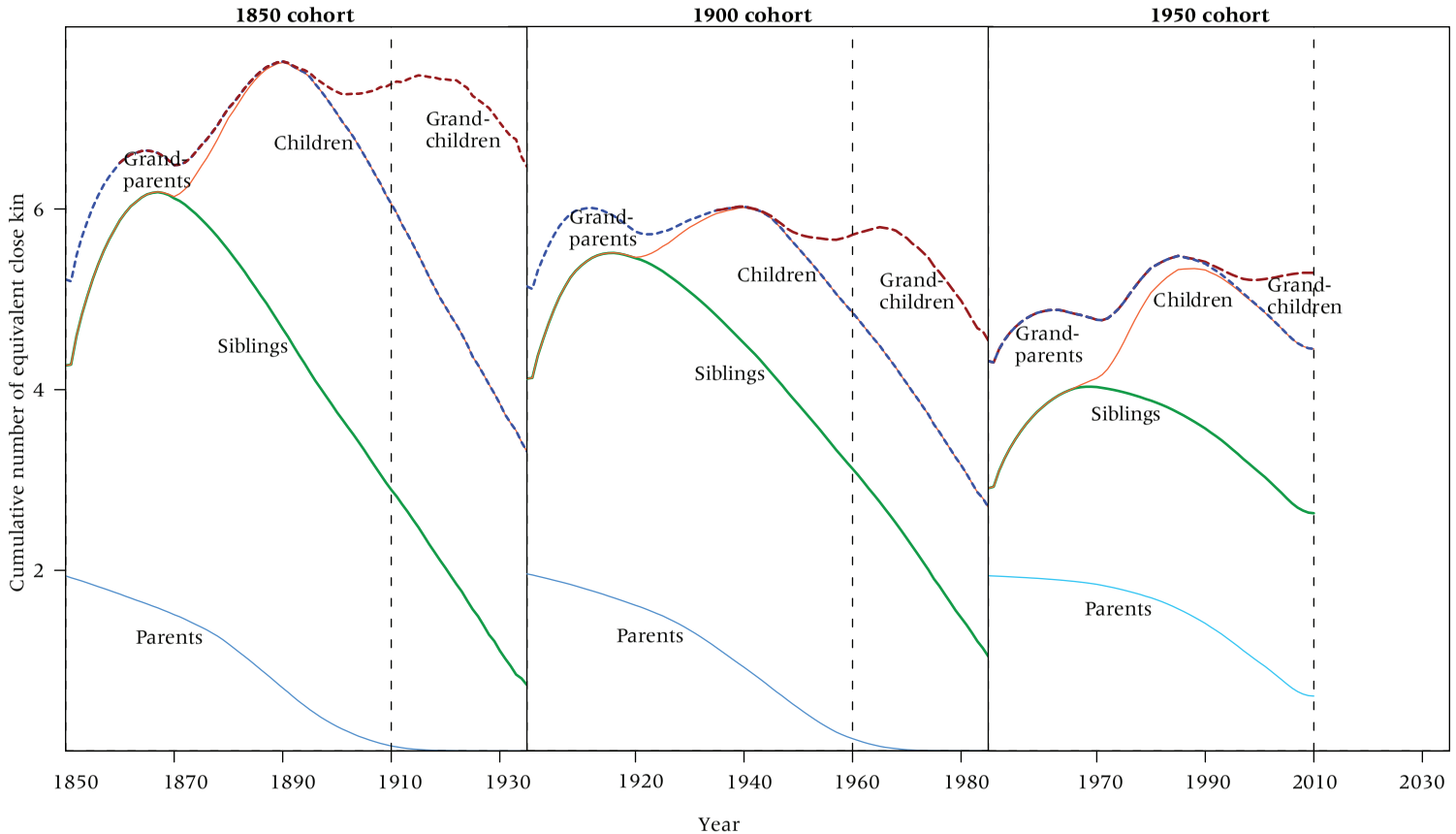
Kin availability is particularly sensitive to long-term population trends. Many of the changes arising from the demographic transition have been more pronounced in the second half of the twentieth century than in earlier periods. In part, this is because declines in fertility and mortality are long-term processes, but it is also the case that the kin pool is generated by long-term trends often occurring before the individuals concerned were born. Whether one has a living grandparent or grandchild is determined by fertility, mortality, and nuptiality over a period close to a century. For instance, the demographic

FIGURE 7a Cumulative average number of kin by generational level and age for persons born in Britain, birth cohorts of 1850, 1900, and 1950



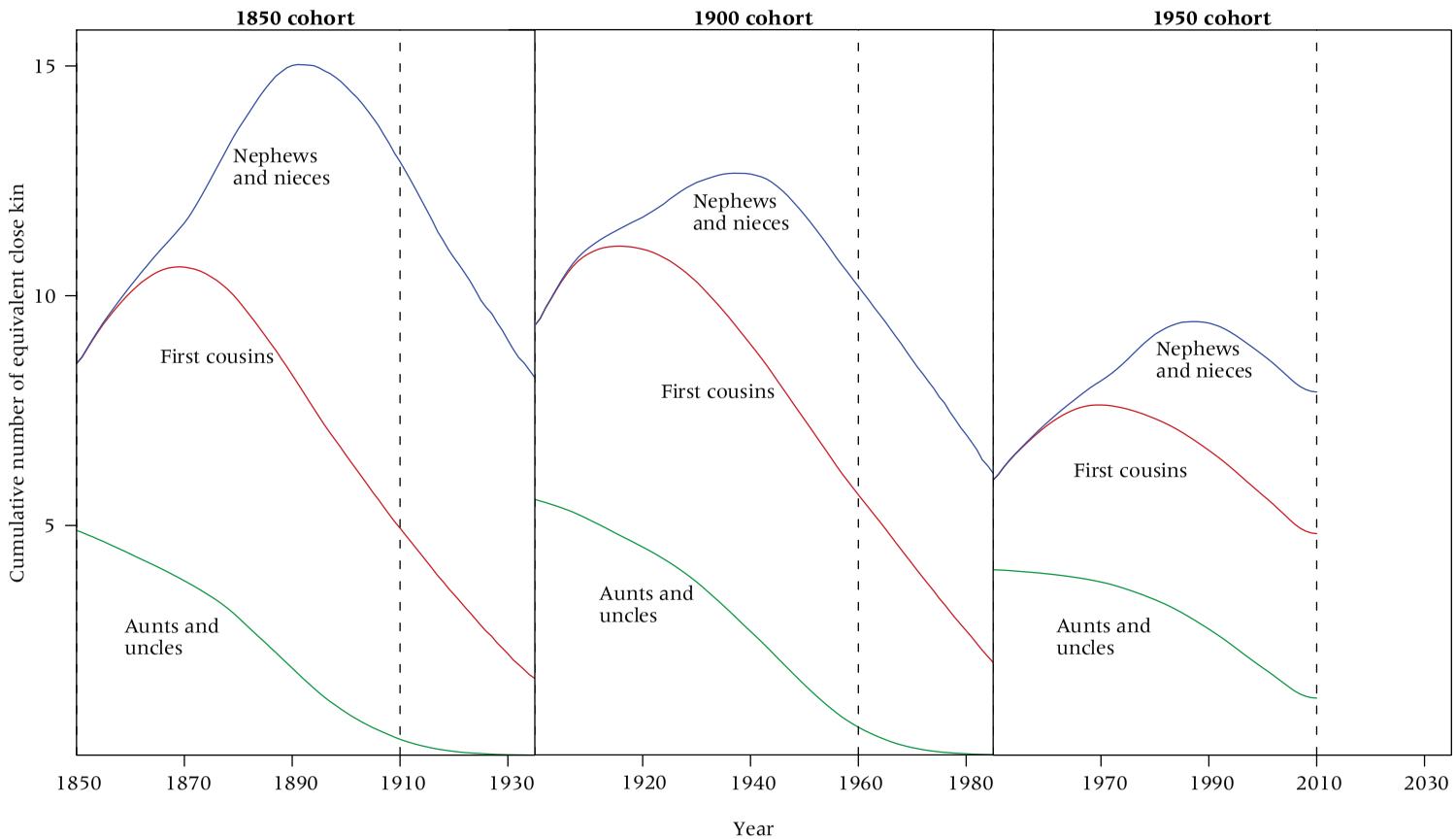
NOTE: Kin numbers are weighted for genetic closeness (see text).
SOURCE: SOCSIM model applied to 1751 population of 40,000.

FIGURE 7b Cumulative average number of primary kin by type and age for persons born in Britain, birth cohorts of 1850, 1900, and 1950



NOTE: Kin numbers are weighted for genetic closeness (see text).
SOURCE: SOCSIM model applied to 1751 population of 40,000.

FIGURE 7c Cumulative average number of secondary kin by type and age for persons born in Britain, birth cohorts of 1850, 1900, and 1950



NOTE: Kin numbers are weighted for genetic closeness (see text).
SOURCE: SOCSIM model applied to 1751 population of 40,000.

transition is only now starting to lose its impact on availability of some types of kin, and its effects were still clearly visible in the 1950s in determining numbers of siblings of older people.

Population aging, now underway in most industrialized societies, will have two main impacts on kin relations, apart from changing the availability of particular kin as a result of changing age structures. The first is an aging of generational relationships: events that formerly occurred early in life now usually occur later in life, such as the experience of one's parents' deaths, or are likely to do so in the future, such as the age at which one becomes a grandparent. The second is that patterns of re-partnering will lead to more partial relationships involving stepparents, half siblings, former partners, and stepchildren.

Appendix

In the SOCSIM model, in any month, each individual has a chance of experiencing a vital event such as becoming a parent, forming or dissolving a partnership, or dying, by generating a random variable that gives the correct probability of the event occurring. Cohabitation is also included from 1950 when it started to become numerically significant.

The SOCSIM model is closed (Watcher 1987) so that partners have to be found within the existing un-partnered simulation population. The model does not include any socioeconomic covariates since only national values are available in the historical data that the model uses.

The main addition to the updated version of the original SOCSIM model here is the inclusion of an extended set of options to incorporate heterogeneity in demographic behavior, assortative mating for demographic characteristics, and intergenerational transmission of demographic behaviors. The importance of such features was stressed by Ruggles (1987, 1993). Further details are given in Murphy and Wang (2002) and Murphy (2006).

Such models cannot replicate the exact patterns over this period since they do not model the fine detail of population inter-relationships. They use realistic but simplified assumptions that give output values acceptably similar to observed values (Murphy 2010a). Comparisons between actual and model values for fertility and mortality are shown in Figure 1.

SOCSIM is designed to analyze the evolution of long-run historical populations and therefore requires vital rates over extended time periods. In the period up to 1850, information on fertility, mortality, and nuptiality in Britain is drawn from unpublished estimates provided by the Cambridge Group for the History of Population and Social Structure. Following the introduction of national vital registration in 1837, this source was used for rates from 1850. More detailed fertility rates by age, marital status, and parity were found to be necessary from 1950. They were constructed using additional information from surveys such as the General Household Survey (Office for National Statistics 2009), which was also used to estimate cohabitation rates.

Demographic factors such as fertility, age at first birth, nuptiality, and marital breakdown are partially inherited at the family level (McGue and Lykken 1992; Dunne et al. 1997; Kohler, Rodgers, and Christensen 1999; Murphy 1999). In addition, different patterns by various social groups will lead to intergenerational correlations (Ruggles 1993). In this model, the correlation in fertility between parents and children is about 0.2 since 1871, in line with observed values (Murphy and Wang 2002). This means that the demographic behaviors of kin group members, such as siblings, will also be positively correlated. Ruggles (1993) concluded that the main impact of inclusion or exclusion of correlated behavior within kin groups was on variability rather than the mean values presented here.

After the 260 years for which the simulation is run, the total number of living people in the simulation population had risen from the initial 40,000 to 262,000 (the total simulation population size including deceased members is 855,000 by 2010, Table 1). The values are smaller than those in Murphy (2010a) since the level of fertility assumed in the early nineteenth century is lower.

For each type of kinship relationship, the relevant kin of each living member of the simulation population ("egos") at various time points were identified. For example, in the case of first cousins, all pairs of members of the simulated population with at least one grandparent in common were identified. In the model as formulated, births outside a partnership do not identify the father; therefore individuals with incomplete genealogies were excluded. For the 25 million such pairs identified, it is possible to calculate the average number of living first cousins, and similarly for other relationships.

Notes

Figures in this chapter are available in color in the electronic edition of the volume.

Thanks are due to the Economic and Social Research Council, who funded this work as part of the projects *Modelling needs and resources of older people to 2030* and *Evolving trends in British kin distributions and family life experience;* to Ken Wachter and his colleagues at Berkeley for access to and advice in using SOCSIM; to Richard Smith and Jim Oeppen of the Cambridge Group for the History of Population and Social Structure for providing historical vital rates; to the Government Actuary's Department for access to unpublished historical mortality rates; and to Duolao Wang, who worked on the project. This work was funded by ESRC project Modelling Needs and Resources of Older People to 2030 (RES-339-25-0002).

1 This analysis uses an updated version of the Berkeley SOCSIM demographic microsimulation model (Hammel et al. 1976; Hammel, Mason, and Wachter 1990). The program is freely available and written in standard ANSI C, and runs on UNIX/Linux operating systems («http://www.demog.berkeley.edu/~socsim/»). The SOCSIM model is briefly described in the Appendix, and further details are available from the author on request (m.murphy@lse.ac.uk).

2 These data are available only in five-year or longer intervals every ten years, so it was necessary to adjust the data to produce single-year-of-age estimates for each year.

3 These data do not include proportions cohabiting, but evidence suggests the numbers in earlier periods were small (Murphy 2000). The recent increase in cohabitation has been insufficient to offset the decline in marriage, so that overall proportions of young people in partnerships have declined (Berrington and Murphy 1994).

4 One group that has started to increase in the last half century and will continue to

do so is persons with living former partners following cohabitation breakdown or divorce. This increase is linked in part to the second demographic transition, but the long-standing high US divorce rates suggest other factors also operate. The analysis here indicates that the numbers in this group were trivial in Britain before 1950 since they arose from the relatively rare event of divorce. By 2000, however, about 20 percent of persons aged between the late 20s and mid-60s have a living former partner (Murphy 2010a).

5 Analyses with such cases excluded are available on request (m.murphy@lse.ac.uk).

6 No national-level fertility data are available until the introduction of a vital registration system in 1837, and even then only limited information on fertility is available until well into the twentieth century. The early estimates should therefore be treated cautiously. Ancestors such as the grandparents of those alive in the nineteenth century would have come from earlier cohorts close to the start of the simulation period when the vital registration system was incomplete, so values for such groups are not shown for early cohorts.

7 The figure of eight ever-born siblings is almost identical to one calculated from the maternity data collected in the 1911 Census of England and Wales for completed fertility of married women, which relates to births around the same period (Registrar General 1923; Murphy 2010b).

8 Although not considered here, there is also a substantial increase in multi-generational kin groups. Proportions with great-grandparents are a particularly rapidly increasing group, although from a low base.

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How Much Does Family Matter? Cooperative Breeding and the Demographic Transition

Rebecca Sear
David Coall

Hillary Clinton may have popularized the proverb "it takes a village to raise a child" in her 1996 book, but interest in who raises children had been widespread among both demographers and anthropologists for some time by the late 1990s. Part of this interest stems from the potential effects of childrearing patterns on fertility rates. Women who can rely on others for support in caring for children during their reproductive years can spare more time and energy for giving birth to additional children. Support from others may therefore be critical for high fertility rates. While both demographers and anthropologists have acknowledged this fact, the two disciplines have tended to focus on different helpers. The contribution of older children to the household economy has long been of interest to the demographic community, arising particularly from Caldwell's influential wealth flows hypothesis. He argued that when children contribute to the household economy, fertility is high; but fertility falls as modernization results in children becoming an economic burden (Caldwell 1978). Research in the 1970s demonstrated that children contribute substantial labor to the household economy in high-fertility societies (Cain 1977). More recent research on this topic convincingly argued that parents may only be able to sustain high fertility rates by making use of the labor of older children, even though each child is a net drain on the household economy (Lee and Kramer 2002; Kramer 2005).

Evolutionary anthropologists, taking a comparative cross-species perspective, were typically more interested in men, and for a long time argued that contributions from fathers are the key factor that distinguishes human childrearing from that of closely related primate species (Lovejoy 1981). More

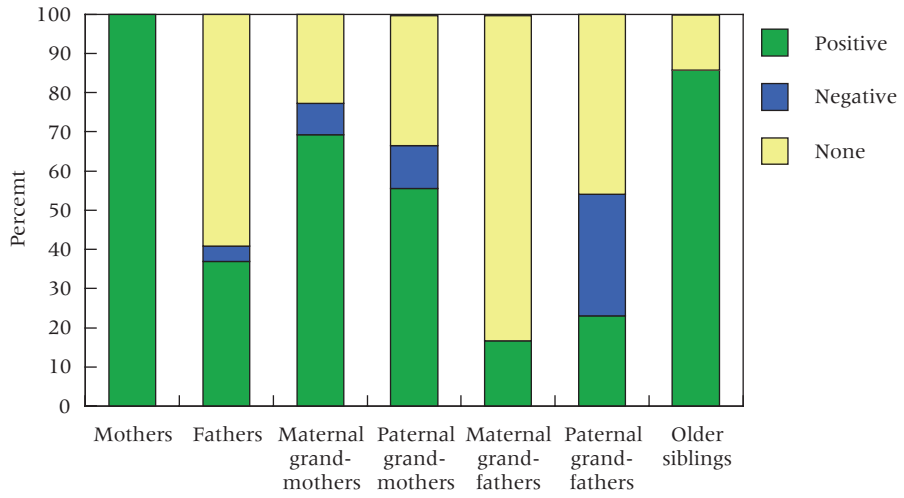
recently, however, evolutionary researchers have broadened their focus, and over the last decade or so have begun to develop the hypothesis that humans are "cooperative breeders," a relatively unusual childrearing system in which mothers receive help from many other individuals in raising offspring (Hrdy 2009). While this help may sometimes come from fathers or other men (Hill and Hurtado 2009), more reliable helpers are likely to be relatives of the mother, particularly her own mother and older children (Hawkes, O'Connell, and Blurton Jones 1989; Turke 1988). Overall, however, the cooperative breeding hypothesis suggests that the best strategy is a flexible one, whereby a woman co-opts a wide range of other individuals, including men, her own kin, and her husband's kin into helping raise her children, depending on who is available and willing to help (Hrdy 2005). This hypothesis suggests that where women receive little help in raising offspring, they will reduce family size—thus potentially contributing part of the explanation for the demographic transition (Draper 1989; Turke 1989). This hypothesis dovetails with (and indeed built on) earlier work by demographers, who observed that fertility tends to be higher among couples living in extended families, compared to those living in nuclear family households without the support and influence of kin (e.g., Davis and Blake 1956; see Burch and Gendell 1970 for a critical review of this early literature on family structure and fertility).

This chapter reviews the evidence that humans receive important help from other individuals in raising children, by drawing together empirical evidence that the availability of family members affects child health and well-being and female fertility rates. In the first section we will concentrate on the evidence for the effects of kin on child well-being in pre–demographic transition societies. In the second section we will tackle the effects of kin on children in post-transition societies. Finally, in the third section we will present evidence that kin may affect fertility rates.

Kin effects on child well-being in pre-transition societies

If family members are helping women to raise children, then we should find evidence that the presence of family members improves child health and well-being. Since child survival is an unambiguous signal of health and well-being, we concentrate on studies that look at the effects of specific family members on the probability of child survival. We have drawn together all published studies that have investigated the effects of fathers, maternal and paternal grandmothers, maternal and paternal grandfathers, and the child's older siblings on child survival. We found 37 populations where the effect of the presence of at least one relative, apart from the mother, has been correlated with child survival rates (see Tables 1–3 and Figure 1: all tables slightly updated from Sear and Mace 2008, which discusses this dataset). All are populations

FIGURE 1 Percent of studies in which a particular relative had a positive, negative, or no effect on child survival



with high mortality and fertility rates. These studies are divided into two groups. Table 1 shows those studies where at least reasonably sophisticated statistical analysis was used to examine these correlations: at a minimum these studies used multivariate analysis to control for potentially confounding factors. Table 2 shows studies that demonstrated only a simple bivariate correlation between the presence of relatives and child survival. Table 3 provides a summary of Tables 1 and 2. A "+" in Tables 1 and 2 indicates that the presence of that relative improved child survival, "none" indicates no effect, and "–" indicates the presence of that relative reduced child survival. Parentheses indicate that the effect was of borderline significance ($0.05>p<0.1$), or was only seen in children of certain ages or one sex.

We include fathers in the table, since there is debate in the literature about how much men help and what they do for children (see e.g., Winking 2006). In a previous study, we also collated published data on those studies that investigated the effects of the presence of the mother on child survival. All 32 such studies found, unsurprisingly, that the absence of the mother was correlated with lower child survival (summarized in Table 3: see Sear and Mace 2008 for details; the additional studies not included in Sear and Mace 2008 are Oris, Derosas, and Breschi 2004; Penn and Smith 2007; van Bodegom et al. 2010; and Willführ 2009). However, this positive effect for mothers declined with the child's age in all populations where an age interaction was investigated, and older children often appeared to have high survival chances even in the mother's absence. A number of these studies found that children as young as two years old apparently suffered no higher mortality in the absence of the mother, suggesting that other individuals must be helping

TABLE 1 Multivariate studies of the effects of fathers, grandparents, and older siblings on child survival

Population	Authors	Age of child (yrs)	Effect of fathers	Effect of maternal grand-mothers	Effect of paternal grand-mothers	Effect of maternal grand-fathers	Effect of paternal grand-fathers	Effect of older siblings
Gambia (4 villages) 1950–74	Sear et al. 2000, 2002	0–5	none	+	none	none	none	+
Canada (Quebec) 1680–1750	Beise 2005	0–5	+	+	+	+	(+)	+
Malawi (Chewa) 1992–97	Sear 2008	0–5	none	(–)	(+)	none	none	+
Kenya (Kipsigis) 1945–90	Borgerhoff Mulder 2007	0–5	none	none	+	none	none	
Poland (Bejsce) 1737–68	Tymicki 2009	0–5	(+)	+	+	+	+	
Japan (Central) 1671–1871	Sorenson Jamison et al. 2002	1–16	none	+	–	none	–	
Germany (Ludwigshafen) 1700–1899	Kemkes-Grottenthaler 2005	0–2		none	+	none	–	
Ethiopia (Oromo) 1993–2003	Gibson 2008; Gibson and Mace 2005	0–5	+/–	(+)	(+)	none	none	
Germany (Krummhörn) 1720–1874	Beise 2002; Voland and Beise 2002; Willführ 2009	0–5	+	+	–	none	none	
Italy (Venice) 1850–69	Derosas 2002; Breschi et al. 2004	0–10	none	none	(+)	none	(–)	
India (Khasi) 1980–2000	Leonetti et al. 2004, 2005	0–10	none	+				
Bolivia (Tsimane) 1930s–2000s	Winking et al. 2006	0–10	none					
Italy (Casalguidi) 1819–59	Breschi and Manfredini 2002; Breschi et al. 2004	0–14	none					
Italy (Madregolo) 1800–83	Breschi et al. 2004	0–14	+					

Sweden (Sundsvall) 1800–95	Andersson et al. 1996	0–15	none				
Belgium (Sart) 1812–99	Oris et al. 2004	0–10 days	none				
Japan (NE) 1716–1870	Tsuya and Kurosu 2002, 2004	1–14	+		(+)	(–)	
Netherlands (Woerden) 1850–1930	Beekink et al. 1999, 2002	0–12	+				
Utah (Mormons) 1860–95	Penn and Smith 2007	0–18	+				
India (Bengali) 1980–2000	Leonetti et al. 2005	0–10			+		
India (Uttar Pradesh) 1990–93	Griffiths et al. 2001	0–2			+		
India (Tamil Nadu) 1990–93	Griffiths et al. 2001	0–2			none		
India (Maharashtra) 1990–93	Griffiths et al. 2001	0–2			none		
NE India (8 states) 1994–99	Ladusingh and Singh 2006	0–5			none		
Bolivia (Aymara) 1960s–90s	Crognier et al. 2002	0–15					+
Morocco (Berber) 1930–80	Crognier et al. 2001	0–15					+
Finland (5 communities) 18th and19th C	Lahdenpera et al. 2004[a]	0–15		(+)			
Ghana (NE) 2003–7	van Bodegom et al. 2010[a]	0–18		none			
Paraguay (Ache) 1890–1971	Hill and Hurtado 1996[a]	0–9	+	none		none	none
China (NE) 1749–1909	Campbell and Lee 1996, 2002, 2004, 2009[a]	~1–15	(+)	none		–	

NOTE: For definitions, details of other effects, and further supplementary information, see «http://www.dur.ac.uk/anthropology/staff/profile/?id=8827».
[a]These studies did not distinguish between maternal and paternal grandmothers or grandfathers but considered grandmothers or grandfathers together.

TABLE 2 Bivariate studies of the effects of fathers, grandparents, and older siblings on child survival (not statistically controlled for confounding factors)

Population	Authors	Age of child (yrs)	Effect of fathers	Effect of maternal grand-mothers	Effect of paternal grand-mothers	Effect of maternal grand-fathers	Effect of paternal grand-fathers	Effect of older siblings
UK (Cambridgeshire) 1770–1861	Ragsdale 2004	0–15	none	+	none	none	none	
Utah (Mormons) 19th century	Heath 2003	0–1		+	none	none	(+)	
Tanzania (Hadza) 1980s–90s	Blurton Jones et al. 2000	0–5	none					
Venezuela (Hiwi) ~1980s	Hurtado and Hill 1992	0–5	none					
Uganda (Rakai) 1994–2000	Bishai et al. 2003	0–6	none					
Bangladesh (Matlab) 1983–85	Over et al. 1992	0–9	none					
Spain (Aranjuez) 1870–1950	Reher and González-Quiñones 2003	0–9	none					

NOTE: For definitions, details of other effects, and further supplementary information, see «http://www.dur.ac.uk/anthropology/staff/profile/?id=8827».

TABLE 3 Summary of kin effects on child survival (figures in parentheses are percentages)

	Multivariate				Bivariate				Total			
	Number of studies	Positive effect	Negative effect	No effect	Number of studies	Positive effect	Negative effect	No effect	Number of studies	Positive effect	Negative effect	No effect
Mothers	20	20 (100)	0	0	12	12 (100)	0	0	32	32 (100)	0	0
Fathers[a]	20	10 (50)	1 (5)	10 (50)	6	0	0	6 (100)	26	10 (38)	1 (4)	16 (61)
Maternal grandmothers	11	7 (64)	1 (9)	3 (27)	2	2 (100)	0	0	13	9 (69)	1 (8)	3 (23)
Paternal grandmothers	16	10 (62)	2 (12)	4 (25)	2	0	0	2 (100)	18	10 (55)	2 (11)	6 (33)
Non-specific grandmothers	4	1 (25)	0	3 (75)	0	0	0	0	4	1 (25)	0	3 (75)
Maternal grandfathers	10	2 (20)	0	8 (80)	2	0	0	2 (100)	12	2 (17)	0	10 (83)
Paternal grandfathers	11	2 (18)	4 (36)	5 (45)	2	1 (50)	0	1 (50)	13	3 (23)	4 (31)	6 (46)
Non-specific grandfathers	2	0	1 (50)	1 (50)	0	0	0	0	2	0	1 (50)	1 (50)
Older siblings	6	5 (83)	0	1 (17)	0	0	0	0	6	5 (83)	0	1 (17)

[a]Percentages do not sum to 100 in this row because one study found a positive effect of fathers on the survival of sons and a negative effect on the survival of daughters.

these children (Sear, Mace, and McGregor 2000; Zaba et al. 2005; Masmas et al. 2004; Andersson, Högberg, and Åkerman 1996). The data presented in Tables 1 and 2 suggest who those other individuals might be.

The first thing to note from these data is the number of "+'s that appear in the tables. In the majority of the studies at least one relative appears to be positively correlated with child survival. One of the most reliable helpers is the maternal grandmother: in more than two-thirds of cases her presence improved child survival rates. Paternal grandmothers were also often associated with positive survival outcomes, though somewhat less consistently: in just over half of cases they improved child survival. Numerically, the most consistently positive relatives were older siblings of the child (beneficial in over 80 percent of cases). However, there were only six studies in this category because we used a fairly restricted definition of older siblings: only older siblings we thought were potential "helpers-at-the-nest" were included, that is, siblings several years older than the child and not those close in age to the child (exact definition depends on study). Siblings close in age are more likely to be in competition with one another for household resources, and several studies find a detrimental effect of having older siblings on child mortality when all siblings are considered (e.g., Muhuri and Menken 1997).

Fathers were rather less important: in just over a third of all cases did they improve child survival, though this proportion rises to half if only multivariate studies were included. Grandfathers on the whole made little difference. Maternal grandfathers showed few correlations with child survival. Paternal grandfathers were roughly evenly split between studies where a difference was found and those where they had no effect. But in those studies where paternal grandfathers did matter, in more than half of cases they actually reduced child survival rates. Not even fathers or grandmothers were always beneficial to children. One study found that the presence of fathers increased the mortality of girls (rural Ethiopia: Gibson 2008); one found a detrimental effect of maternal grandmothers (rural Malawi: Sear 2008); and two found detrimental effects of paternal grandmothers (historical studies in Germany and Japan: Beise 2002; Sorenson Jamison et al. 2002). Family relationships may sometimes be characterized by conflict, rather than cooperation.

We conclude that the evidence supports the hypothesis that humans are cooperative breeders. Children do better in the presence of certain relatives, including grandmothers, older siblings, and, occasionally, fathers. Data on kin effects on the survival rates of children may even underestimate the effects of relatives since mortality is an extreme indicator of child well-being. For example, in the study of Spain included in Table 2, though fathers had little effect on the survival of their young children, teenage boys had shorter stature in the absence of fathers (Reher and González-Quiñones 2003). We note some caveats, however. First, a review based on published literature

inevitably runs the risk that studies which find positive associations between relatives and child survival may be more likely to be published than those which find no associations. We hope this problem is not too severe in the case of this particular review, at least partly because many authors have included a wide range of relatives in their analysis and published the results whether positive or null. A second problem is that the studies we have presented show correlations, but not necessarily causal relationships, between the presence of relatives and child survival. The studies in Table 1 attempt to control for some potentially confounding factors (e.g., maternal age, which is likely to be correlated both with child survival and the probability that a child has a living grandparent); a number also control for heterogeneity between mothers in child survival. But many studies use the survival status of relatives as a proxy for whether they are available to help mothers, and it is possible that shared genes or shared environment might result in positive associations between the survival of children and their relatives. Such a possibility is difficult to exclude entirely, but many of the studies in Table 1 have demonstrated that only some relatives are correlated with child survival and not others. If shared genes or environment were the explanation then one might expect to see positive correlations with all relatives not just some. Further, some studies investigated whether the effects vary by age or by sex of child. In the Gambia (Sear, Mace, and McGregor 2000; Sear et al. 2002), historical Germany (Beise 2002), and Canada (Beise 2005), grandmaternal effects are age-specific; in Ethiopia (Gibson and Mace 2005), Malawi (Sear 2008), and Japan (Sorenson Jamison et al. 2002), the effects of grandmothers are sex-specific (see Fox et al. 2010 for a hypothesis to explain why grandmaternal effects are sex-specific). Again, if shared genes or environment were the explanation, these effects might be expected to be seen at all ages and for both sexes.

More convincing evidence that kin do indeed help would result from detailed research on what relatives do within the household. A handful of studies in Table 1 collected additional data to support the hypothesis that kin actively help mothers. Usefully, the study in rural Ethiopia collected time-budget data on what individuals within the household were actually doing (Gibson and Mace 2005). This research found that grandmothers were contributing household labor, with maternal grandmothers tending to help with heavy domestic tasks and paternal grandmothers with agricultural labor. The productive nature of grandmothers has been confirmed in other African agricultural (Bock and Johnson 2008) and hunter-gatherer societies (Hawkes, O'Connell, and Blurton Jones 1989). Similarly, recent work has confirmed that children contribute both domestic and productive labor to the household (Lee and Kramer 2002; Kaplan 1994).

Relatives may also help directly with childcare. Earlier research in the Gambian population included in Table 1 demonstrated that maternal grand-

mothers play an important role in childcare when children are weaned: mothers send children away to a relative during this period so that they will "forget the breast"; the majority of children are sent to their maternal grandmother (Thompson and Rahman 1967). It is notable, therefore, that the effect of maternal grandmothers in this population was seen around the time of weaning, but not before. Several other observational studies by anthropologists have confirmed that individuals other than the mother are frequently heavily involved in caring for children. Among two forager groups in Central Africa (Ivey 2000; Fouts and Brookshire 2009), infants spend more time in allomaternal care than maternal care; one of these studies found that infants were cared for, on average, by 24 individuals (Ivey 2000). In an agro-pastoralist African population, the quality of allomaternal care was found to be high whether or not the mother was present, such that the infant did not experience increased distress during the mother's absence (Borgerhoff Mulder and Milton 1985). That kin are the most important helpers is suggested by further studies among both Martu aborigines in Australia and Hadza hunter-gatherers in Tanzania, which find that the degree of genetic relatedness affected both the probability of caring for infants and the intensiveness of care: more closely related individuals provide more care and more intensive care (Scelza 2009; Crittenden and Marlowe 2008).

Qualitative research has also demonstrated that grandmothers, in particular, seem to have influential roles around the perinatal period and in child feeding practices, by giving advice and practical support, which may provide a mechanism for affecting child survival rates. Douglass and McGadney-Douglass (2008) found that grandmothers in Ghana (usually paternal) may have a vital role to play in improving children's rates of survival from kwashiorkor, by recognizing illness and ensuring the child's parents complied with the daily regime of nutritional treatment. In northern Malawi (Bezner Kerr et al. 2008) and Nepal (Masvie 2007) paternal grandmothers are influential in perinatal care (for example, assisting delivery) and child feeding practices. A community health programme in Senegal demonstrated that including grandmothers in programmes aimed at improving nutritional practices related to pregnancy and infant feeding was successful in improving these practices among reproductive-aged women (Aubel, Toure, and Diagne 2004, in whose population "A home without a grandmother is like a house without a roof"). In a study in Gujarat, India, Sharma and Kanani (2006) found that grandmothers appeared to improve the calorie and nutrient intake of children (especially aged 6–11 months) leading to improvements in nutritional status. Such helpful practices related to child feeding may be part of the reason why the positive effects of relatives on child survival in the Ethiopian and Gambian studies in Table 1 were mirrored by positive effects on nutritional status (Sear and Mace 2009; Sear, Mace, and McGregor 2000; Gibson and Mace 2005).

Grandparental effects on child well-being in post-transition societies

In our survey of kin effects in post-transition societies, we focus on the effects of grandparents. A large literature on the involvement of fathers and their impact on child well-being suggests they may be more important in post-transition than many pre-transition societies; however, this large literature requires a separate review (see Amato and Rivera 1999; Sigle-Rushton and McLanahan 2004). It is also difficult to analyze the effects of older siblings in post-transition societies since, by definition, far fewer siblings are available to provide care in low-fertility societies. Moreover, siblings tend to be close in age, thereby violating our principle of analyzing only the effects of potential helpers at the nest; and universal and extended education makes sibling contributions to the household economy much less likely. Low rates of fertility and childhood mortality in post-transition societies make grandparents' influences on classic fitness indicators difficult to assess. Rather, because of low fertility and ever-increasing investment per child, it is likely that grandparental influences, if they exist at all, will be found in measures of child development such as psychological adjustment, mental health, and cognitive ability (Coall and Hertwig 2010).

Extending a previous review (Coall and Hertwig 2010) to include grandparental effects across a range of family types, we identified 19 articles that examined the influence of grandparents on grandchild outcomes in post-transition societies: 13 examining grandchildren's psychological adjustment (see Table 4), three examining depression (Botcheva and Feldman 2004; Ruiz and Silverstein 2007; Silverstein and Ruiz 2006), two examining academic achievement (Falbo 1991; Scholl Perry 1996), and one examining mental and physical development (Tinsley and Parke 1987). The 13 studies exploring grandparental influences on grandchildren's psychological, social, and emotional adjustment form a relatively homogeneous group and are the focus of the discussion that follows.

The majority of studies (77 percent) included in Table 4 and reviewed here suggest grandparents continue to have a beneficial impact on grandchild development in post-transition societies. Grandparental involvement with their grandchildren and the quality of their relationships appear to influence grandchild well-being, specifically psychological adjustment. In family situations where fewer parental resources are available (e.g., step- and single-parent families), the resources grandparents provide appear to have a stronger positive association with grandchild well-being (Henderson et al. 2009; Lussier et al. 2002). Although having a custodial grandparent seems to result in poorer grandchild outcomes, this is likely to be a consequence of the family situation that resulted in the grandparent assuming that role (Pittman 2007). Perhaps surprisingly, three studies have found weak negative associations between

TABLE 4 Studies of the effects of grandparents on grandchild's psychological adjustment

Population/ location	Authors	Sample	Age of grandchild (years)	Grandparental involvement measure	Grandchild's psychological adjustment
England and Wales	Attar-Schwartz et al. 2009	1,515 children	11–16	Grandparental involvement (summed across 6 items)	Strengths and difficulties questionnaire
England and Wales	Griggs et al. 2010	1,596 children	11–16	Grandparental involvement across 9 individual items	Strengths and difficulties questionnaire
Bristol (England)	Fergusson et al. 2008	8,752 families	4	Regular grandparental childcare (i.e., at 8, 15, and 24 months of age)	Strengths and difficulties questionnaire
Bristol (England)	Lussier et al. 2002	155 children	7 or older	Sum of closeness to and importance of grandparent as rated by grandchild	Composite measure including child behavior checklist
Bristol (England) (140 from above study)	Bridges et al. 2007	385 children	7–22	Closeness to grandparent rated by grandchild	Child behavior checklist
Texas (US)	Henderson et al. 2009	324 high school and university students	17–20	Maternal grandmother–grandchild relationship quality (Inventory of parent and peer attachment)	Relationship competence, self-efficacy, and psychological symptoms
Khartoum (Sudan)	Al Awad and Sonuga-Barke 1992	210 families	4–9	Grandmother involvement in everyday child care	Childhood psychological adjustment questionnaire
Boston, Chicago, and San Antonio (US)	Pittman 2007	514 children	10–14	Grandmother's child care responsibility and co-residency	Child behavior checklist
Chicago (US)	Kellam, Ensminger, and Turner 1977	1,387 families	6	Co-residence with mother and grandchild	Adequacy of social role performance in classroom (teacher rated)
Virginia (US)	Hetherington 1989	144 families	4	Contact with grandparents	Psychological adjustment
US national	Cherlin and Furstenburg 1986	510 grandparents	13–17	Grandparental involvement	Social and psychological adjustment (parent, teacher, and child rated)
Detroit (US)	Radin, Oyserman, and Benn 1991	66 multigenerational teen mother families (biological father absent)	1 or 2	Grandparent involvement Grandparent nurturance	Socio-emotional functioning
Detroit (US)	Oyserman, Radin, and Benn 1993	As above	As above	As above	As above

NOTE: For definitions, details of other effects, and further supplementary information, see «http://www.dur.ac.uk/anthropology/staff/profile/?id=8827».

grandparental childcare and grandchild outcomes (Cherlin and Furstenburg 1986; Fergusson, Maughan, and Golding 2008; Hetherington 1989). Unfortunately, none of these studies considered the quality of childcare provided to establish whether it is grandparental childcare or underlying familial factors that contribute to this association. It appears more likely that in difficult financial or behavioral situations, parents are more likely to turn to grandparents for help, rather than that grandparental childcare has a negative influence on grandchildren (Cherlin and Furstenburg 1986; Hetherington 1989; Pittman 2007).

In contrast to pre-transition societies, grandfathers in post-transition societies appear to have an equal if not greater impact on grandchild development than grandmothers. Interestingly, grandfathers appear to have a more positive impact even though they have less contact with grandchildren than grandmothers. This finding may be due, in part, to the availability of family members. For example, in the studies that explicitly chose families with a biological mother present and biological father absent, a resident grandfather had a large influence on grandchild development. This may indicate that the grandfather assumed the father figure role while the grandmother, usually the maternal grandmother, had a smaller role since the mother was present (Oyserman, Radin, and Benn 1993; Radin, Oyserman, and Benn 1991). It must be noted, however, that studies focusing on grandmothers, especially coresiding grandmothers, find consistent beneficial influences (e.g., Henderson et al. 2009). There is some evidence that maternal grandparents have a more beneficial effect than paternal grandparents (Bridges et al. 2007; Lussier et al. 2002); however, a clear limitation in the post-transition literature is the lack of distinction between grandparent types, a distinction that seems to be influential in pre-transition societies.

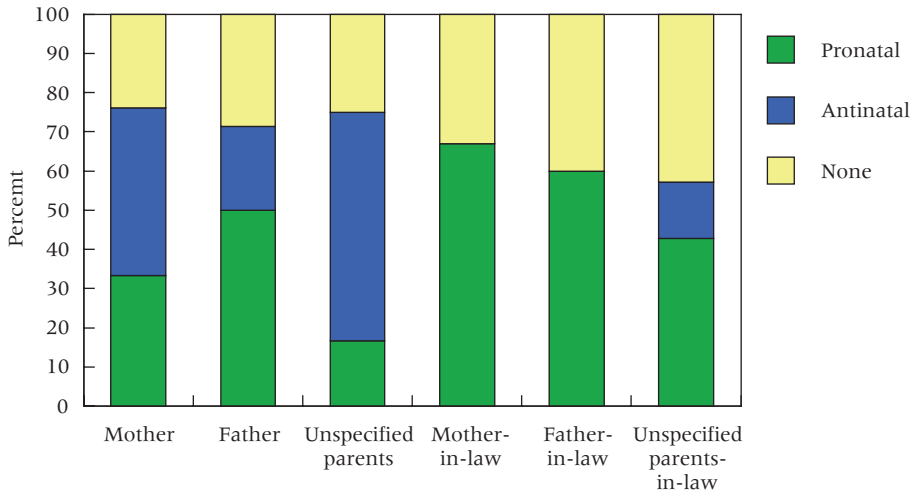
The effects grandparents have on grandchild development are generally small (but see Henderson et al. 2009; Radin et al. 1991). The fact that these associations are found across grandchild ages, study designs, and diverse populations, and generally take into account a range of potential confounding variables, adds strength to these findings. We reiterate that the direction of the causal association cannot be established from these correlational studies. From the current literature we cannot establish whether grandparental investments specifically improve grandchild outcomes. Rarely is it possible to rule out the alternative explanation that grandparents are more attracted to happy and responsive grandchildren and that their increased investment is purely a side effect of this interaction. Likewise, it may be that grandchildren live with custodial grandparents when very difficult circumstances have befallen a family and that these conditions, not the grandparents' investment, influence grandchild development. However, the ability in longitudinal studies to adjust for earlier measures of the grandchild's environment and development is showing promise (see Coall and Hertwig 2010). For example, in a longitudinal analysis that controlled for earlier psychological adjustment, Pittman and Boswell (2007) found

that grandchildren who moved into custodial grandparent households demonstrated improved psychological adjustment. Moreover, like the ethnographic data, these findings are supported by qualitative analyses that show it is not the grandparent–grandchild relationship per se that makes a difference; rather it is how grandparents care for their grandchildren that is crucial (see Al Awad and Sonuga-Barke 1992; Botcheva and Feldman 2004; Griggs et al. 2010; Coall and Hertwig 2010; Kennedy and Kennedy 1993). The burgeoning field of grandparental investment in post-transition societies does suggest grandparents play a crucial supportive role to mothers and grandchildren reminiscent of that found in many pre-transition societies. With the demographic transition the child outcomes have changed; however, the evidence that grandparents have a positive influence on grandchild development, especially in the trying times of divorce, re-marriage, and economic hardship, is growing.

Kin effects on female fertility

We have seen that kin help mothers in both pre- and post-transition societies, but do their presence and assistance also affect fertility rates? Such help in reducing the costs of childrearing may plausibly affect fertility rates in both pre- and post-transition societies. In pre-transition, poorly nourished societies, relieving some of women's energetic burden of reproduction may result in more frequent conceptions and higher birth rates. In both types of societies, women may be more inclined to have children, and to have more children, when they are surrounded by supportive kin networks. Kin may also take an active role in encouraging childbearing, at least when conditions are suitable for successfully raising children, so that social norms may be more pronatal in situations where women are surrounded by kin (Newson et al. 2007). Here, we review studies that contribute empirical data to the question of whether kin influence fertility (a more detailed description of this dataset is in preparation: Sear and Mathews in prep). We restrict our review to published studies that investigated the impact of the presence of parents or parents-in-law on women's fertility. We do not include the many studies which have investigated whether sibship size influences fertility, since we are keen to restrict our analysis to those kin known to be available to influence a woman's fertility during her reproductive years. We have also only included those studies which indicated whether named relatives were available to the woman, rather than including the several studies which have analyzed the effects of family form or household composition on female fertility (such as living in a nuclear versus extended family), since such analyses also do not provide precise data on which kin are available to influence fertility. We argue that it is important to know exactly *who* is available to women, since different relatives may have different roles to play within the household.

FIGURE 2 Percent of studies in which a particular relative had a pronatal, antinatal, or no effect on fertility



We identified 39 populations in which the effects of parents and parents-in-law on female fertility have been statistically investigated (Tables 5 and 6 for multivariate and bivariate studies respectively, substantially updated from Mace and Sear 2005, and summarized in Table 7). Each row in these tables represents a different sample of women: in some cases more than one row relates to the same national population, but the sample of women is different in each case; where clearly distinct populations of women were identified in the same study (such as ethnic groups with different postmarital residence patterns) and analyzed separately, a separate row is devoted to each distinct sample of women. These tables and Figure 2 should therefore be interpreted with caution, since this dataset may both over- and under-estimate the effects of kin on fertility (for example, because different samples from the same national population are not necessarily independent datapoints; and because analyzing large national populations may hide kin effects if they are only found in some sections of the population). In some cases more than one row relates to the same national population, but the sample of women is different in each case. A variety of fertility outcomes is included—mostly age at first birth (in some studies proxied by teenage birth), length of birth intervals, and total number of children born (which may or may not be restricted to post-reproductive women). A "+" in Tables 5 and 6 represents an increase in fertility in the presence of kin, as indicated by earlier age at first birth, shorter birth intervals, and higher total number of children born; "–" represents a decrease in fertility, and "none" indicates no effect. In this case the relationship of each kin category refers to the woman herself, so that "mothers" in these tables are equivalent to "maternal grandmothers" in Tables 1 and 2. Because these

TABLE 5 Multivariate studies of the effects of parents and parents-in-law on fertility

Population[a]	Authors	Fertility[b]	Fertility outcome studied[c]	Effect of mothers	Effect of fathers	Effect of mothers-in-law	Effect of fathers-in-law
Paraguay (Ache)	Hill and Hurtado 1996 Waynforth 2002	High	IBI AFB	none	none +	none	none
Gambia (4 villages)	Sear et al. 2003 Allal et al. 2004	High	IBI AFB	none none	none +	+ none	+ none
Dominica	Quinlan 2001	High	AFB		none		
India							
Bengali	Leonetti et al. 2005	High	IBI			+	
Khasi	Leonetti et al. 2005 Leonetti et al. 2008	High	IBI AFB	none –			
Finland 1702–1823	Lahdenpera et al. 2004, 2007	High	AFB IBI TCH Span	+ + + +	+ + none none		
Poland							
<1900	Tymicki 2004	High	IBI TCH	+/–[d] +	+ +	+ +	none +
>1900	Tymicki 2004	High	IBI TCH	+ +	+ +	+ +	none +
Germany 1720–1874	Voland and Beise 2002	High	IBI	none	none	none	none
Utah <1900	Hawkes and Smith 2009	High	TCH	+			
Tanzania	Ainsworth et al. 1998	High	Recent birth	+	none		
Malaysia							
Malays	Morgan and Rindfuss 1984[e]	High	First birth interval	+		none	
Chinese	Morgan and Rindfuss 1984[e]	High	First birth interval	none		none	
Indians	Morgan and Rindfuss 1984[e]	High	First birth interval	none		–	
South Korea	Morgan and Rindfuss 1984[e]	High	First birth interval	–		none	
Turkey	Gökçe et al. 2007	Low	Teenage pregnancy	none		none	
South Africa Cape Town	Vundule et al. 2001	Low	Teenage pregnancy	none	–		

Taiwan							
Taichung	Lee 2001	Low	Teenage birth	–			
Southern	Wang and Chou 1999	Low	Teenage birth	–			
UK (NCDS) Nat. rep.[f]	Kiernan 1992	Low	Teenage birth	–/none[g]	none/–[g]		
Finland Nat. rep.	Vikat et al. 2002	Low	Teenage birth	–			
Australia Nat. rep.	Parr 2005	Low	Childlessness	none	+		
Australia	Chisholm et al. 2005	Low	AFB	–	–		
Taiwan Nat. rep.							
1980 KAP	Thornton et al. 1986[e]	Low	TCH				+
1999–2000 PSFD	Tsay and Chu 2005[e]	Low	IBI				+
1990 THRS	Chi and Hsin 1996[e]	Low	TCH IBI				+ +/none[h]
West Germany Nat. rep.	Hank and Kreyenfeld 2003[e]	Low	AFB IBI		+ none		
Canada Nat. rep.	Wu and Schimmele 2003[e]	Low	AFB TCH		–		
US Nat. rep.							
HSB	Astone and Washington 1994[e]	Low	Teenage pregnancy		–		
1995 NSFG	Manlove, Terry et al. 2000[e]	Low	Teenage birth		–		
1982 NSFG	McLanahan and Bumpass 1988[e]	Low	Teenage birth		–		
NELS	Lopoo 2004[e]	Low	Teenage birth		–		
US, NW Teenage mothers	Gillmore et al. 1997[e]	Low	IBI		none		
US Teenage mothers	Manlove, Mariner, and Papillo 2000[e]	Low	IBI		–		

NOTE: For definitions, details of other effects, and further supplementary information, see «http://www.dur.ac.uk/anthropology/staff/profile/?id=8827». NCDS: National Child Development Survey; KAP: Knowledge, Attitude, Practice; PSFD: Panel Study of Family Dynamics; THRS: Taiwan Human Resources Survey; HSB: High School and Beyond; NSFG: National Survey of Family Growth; NELS: National Educational Longitudinal Study.

[a]Unless otherwise stated, data were collected in recent decades. [b]High = TFR ≥ 3; Low = TFR < 3. [c]AFB = age at first birth; IBI = length of birth intervals; TCH = total number of children born; span = length of reproductive span. [d]Reproductive-aged mother –; post-reproductive mother +. [e]These studies did not distinguish between mothers and fathers or mothers-in-law and fathers-in-law but considered parents or parents-in-law together. [f]Nationally representative sample. [g]Parental absence due to death/divorce. [h]Significant effect for second IBI but not third.

TABLE 6 Bivariate studies of the effects of parents and parents-in-law on fertility

Population[a]	Authors	Fertility[b]	Fertility outcome[c]	Effect of mothers	Effect of fathers	Effect of mothers-in-law	Effect of fathers-in-law
Trinidad	Flinn 1986, 1989	High	TCH	–/+[d]			
Costa Rica 1500s–1900s	Madrigal and Meléndez-Obando 2008	High	TCH	–			
Hungary							
Gypsies	Bereczkei 1998, Bereczkei and Dunbar 2002	High	TCH	+			
Non-Gypsies	Bereczkei 1998, 2002 Bereczkei and Dunbar 2002	Low	TCH	none			
Hungary	Bereczkei and Csandaky 1996	Low	Total conceptions		+		
			TCH		none		

NOTE: For definitions, details of other effects, and further supplementary information, see «http://www.dur.ac.uk/anthropology/staff/profile/?id=8827».
[a]Unless otherwise stated, data were collected in recent decades.
[b]High = TFR ≥ 3; Low = TFR < 3 .
[c]AFB = age at first birth; IBI = length of birth intervals; TCH = total number of children born.
[d] – for women 18–21 years; + 22–29 years.

TABLE 7 Summary of kin effects on female fertility (figures in parentheses are percentages)

	High fertility				Low fertility				Total			
	Number of studies	Positive effect	Negative effect	No effect[a]	Number of studies	Positive effect	Negative effect	No effect[a]	Number of studies	Positive effect	Negative effect	No effect[a]
Mothers[b]	12	7 (58)	4 (33)	3 (25)	9	0	5 (56)	4 (44)	21	7 (33)	9 (43)	7 (33)
Fathers	8	5 (63)	0	3 (38)	6	2 (33)	3 (50)	1 (17)	14	7 (50)	3 (21)	4 (29)
Unspecified parents	4	1 (25)	1 (25)	2 (50)	8	1 (13)	6 (75)	1 (13)	12	2 (17)	7 (58)	3 (25)
Mothers-in-law	6	4 (67)	0	2 (33)	0	0	0	0	6	4 (67)	0 (0)	2 (33)
Fathers-in-law	5	3 (60)	0	2 (40)	0	0	0	0	5	3 (60)	0	2 (40)
Unspecified parents-in-law	4	0	1 (25)	3 (75)	3	3 (100)	0	0	7	3 (43)	1 (14)	3 (43)

[a]A population was counted as having "No effect" only if there was no correlation between any fertility outcome in that population and the relative in question.
[b]Percentages do not always sum to 100 because some studies find both positive and negative effects .

studies include both pre- and post-transition societies, we divide Tables 5 and 6, somewhat arbitrarily, into high-fertility populations (top panels: defined as TFR ≥3) and low-fertility populations (bottom panels: TFR < 3).

This preliminary survey should be interpreted with caution: as with the data on child survival, a review of empirical findings may be distorted if studies that find significant effects are more likely to be published, and these studies only demonstrate correlation not causation. The picture for female fertility is less clear-cut than for child survival. Table 5 suggests that the effects of parents and parents-in-law on fertility are not always consistent across all measures of fertility. We may draw some tentative conclusions, however. First, kin effects are again common: in only five (13 percent) of the 39 populations was there no evidence that parents or parents-in-law influenced fertility. But which relatives are important differs somewhat from those important for improving children's survival (compare Figures 1 and 2). The direction of the effect is also more variable than for child mortality: a woman's parents, in particular, seem if anything more likely to reduce than increase her fertility. Many of these parental antinatal effects can be attributed to the protective effects against teenage childbearing of living with both parents in low-fertility societies. A woman's parents-in-law almost invariably increase her fertility, although few studies include parents-in-law in low-fertility societies. If we focus on high-fertility societies (see Table 7), we can still tentatively conclude that a woman's parents-in-law tend to have pronatal effects, while the effects of a woman's own parents may be more variable. More data need to be collected, however, before such a conclusion can be drawn with confidence.

A further caveat is that it is more difficult to interpret these fertility results than results for child survival. While all family members should be interested in improving child health and well-being once a child is born (with certain exceptions), whether family members are interested in increasing or decreasing the number of children produced is more difficult to determine. Giving birth to many, closely spaced children may not be in a woman's best interest, for example, since it can lead to maternal depletion (Jelliffe and Maddocks 1964). Her husband, however, may wish to have many children and may desire a higher fertility than is optimal from the woman's point of view (since he does not bear the same costs of reproducing that she does). Studies of fertility preferences in men and women tend to show that, where they differ (and mostly they don't), men want more children than women (Ratcliffe, Hill, and Walraven 2000; Gebreselassie 2008). A woman's husband and his family may therefore encourage high fertility, whereas a woman's own family may attempt to protect her from the high fertility demands of her husband and in-laws, and not encourage rapid childbearing (Mace and Colleran 2009; Sear, Mace, and McGregor 2003). Evidence for this hypothesis comes from a recent study in rural Africa which found that a woman's kin may actually

assist her uptake and use of modern contraception, thereby potentially reducing her fertility (Borgerhoff Mulder 2009), but perhaps optimizing the total output of children to maintain her own health.

Grandparental childcare and fertility—post-transition societies

As with the analysis of child survival, correlations between the availability of relatives and fertility do not necessarily demonstrate causal relationships. We have argued that one potential pathway through which parents could influence their children's fertility is by providing practical help with raising grandchildren, and data collected from post-transition societies suggests that grandparents still play a pre-eminent role as childcare providers in post-transition societies (see Hank and Buber 2009). Despite this, surprisingly few studies have examined in detail these grandparental influences on fertility. Using population-level data Coall and Hertwig (2010) examined the association between total fertility rate and grandparental childcare across ten European countries; we extend their analysis and present it graphically here (see Figures 3 and 4). The percentage of grandparents who took care of their grandchildren, without the presence of their parents, *regularly* (almost weekly or more often) or at all (*any*) over the last 12 months was taken from Hank and Buber's analysis of the Survey of Health, Ageing and Retirement in Europe. If grandparents rated frequency of child care for more than one of their children, the child who received the most frequent care was counted. Total fertility rates are the 2009 estimates from the CIA's world fact book (Central Intelligence Agency 2009). Figure 3 shows a strong negative association between *regular* childcare by grandmothers and total fertility rate across Europe ($r = -.90$) with a slightly weaker association for grandfathers ($r = -.88$ not shown). Perhaps surprisingly this means that in countries where grandparents provide *less* regular care fertility is higher and where a higher proportion of grandparents provide regular care the fertility rates are lower. In line with Hank and Buber's interpretation we suggested this reflects the inadequate provision of institutional childcare and support for women to return to work after having a family in countries such as Greece and Italy. In these countries it would appear that if women want a career and a family, grandparents must step up to provide regular childcare. Evidence from a German study suggests when state-funded childcare provisioning is inadequate, it is this informal childcare that influences parents' fertility decisions (Hank and Kreyenfeld 2003). Importantly, grandparental childcare in countries with adequate state-funded childcare has not been crowded out; it has merely changed. As Figure 4 shows, a higher proportion of grandmothers from the higher fertility countries provide any childcare ($r = .82$; and for grandfathers $r = .66$). This suggests that grandparents in the lower fertility Mediterranean countries are less likely

FIGURE 3 Association between total fertility rate and percentage of grandmothers providing regular grandchild care for ten European countries

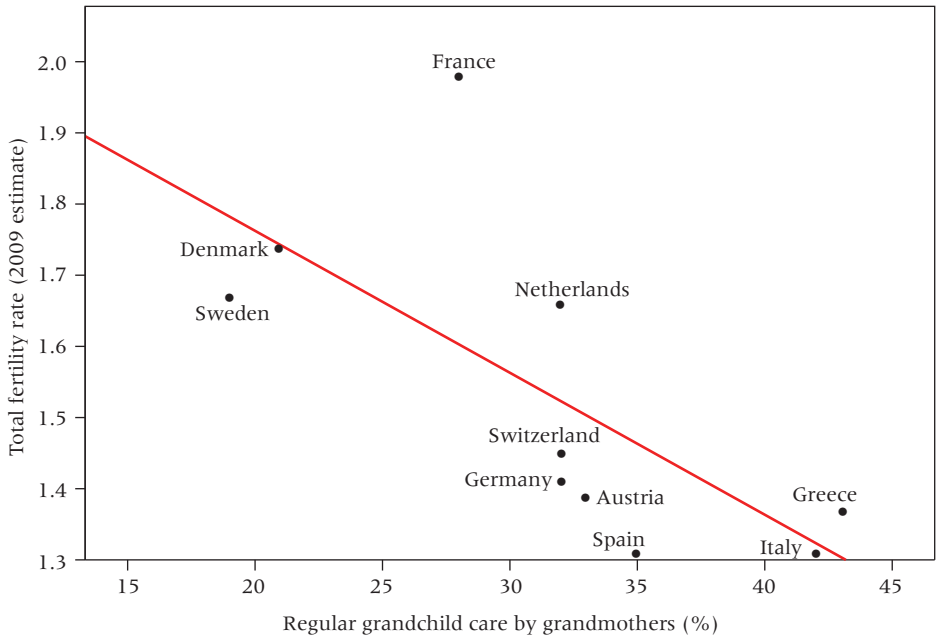
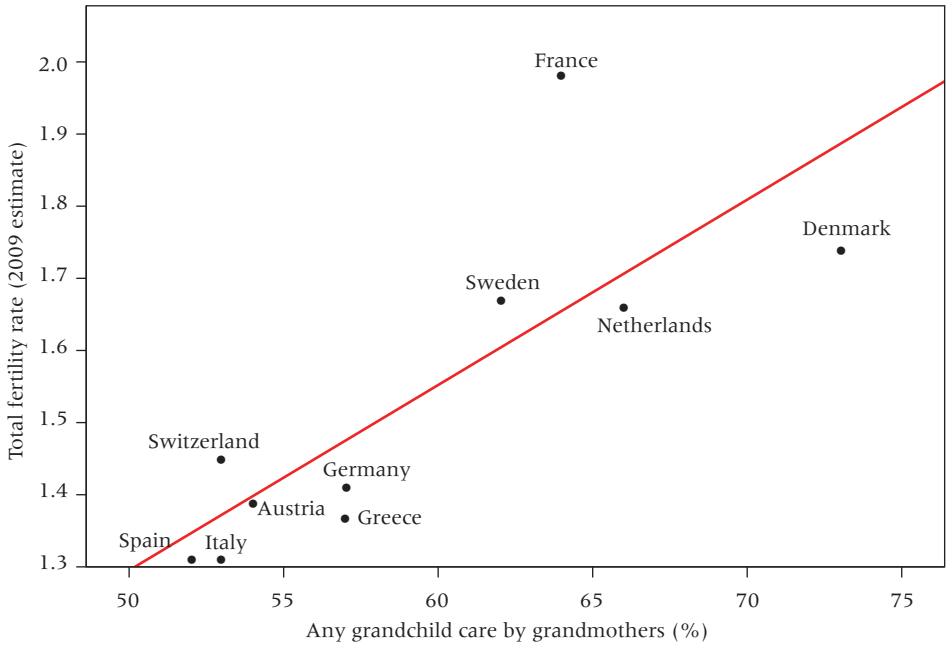


FIGURE 4 Association between total fertility rate and percentage of grandmothers providing any grandchild care for ten European countries



to care for their grandchildren *at all*. A range of cultural, demographic, and historical factors could conceivably explain this association. However, Hank and Buber (2009) show this association holds after adjustment for, among other things, grandparental age, health, lineage, partner status, employment status, and distance to child's residence. These analyses suggest that even in post–demographic transition societies grandparents still influence classic fitness indicators such as fertility.

Implications for the demographic transition—past and future

This survey suggests that relatives are clearly beneficial to mothers in raising children in pre-transition societies. Evidence from post-transition societies also broadly suggests that the presence of grandparents confers benefits on children. We also found tentative evidence that kin affect fertility—sometimes by increasing it, other times by lowering it. Do these findings have any relevance for the demographic transition? The demographic transition tends to follow economic development. As societies move from a subsistence economy to an industrial wage-based economy, fertility declines. This shift in subsistence strategy tends to be accompanied by changing social networks: individuals associate more often with non-kin and may physically move away from kin to enhance their prospects of work. This does not mean that kin become unimportant, rather that the relative significance of, and frequency of interactions with, non-kin increase. This reduction in kin-based social support may raise the perceived costs of childrearing, since mothers and parents have to shoulder far more of the burden of childcare in the absence of helpful kin. In post-transition societies, the shift from an emphasis on the quantity of children to their quality means that parents still invest heavily in their children (Becker 1991; Mace 2007). But parents may instead have to rely on non-kin-based help. Such help, whether purchased in the market or provided by the state, may be less reliable, of lower quality, or less readily available compared to help provided by a supportive network of kin.

The availability of certain kin will also change as societies move through the demographic transition. Grandparents may well become more widely available as mortality rates decline, but, in the later stages of the demographic transition, they may also spend a longer period of time in poor health and therefore require help from their children rather than being able to provide it. As fertility declines, older children will be less available as helpers, and the overall size of kin networks will also decline, reducing the availability of siblings, cousins, aunts, and uncles. The demographic transition undoubtedly has many contributing factors, not all of which will necessarily apply in any one case, but a loosening of kin ties, which increases the costs and perceived costs of raising children, is a plausible contributing factor.

It has recently been suggested that these changing patterns of kin association and childcare, along with demographic changes, may affect more than just future demography. Children in contemporary industrial societies now require much less intense care in order to survive to adulthood. They also tend to receive care from a different set of individuals than was typical in the past. Hrdy (2009) has proposed that it was the evolution of a cooperative breeding strategy which was responsible for our cognitive divergence from other apes. One of the hallmarks of our species is our ability to empathize with and understand the intentions of others (Tomasello 1999), a characteristic that, according to Hrdy, arose through the needs of infants to acquire care from a variety of individuals in addition to the mother. Hrdy speculates that because contemporary, low-fertility populations no longer raise children in cooperative kin networks, our cognitive abilities may not develop in the same way as in the past, leading perhaps to a decline in our ability to empathize with and cooperate with others. We leave to her the last, rather pessimistic word (p. 293) on the long-term implications of demographic and childrearing changes:

> To all the reasons people might have to worry about the future of our species… add one more having to do with just what sort of species our descendants millennia hence might belong to. If empathy and understanding develop only under particular rearing conditions, and if an ever-increasing proportion of the species fails to encounter those conditions but nevertheless survives to reproduce, it won't matter how valuable the underpinnings for collaboration were in the past. Compassion and the quest for emotional connection will fade away as surely as sight in cave-dwelling fish.

Notes

Figures in this chapter are available in color in the electronic edition of the volume.

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AGING AND INTERGENERATIONAL TRANSFERS

Generational Economics in a Changing World

Ronald D. Lee
Andrew Mason

Across the developed world, generous welfare state programs for the elderly, together with projected doublings or more in the proportion old, have led to political struggles that sometimes pit younger generations against the elderly. The goal of this chapter is to put the current situation in historical and institutional context. We begin with a brief review of research on hunter-gatherer groups, and then turn to substantive results for modern-day countries at different stages of economic development drawn from the National Transfer Accounts project, a large international collaboration.

Human hunter-gatherer offspring have an exceptionally long period of immaturity and nutritional dependency, lasting until around age 20 years, judging by studies of contemporary groups (Kaplan 1994; Hill and Hurtado 2009; Howell 2010). Adults at all ages up to around 70 years produced more calories than they consumed on average, contributing their surplus to feed the young. The modern demographic transition began many thousands of years after hunting and gathering had been displaced by agriculture as the dominant form of production technology and social organization. The demographic transition eventually led to a much-reduced proportion of children in the population and a very much increased proportion of elderly. Given the intergenerational transfer patterns of hunter-gatherers just described, including the net productivity of the elderly, one would have expected that population aging would relax the social budget constraint, as the ratio of adults to children soared. But a funny thing happened along the way: societies invented retirement, older people became increasingly dependent on younger adults, and the economic consequences of population aging are now viewed with alarm.

We explore the interaction of the transition's changing population age distributions with the changing organization of the economic life cycle and with differing institutional arrangements. We draw on estimates by 23 country teams participating in the National Transfer Accounts project. (The researchers are identified and more detailed information is available for many

countries in working papers on the NTA website: «www.ntaccounts.org».) We show that the direction of intergenerational transfers in the population has shifted from downward to upward, at least in a few leading rich nations. This sea change has resulted in part from the changing economic role of the elderly, which is closely tied to the rise of the welfare state and the increasing importance of assets, and in part from population aging brought about by the demographic transition. Despite the change in the net direction of resource flows, investment in health and education per child has risen relative to incomes, in association with fertility decline.

The degree to which these changes have occurred varies across levels of economic development, broad regions of the world, and the idiosyncratic institutions of particular countries. It is well known, however, that the systems of public transfers to the elderly as currently structured will not be fiscally sustainable as populations continue to age rapidly in the first half of the twenty-first century. Structural reforms will occur and in some cases have already been made, and the outcome is likely to be a reversal in the trend toward earlier retirement and related changes.

Theoretical background

A great deal of theory is relevant for interpreting patterns of intergenerational transfers, and here we briefly mention a few particularly relevant themes. Evolutionary theory explains the co-evolution of the long period of juvenile dependency, large brain, food acquisition strategy, short birth intervals, and long life, including a long post-reproductive life span during which elders provide support and food transfers for the young (Kaplan 1994; Kaplan and Robson 2002; Hawkes and Blurton Jones 2005; Hrdy 2009; Chu and Lee 2006; Lee 2003, 2008). Elders remained net producers until near death, transferring their surplus output to the young. Presumably our emotional apparatus evolved to motivate this behavior. This emotional apparatus is taken as given by economic theories of the family, which start with a utility function expressing parental affection for children, and a parental desire to invest in their children's human capital. However, the altruism of parents toward their children is limited by a concern for their own consumption and well-being (Becker and Lewis 1973; Willis 1973; Becker and Barro 1988; Willis 1987; Nerlove, Razin, and Sadka 1987; Razin and Sadka 1995).

Within this basic framework, various patterns of intergenerational transfers can be generated by varying the institutional, technological, and cultural contexts (Willis 1987, 1994). When the rate of return to children's human capital is low, parents choose to have more children while investing less in each. Once technological progress raises the rate of return to education, the limited altruism of parents can lead them to invest less than the optimal amount in their children's education (Becker and Murphy 1988). When there

are cultural or institutional means of compelling adult children to repay their elderly parents for earlier investments exceeding those motivated by altruism, then parents will invest more in children's human capital as a loan, and be supported by them in old age. When such cultural and institutional supports are lacking, human capital investment may be too low, and then there is a role for the introduction of public education packaged with public-sector support of the elderly through pensions (ibid.).

It is central to these themes that parents choose a preferred balance of their own lifetime consumption and that of their children, a balance that reflects their limited altruism. If the public sector provides overly generous pension payments, for example, then elderly parents may partially offset the pensions by making larger private transfers to their grandchildren and adult children, perhaps as bequests at death or as *inter vivos* transfers: help with the mortgage on a house, or grandchildren's education, for example. Similarly, private expenditures on education may be reduced when public education is introduced. In this way, public transfers may crowd out some private transfers but "crowd in" others.

Age profiles of labor income and consumption

Our starting point is estimated age profiles of labor income and consumption. These estimates are averages across males and females in the population at a given age. For labor income, individuals are counted whether they generate income or not. Income includes pretax wages and salaries, fringe benefits paid by the employer, income accruing to unpaid family labor, and two thirds of "mixed" or self-employment income (one-third is assumed to accrue to property or capital). Estimates derive from pre-existing surveys, and the levels of the estimated profiles are adjusted so that, taken together with the population age distribution, they are consistent with the totals given in National Income and Product Accounts (NIPA). (For further details, see Lee, Lee, and Mason 2008 and Mason et al. 2009.) For hunter-gatherer populations, labor income is estimated as average food calories acquired at each age, drawing on estimates by anthropologists (for details see Kaplan 1994 and Howell 2010).

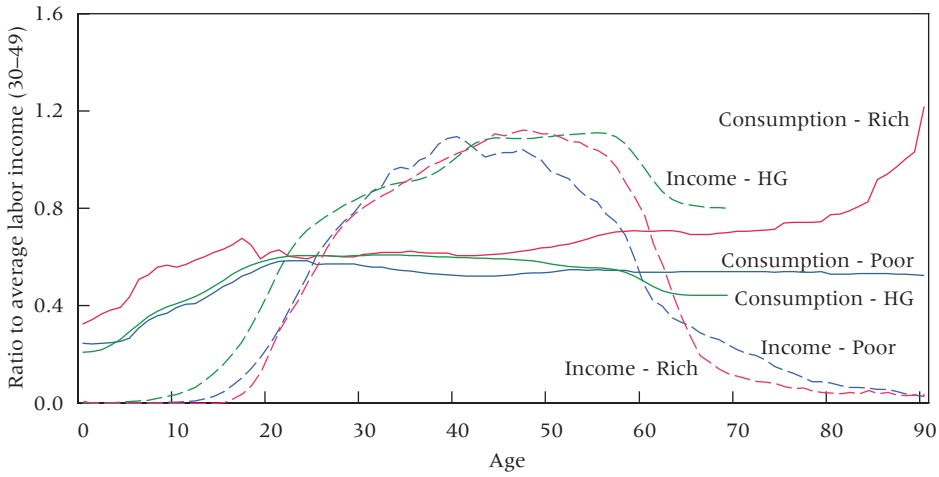
The age profile of consumption is again an average of male and female consumption at each given age, and includes both private consumption and in-kind government transfers, most notably for public education, health care, and long-term care. In household surveys, private expenditures on health and education may be reported for individual household members or may be available only for the household as a whole, in which case they can often be reliably allocated by age. Other private expenditures for each household are allocated to individual household members using Equivalent Adult Consumer weights, which start at 0.4 for those age 4 and younger and rise to 1.0 for age 20 and above. The individual estimates are then tabulated

to estimate the age profile of other private consumption. Estimated private expenditures on health, education, and other consumption are adjusted to be consistent with NIPA. (For details see Lee et al. 2008 and Mason et al. 2009.) For hunter-gatherers, total food production is calculated separately for each sharing group (which could be a collection of households or a larger group). It is then allocated to the individuals in the sharing group in proportion to standard caloric-need tabulations by age, sex, and sometimes body weight and level of physical activity (Kaplan 1994). Howell (2010) uses a variant of this approach.[1]

To facilitate comparison, we have formed an unweighted average of the Kaplan and Howell hunter-gatherer age profiles, which in any case are very similar. We have also made an unweighted average of the profiles for four of the lowest-income countries in our NTA collection: Kenya, Indonesia, Philippines, and India. Finally, we have formed an average of four of the richest countries in NTA: Japan, the United States, Sweden, and Finland. In order to make the shapes of the age schedules visually comparable, we adjusted the level by dividing by the average level of labor income across ages 30–49, chosen to be affected neither by educational enrollment nor by early retirement.[2] The resulting age profiles are plotted in Figure 1.

We note, first, the close similarity between the hunter-gatherer consumption age schedule and that of the poor countries. Although there are some differences, such as the decline in consumption at older ages in the hunter-gatherer profile but not in the poor-country profile, these may well

FIGURE 1 The economic life cycle of hunter-gatherers (HG), poor agricultural populations, and rich industrial populations: Consumption and labor income (ratio to average labor income, ages 30–49)



NOTE: See text for method of construction and data sources.

be due to differences in the methods and assumptions used to estimate these levels. For example, the caloric-need tables indicate a decline in old age whereas the equivalent adult consumer weights we use assume no change in adulthood. The slightly lower consumption schedule for hunter-gatherers, relative to the labor income schedule, reflects the higher fertility and younger age distribution among the Amazon Basin hunter-gatherers. The less favorable support ratio leads to lower consumption for all. In addition, hunter-gatherers have little or no non-labor income, and non-labor income in these estimated profiles is zero by construction.

The strongest contrast is between the consumption schedule for hunter-gatherers and poor countries, on the one hand, and the rich countries on the other. We note the strikingly higher level of child consumption up to the late teen years in the rich countries, reflecting primarily the heavy investment in education in these countries. We also note that in the rich countries, the level of consumption increases with age in the adult years, and is highest at the very highest ages. This increase is in large part attributable to the substantial expenditures on health care for the elderly, which rise with age and are largely funded by the public sector.[3] At the highest ages, above 80 years, the rapid increase reflects the costs of long-term care. But publicly funded health care and long-term care are not the whole story. In the United States, at least, private consumption also rises with age until around age 60. It seems likely that this increase in private consumption with age reflects the separate living arrangements of the elderly in rich countries, and perhaps more fundamentally reflects a decline in private intergenerational sharing, in contrast to the poor and hunter-gatherer groups where private consumption is shared across ages within co-residential or sharing groups. These separate living arrangements are in turn fostered by the shift toward public transfers to the elderly.

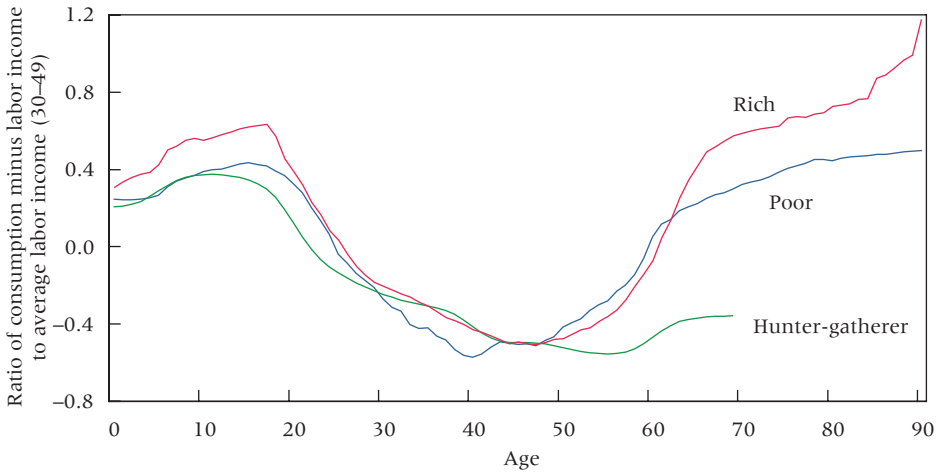
The labor income schedules also reveal interesting differences. The relative contributions of teenagers are much greater in the hunting and gathering groups. It appears that the age schedule is similar in shape to the other groups but displaced three or four years to the left, indicating an earlier start. The poor countries also show greater labor contributions by children than the rich countries, but by a surprisingly small amount. We believe this smaller difference reflects low wages among young agricultural workers and the great importance of the nonagricultural labor force, which generally has much higher incomes and higher enrollment rates and therefore starts work later than in the agricultural areas. Preliminary estimates for some African countries suggest that rates of employment and labor income may also be very low for young adults who are not in school in urban settings.

We also note that labor income peaks around age 40 in the poor countries, at around 50 in the rich countries, and is quite flat among hunter-gatherers from ages 40 to 60. Labor income drops precipitously in the rich countries, particularly in the early 60s, reflecting retirement facilitated by

pensions and motivated by the incentives for early retirement built into their structures (Gruber and Wise 1999) and an increase in the demand for leisure (Costa 1998). In poor countries, we also see an initial rapid decline, but then labor income continues well into the later years. This pattern may be the result of averaging together incomes of those in urban areas and the modern sector with those in rural areas where older people continue to work. Finally, we note the striking pattern for hunter-gatherers, who continue to work productively into old age. The data for the Amazon Basin groups include almost no one beyond age 70, but Howell reports that the !Kung continue to produce about the same amount as they consume up to around age 80 (Howell 2010, Figure 5.6).

The net effect of these differences in the age schedules of consumption and labor income can be seen clearly by plotting consumption minus labor income, which we call the "life-cycle deficit," or LCD. This is done for the three populations in Figure 2. The positive values indicate that more is consumed than is produced at those ages, hence the deficit is positive. The LCD is smaller for young hunter-gatherers because of their earlier productivity and the absence of market inputs for education, training, and health care. In all three populations, adults have a negative LCD, that is they produce more than they consume and reallocate the surplus to others. What is most noticeable, however, is that in the rich and poor countries, this adult LCD begins to move toward zero after age 45, and turns positive around age 60, whereas in the hunter-gatherer groups the LCD remains strongly negative until the end of observation at age 70 (after which it drops to zero in the !Kung data). This is driven in part by the reduction in labor income at older ages and in

FIGURE 2 The life-cycle deficit (consumption minus labor income) of hunter-gatherers, poor agricultural populations, and rich industrial populations



NOTE: See text for method of construction and data sources.

part by the increase in old-age consumption. In addition, consumption in rich countries is funded by asset income to a greater extent than in poor ones, which has shifted the consumption curve up relative to labor income. We also see that the LCDs in both childhood and old age have increased sharply over time and with development. These changes in the economic life cycle are central to understanding how intergenerational flows have evolved over the development process.

Before turning to this issue, we discuss a number of features of these estimates. The level of the LCD curve is governed by a social budget constraint—total outflows cannot exceed total inflows. Were labor income the only inflow and consumption the only outflow, the population-weighted sum of the LCD curve would necessarily equal zero and the level of the LCD curve in Figure 2 would depend only on population age structure. This is assumed to be the case in the construction of the profiles for hunter-gatherer populations. For contemporary economies, however, other economic mechanisms can be used to fund life-cycle deficits. First, the life-cycle deficit can be funded by relying on assets—using asset income or dissaving. Second, the LCD can be funded by relying on net transfers from abroad, that is, remittances and foreign aid. The higher levels of the LCD profiles for poor and rich countries, as compared with hunter-gatherer populations, reflect the increased reliance on assets by almost every contemporary population and reliance on net foreign transfers by many poor populations.[4]

Often in this chapter we refer to the "life cycle," which suggests longitudinal patterns, but in fact all the estimates we present are cross-sectional, referring to different ages in the same calendar year. It is possible that cross-sections may affect some of the profiles' features, particularly in populations experiencing rapid economic growth. For a number of countries we do have long series of these cross-sectional estimates from which longitudinal life cycles can be constructed, but we do not discuss these data here.

Probably the most serious shortcoming of the estimates is that they do not include the value of time spent in home production, other than standard measures of unpaid family labor and self-employment income. This means that we count consumption of market-provided education, health care, and long-term care, whether publicly or privately funded, but do not count the value of similar services provided privately by the family. Nor do we count the value of non-market time spent rearing children, preparing meals, cleaning, and other domestic tasks. Where data permit, it would be very useful to include time in our accounts, but our project resources have already been stretched to the limit in preparing the current version of the accounts. For an example of accounts including time, see the case of Thailand (Phananiramai 2008), early estimates for the United States (Lee and Lapkoff 1988), a study of Mayan subsistence agriculturalists (Lee and Kramer 2002), and a reanalysis of Cain's data for a poor village in Bangladesh (Robinson, Lee, and Kramer 2008).

Life-cycle wealth and the direction and scale of generational flows

We have begun our analysis by considering the economic life cycle because intergenerational transfers and other generational flows are the counterpart of the life cycle. The purely cross-sectional perspective we have employed to this point is incomplete, however. It tells us how resources are being allocated between different generations at a point in time, but further analysis is needed to understand how features of the economic life cycle influence the allocation of resources across successive generations. This requires a generational perspective and for that reason we introduce two important concepts: life-cycle wealth and one of its components—transfer wealth.

To understand these concepts, consider first the relationship between the old-age life-cycle deficit and the demand for life-cycle wealth. In the absence of intergenerational transfers, individuals would have to accumulate assets during their working years on which they would rely during retirement. Per capita assets would rise with age and then at some point begin to decline. For the population as a whole the demand for per capita assets would depend on the asset profile that corresponds to the life-cycle deficit and the age distribution of the population.

The one-to-one relationship between the life-cycle deficit and the demand for assets is readily extended to include reliance on intergenerational transfers to fund the life-cycle deficit. During working years individuals contribute to a public transfer system and later, in retirement, they receive benefits. From the perspective of the individual, the transfer system is a form of wealth equal to the present value of benefits to be received in the future less payments to be made. Transfer wealth increases as an individual passes through the working years and then declines as he or she proceeds through retirement, drawing down lifetime benefits.

Transfer wealth is different from assets in a critical way. Assets are created through investment, raising the productive potential of an economy. Transfer wealth is purely a social obligation. There is no physical counterpart to transfer wealth, only a commitment to fulfill a social contract. For current retirees the obligation falls on those who are currently contributing. But for the current population, taken in its entirety, transfer wealth is an obligation borne by future generations. The counterpart of transfer wealth is implicit debt passed on to descendants.

Now consider the life-cycle deficit during childhood. By relying on transfers to fund the life-cycle deficit of children, we create an obligation on the part of the current population to provide resources to support current children and future generations (during their childhood). The present value of net transfers to future generations by the current population is equal to downward transfer wealth. Total transfer wealth is equal to the sum of downward

transfer wealth—a negative value—and upward transfer wealth—a positive value. Depending on the relative magnitudes of these two values, transfer wealth is either positive or negative and future generations are gaining or losing from existing transfer systems.

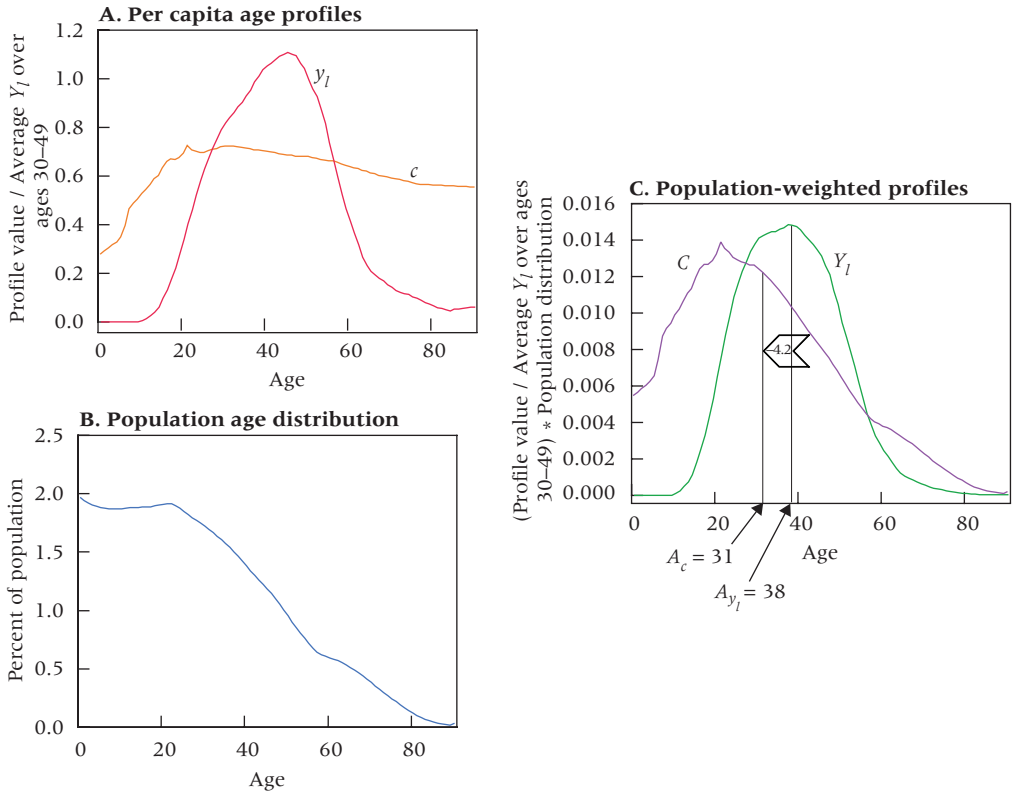
Life-cycle wealth is the combined value of assets and transfer wealth. To explore the relationship between the economic life cycle and life-cycle wealth, we take into account the population age distribution so that we can view the scale and direction of flows in the aggregate population and economy. To do this, we multiply the population age distribution by the age profiles to calculate the aggregate consumption and labor income by age, and their difference, the aggregate LCD (in contrast to the per capita profiles in Figures 1 and 2). The information contained in these aggregate age profiles can be summarized using arrow diagrams that indicate the direction and distance across age of transfers and asset operations, and their volume or relative importance.

We illustrate the construction of these arrow diagrams for Indonesia in 2002 (Maliki forthcoming). Indonesia is one of the lowest-income countries in our collection, but in 2002 it was well along in the fertility transition with a TFR of about 2.6; 8.3 percent of its population was age 65 and over. Panel A of Figure 3 plots the per capita age profiles of consumption (c) and labor income (y_l). Panel B plots the population age distribution in 2002. Panel C plots the age profiles for aggregate consumption $C(x)$ and labor income $Y_l(x)$, where x is age, obtained by multiplying the per capita values at each age by the population at that age. The simple sums across ages of these aggregate profiles shown in Panel C equal total consumption and total labor income as reported in the National Income and Product Accounts for Indonesia in 2002, by construction.

Panel C shows the age at which each unit of consumption is consumed, and from this information we can calculate the age at which the average unit is consumed, and similarly for labor income. The average age of consumption is calculated by multiplying each age by the aggregate consumption at that age, summing these products over all ages, then dividing by the total amount of consumption at all ages. An equivalent calculation gives the average age of labor income.[5] The results of these mean age calculations for Indonesia are indicated by vertical lines in Panel C. It is evident that these average ages abstract from a great deal of interesting information, reducing it to a single number, but we will see that these average ages are nonetheless useful and informative.

We then compare the average age of consumption, A_c, to the average age of labor income, A_{y_l}. If every individual simply consumed 100 percent of his or her labor income at each age, then we would have $c(x) = y_l(x)$, $C(x) = Y_l(x)$, and therefore $A_c = A_{y_l}$: the average ages would be identical. The same would be true if the aggregate deficit at young ages ($C(x) - Y_l(x)$) were exactly offset by the deficit in old age. But neither of these situations is likely to occur.

FIGURE 3 Illustration of arrow diagram construction for Indonesia (2002)



SOURCE: Data from Maliki (forthcoming).

If $A_c > A_{y_l}$, then the average unit of output is shifted upward from the lower age at which it was earned to the higher age at which it was consumed; and if $A_c < A_{y_l}$, then the average direction of shifting is downward, from older to younger. If only a small amount of income is shifted, there will be only a small effect on the average age of consumption, and the average ages will still be close together.

In the case of Indonesia, Panel C indicates that $A_c < A_{y_l}$. Indeed, the average age of consumption is 6.8 years younger than the average age of labor income. The arrow therefore points in the negative direction toward younger ages. The width of the arrow, equal to per capita consumption normalized by dividing by average labor income at ages 30–49, is equal to 0.61, that is per capita consumption is about 60 percent of the average labor income of a prime-age adult. The area of the arrow is $-6.8 * .61 = -4.2$. The interpretation is that over his/her remaining life, the average Indonesian in 2002 expects to consume less than he/she produces by an amount equal to 4.2 years' worth

of labor income (in survival-weighted present value). In this sense the average Indonesian holds negative transfer wealth: on average, labor income will be used to support children's consumption in the future to a greater extent than the labor income of others or own assets will be used to support future consumption in old age.

The area of the arrow measures the demand for life-cycle wealth per capita (relative to average labor income) needed to achieve the consumption profile, given the labor income profile, under steady-state conditions with a discount rate equal to the growth rate of population plus the productivity growth rate. This was first shown by Willis 1988, and further developed in Lee 1994a.

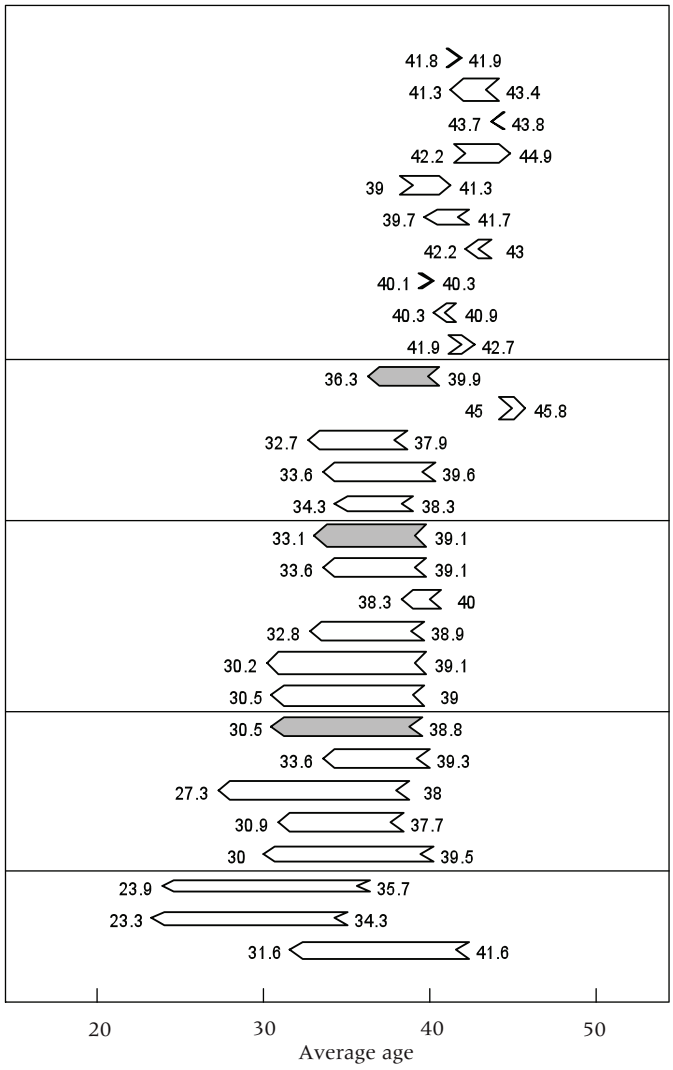
The area of the arrow lumps together transfer wealth and asset wealth. In this chapter we largely ignore assets and concentrate on transfers and transfer wealth. Since actual populations and economies are unstable and non-steady-state, and since discount rates are generally different from the population growth rate plus productivity growth rate, the area of the arrow only approximates the demand for life-cycle wealth.[6]

The width of the arrow is per capita consumption divided by labor income. This may differ considerably from country to country. In China, with a low value of 0.44, a very high proportion of income is saved, so consumption is low relative to labor income, and the arrow is thin. In countries with low saving rates, high support ratios reflecting favorable population age distributions, high remittance income, or high asset income including income from extractive industries, consumption may be considerably greater than labor income, so the arrow is fat. The highest values are found in Mexico (0.77) and the United States (0.71).

With this background, Figure 4 plots arrows for 23 countries plus two hunter-gatherer groups. We might expect the arrows to cluster in regional patterns, in part because regions share certain demographic features and in part because regionally similar cultures shape the life cycle. The countries are grouped into four broad regions—Europe/United States; East Asia; Latin America; and South and Southeast Asia—and two hunter-gatherer groups. These regions are arranged in order of per capita GDP, with the highest first. Within each region, the member countries are also ordered by per capita GDP, except for the hunter-gatherer groups. The unweighted averages for the regions are shaded.

Two features of the figure are visually striking. First, the arrows for the hunter-gatherer groups[7] and the poorer countries at the bottom of the figure all point to the left and are long, indicating strongly downward net transfers from older to younger ages. The length of the arrows tends to decline as we move up the figure, ending with short arrows at the top, some pointing slightly left (downward) and some slightly right (upward), indicating that net transfers are no longer predominantly from older to younger ages. The

FIGURE 4 Average age of consumption (C) and labor income (Y_l), using each country's age distribution



	width	wealth
Europe & US	0.59	0.06
United States	0.71	-1.41
Sweden	0.54	-0.04
Germany	0.63	1.67
Austria	0.58	1.35
France	0.50	-0.97
Finland	0.60	-0.50
Slovenia	0.51	0.10
Spain	0.58	-0.30
Hungary	0.64	0.49
East Asia	0.59	-2.10
Japan	0.68	0.61
Taiwan	0.66	-3.47
South Korea	0.58	-2.90
China	0.44	-1.74
Latin America	0.67	-4.01
Chile	0.66	-3.65
Uruguay	0.60	-1.00
Costa Rica	0.64	-3.90
Mexico	0.77	-6.07
Brazil	0.66	-5.66
Southeast Asia	0.58	-4.79
Thailand	0.61	-3.48
Philippines	0.59	-6.23
Indonesia	0.61	-4.19
India	0.51	-4.85
Kenya	0.33	-3.88
Ache etc.	0.42	-4.62
!Kung	0.54	-5.40

NOTE: Arrow point is average age of C; arrow tail is average age of Y_l; width is per capita C relative to average Y_l over ages 30–49. Area within arrow is implied wealth. Within region, country order by ppp-adj avg GDP.

arrows for regional averages also follow this pattern, with the arrow for the average of the European/US region pointing very slightly to the right, indicating net transfers to the elderly. Second, we see that the stack of arrows, broad at the base, is tilted to the right. The richer countries toward the top are also older, so both ends of the arrows are placed at older ages

and farther to the right. The mean age of making and receiving transfers is older in older populations.

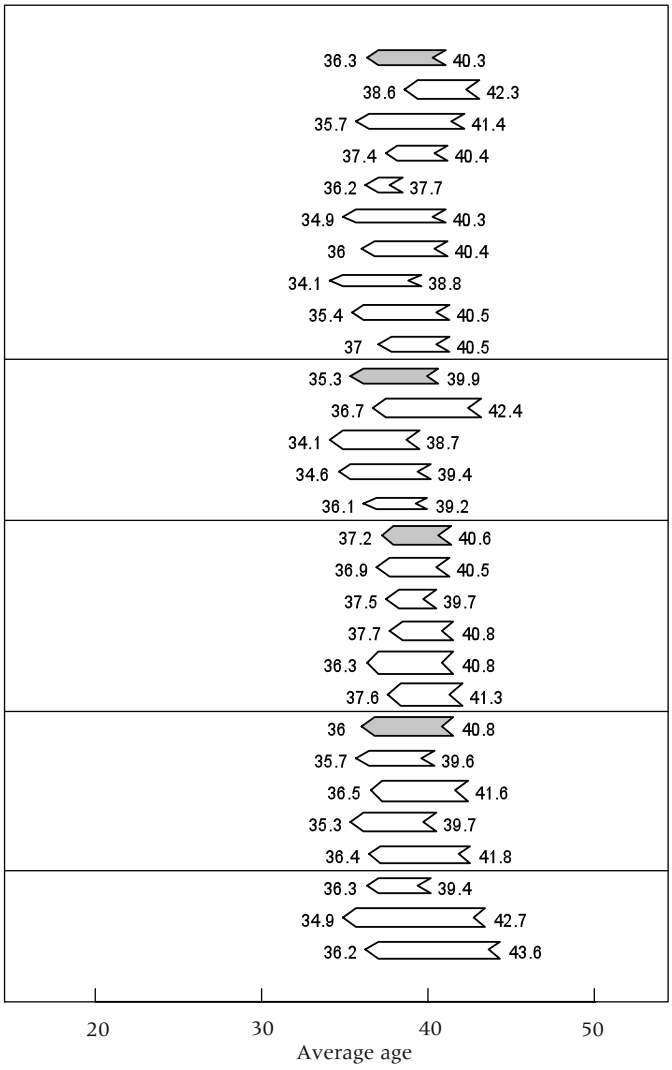
For five countries the arrows point upward: Germany, Austria, Japan, Slovenia, and Hungary. For another three countries the arrows point only very slightly downward, by less than a year: Sweden, Finland, Spain. There are nine countries in our data set in which more than 15 percent of the population is 65 or over, and all five of our upward arrows come from this group, as do all three of our short downward arrows. The United States, the richest country, has only about 12 percent of its population 65+ and has a downward-pointing arrow, similar to Uruguay—which, although relatively poor, has the same proportion 65+ as does the United States. Kenya, with the youngest population, also has the longest downward-pointing arrow. This suggests that the population age distribution has an important influence on the length and direction of the arrows, a possibility we investigate below.

The main goal here is to increase our understanding of these cross-sectional patterns and apparent historical changes, and their relation to the demographic transition and the population aging it eventually brings about. The direction of flows results in part from the population age distribution, since higher proportions of the young or the old tilt the aggregate flows toward that age group. Thus population aging makes arrows less downward or more upward. However, the shapes of the age profiles of consumption and labor income also play an important role. These shapes are influenced by individual incentives, culture, and institutional contexts, and particularly by the growth of the public sector and its transfer programs.

We begin by probing the role of population age distribution in shaping the pattern we observed in Figure 4. We calculate the unweighted average population age distribution for all 23 countries in our current data set, and recompute all average ages and per capita flows using this same age distribution for all populations.[8] The results are shown in Figure 5, in which all arrows are now downward and most of the variation across countries has disappeared. Austria stands out for its short downward arrow, as does Uruguay. Among the regions, Latin America now has the shortest arrow, while the arrows for Europe/US and the lowest-income region, South and Southeast Asia, are nearly identical. This shows clearly that population age distribution has a huge effect on the direction of transfers. Nonetheless, it is not the whole story, and in addition the arrows summarize and thus obscure other important changes and differences.

These data are cross-sectional and not historical. Nonetheless, they suggest that over past millennia, the direction of income flows has been strongly downward from older to younger generations, probably in all societies. Once we realize the key role that population aging has played in shortening the arrows and even reversing them, it follows that in the

FIGURE 5 Average age of consumption (C) and labor income (Y_l), using age distribution averaged across all countries



	width	wealth
Europe & US	0.55	-2.19
United States	0.66	-2.43
Sweden	0.51	-2.91
Germany	0.57	-1.70
Austria	0.55	-0.83
France	0.48	-2.56
Finland	0.56	-2.49
Slovenia	0.46	-2.15
Spain	0.54	-2.75
Hungary	0.58	-2.02
East Asia	0.54	-2.52
Japan	0.62	-3.55
Taiwan	0.61	-2.86
South Korea	0.52	-2.51
China	0.41	-1.30
Latin America	0.72	-2.47
Chile	0.68	-2.44
Uruguay	0.64	-1.38
Costa Rica	0.67	-2.12
Mexico	0.86	-3.87
Brazil	0.76	-2.77
Southeast Asia	0.63	-3.00
Thailand	0.58	-2.37
Philippines	0.74	-3.83
Indonesia	0.63	-2.74
India	0.59	-3.15
Kenya	0.50	-1.58
Ache etc.	0.66	-5.21
!Kung	0.59	-4.37

NOTE: Arrow point is average age of C; arrow tail is average age of Y_l; width is per capita C relative to average Y_l over ages 30–49. Area within arrow is implied wealth. Within region, country order by ppp-adj avg GDP.

pretransitional and therefore young populations of the past, income would have been reallocated downward across age for any plausible shape of the per capita age profiles.[9] The young population age distributions in the past would have placed so much weight on the necessarily heavy dependence of children that downward transfers would have dominated any upward flows that may have occurred.

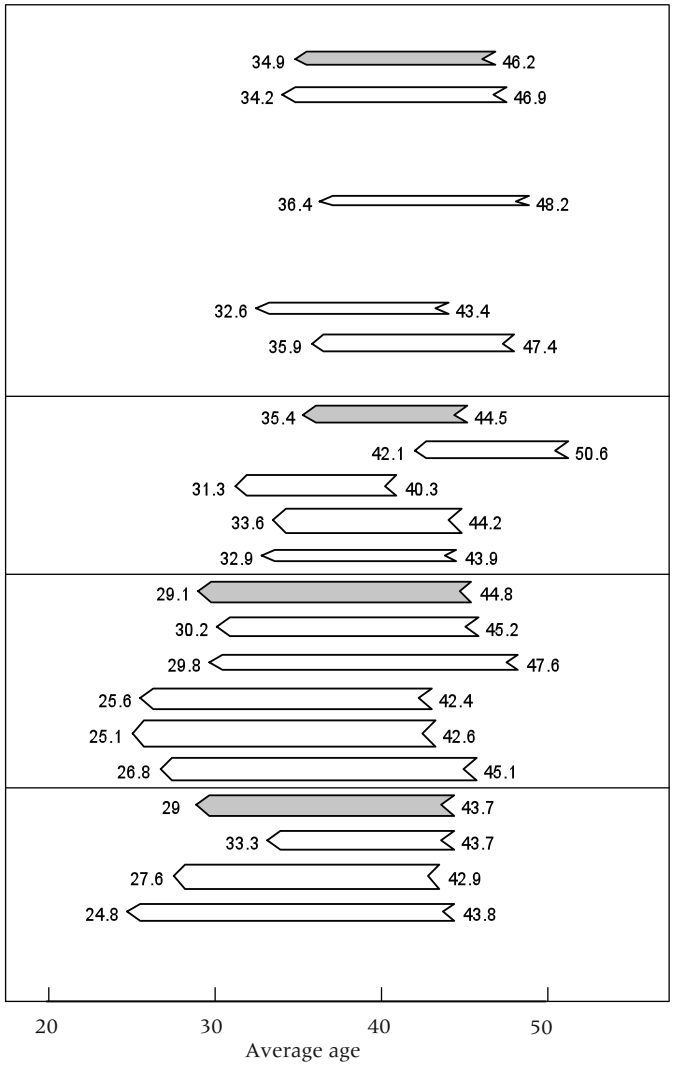
The roles of public and private transfers

We have seen the extent to which individuals are able to consume more than their labor income, particularly in childhood and old age. How is this accomplished? The many mechanisms can be classed under the headings of asset operations and transfers. Asset operations include saving and investing during the working ages and dissaving while living on asset income and asset sales in old age. They also include borrowing money to pay for higher education, paying interest on the loan, and eventually repaying the principal. All borrowing and lending, paying and receiving interest or dividends, and similar operations come under this heading, including operations involving foreigners and foreign governments. These asset operations are included in NTA, but are not discussed here. Instead we emphasize transfers. These include private or familial transfers, both intrahousehold and interhousehold, and public transfers, both in-kind and monetary. Remittances to or from other countries are private interhousehold transfers.

NTA includes explicit measures of both public and private transfers. Public transfers received are estimated using the in-kind transfers that have already been included in the measure of consumption, plus cash transfers to individuals such as public pensions, family allowances, public assistance, and unemployment insurance, plus a prorated share of expenditures on public goods such as the military, publicly funded research, social infrastructure, and so on. Public transfers made are based on various taxes paid by age. Private transfers are interhousehold and intrahousehold. Interhousehold transfers are reported on some surveys and are here assumed to be given to the head of the household, who redistributes them through transfers to other members. Remittances from abroad are also interhousehold transfers. Intrahousehold transfers are measured as if a tax were levied within the household on all labor income in excess of consumption, and transfers are assumed to be made to those who consume more than they produce. Transfers in this way are allowed without passing through the head of household. Household assets, such as consumer durables or a home, are assumed to be owned by the head, and the services imputed to these assets are then transferred to household members in the usual way and counted as transfers from the head. Our estimates do not include bequests at death.[10]

Estimates of public and private transfers are not yet available for all 23 countries included in Figures 4 and 5. Figure 6 shows arrows for private *inter vivos* transfers for those countries with the necessary data, and empty spaces otherwise. (Kenya and the hunter-gatherer groups are omitted here and in subsequent figures because they lack the relevant data.) The tails and heads are placed on the average age of making and receiving a private transfer. The width of the arrow is now the per capita value of private transfers divided by average labor income.

FIGURE 6 Average age of private transfer inflows (TFI) and private transfer outflows (TFO), using each country's age distribution



	width	wealth
Europe & US	0.23	-2.59
United States	0.25	-3.19
Sweden	-	-
Germany	-	-
Austria	0.17	-1.69
France	-	-
Finland	-	-
Slovenia	0.19	-2.05
Spain	0.30	-3.42
Hungary	-	-
East Asia	0.32	-2.97
Japan	0.29	-2.48
Taiwan	0.35	-3.16
South Korea	0.45	-4.64
China	0.20	-2.22
Latin America	0.36	-5.68
Chile	0.33	-4.89
Uruguay	0.26	-4.66
Costa Rica	0.35	-4.77
Mexico	0.47	-6.87
Brazil	0.39	-7.18
Southeast Asia	0.35	-5.17
Thailand	0.33	-3.40
Philippines	0.42	-6.38
Indonesia	0.29	-5.60
India	-	-

NOTE: Arrow point is average age of TFI; arrow tail is average age of TFO; width is per capita TFI relative to average labor income over ages 30–49. Area within arrow is implied wealth. Within region, country order by ppp-adj avg GDP.

The figure shows that in every region, private transfers are strongly downward. Nonetheless, there are some important differences in length and thickness of these arrows. East Asia has the shortest arrows. Although countries in this region make substantial private transfers per child for health and education, fertility is low, and Taiwan and South Korea make substantial transfers to the elderly through family support systems, which offset the effect of child transfers. Latin America and Southeast Asia have the longest arrows,

reflecting their higher fertility and younger populations with fewer elderly, so that transfers to children dominate. Aside from Thailand, these countries do not have strong familial transfers to the elderly.

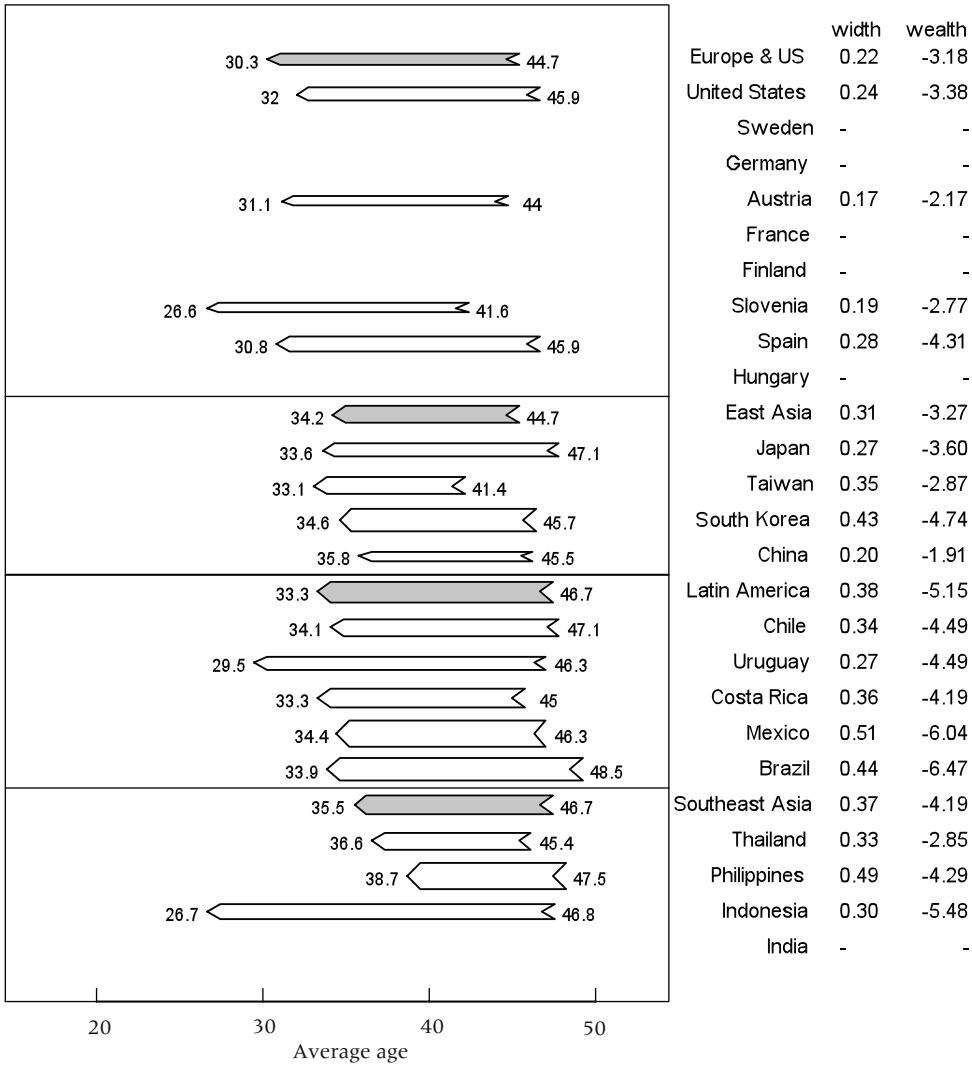
Europe and the United States have extremely thin arrows. In part, this is because they have very low fertility and few children, so transfers to children are reduced.[11] But in addition, these countries have very strong welfare states with good public education and, except for the United States, good publicly provided health care for children. Private expenditures on children for health and education are very limited. At the same time, private transfers to the elderly are nonexistent, and in fact the elderly make net private *inter vivos* transfers to younger generations on average. All this tends to make the arrows longer and thinner.

Figure 7 shows similar arrows, but this time for the standard population age distribution. Brazil has by far the strongest downward private transfers of any country, as measured by the size of the transfer wealth (area of the arrow). There are some differences from the arrows drawn using own-population weights, but no qualitative differences, so we do not dwell on these.

The finding that private transfers are uniformly downward from older to younger ages is important. In Caldwell's (1976) classic article on the demographic transition, he wrote: "The key issue here, and, I will argue, the fundamental issue in demographic transition, is the *direction and magnitude of intergenerational wealth flows* or the net balance of the two flows—one from parents to children and the other from children to parents—over the period from when people become parents until they die.… In all primitive societies and nearly all traditional societies the net flow is from child to parent" (p. 344; emphasis in original). If we take this statement at face value, then Figures 6 and 7 contradict it for rich and poor countries alike. Private transfers, the ones relevant for private fertility decisions, are uniformly downward from older to younger on average. The figures confirm similar findings by Lee 1994b and 2000 and Stecklov 1999. When we interpret the statement more broadly to include other instrumental benefits that adults may derive from their children, such as insurance and physical security, then it is more difficult to bring quantitative evidence to bear (see Caldwell 2005 for an updated statement of his views, emphasizing that child services such as insurance should be taken into account).

In pretransitional agricultural societies, private transfers dwarf public transfers in importance, but the situation changes as countries become richer and more industrial and urban. Figure 8 shows the arrows for public transfers. Toward the bottom of the figure, the arrows are long and point downward to younger ages, and at the top in the richer countries they are short and mostly point upward. Evidently, at least in an accounting sense, the public sector plays a bigger role than the private sector in the reversal of the direction of transfer flows. The countries and regions show very divergent patterns. Net public transfers for Europe are upward, with the strong public pension pro-

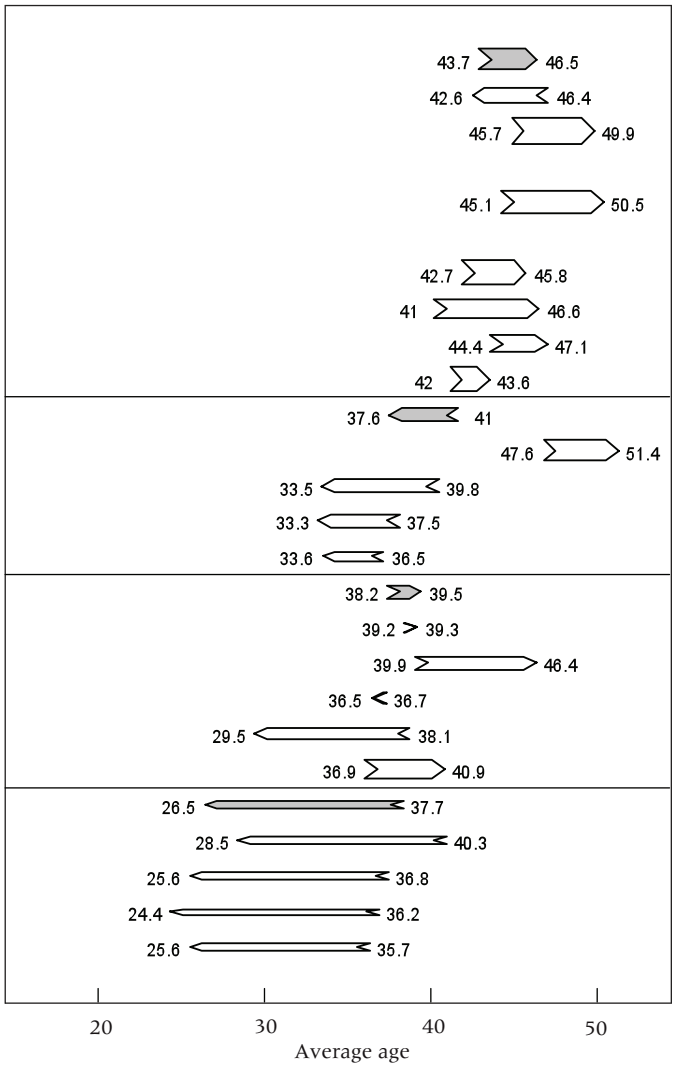
FIGURE 7 Average age of private transfer inflows (TFI) and private transfer outflows (TFO), using age distribution averaged across all countries



NOTE: Arrow point is average age of TFI; arrow tail is average age of TFO; width is the annual per capita flow in the population relative to labor income over ages 30–49. Area within arrow is implied wealth. Within region, country order by ppp-adj avg GDP.

grams and health care for the elderly dominating public education and family allowances, and with the already old populations of Europe. The United States, however, is an exception to this pattern with a downward arrow, the only one in the region, resulting in part from its younger age structure. The East Asian regional arrows generally point to the young (left), but Japan with

FIGURE 8 Average age of public transfer inflows (TGI) and public transfer outflows (TGO), using each country's age distribution

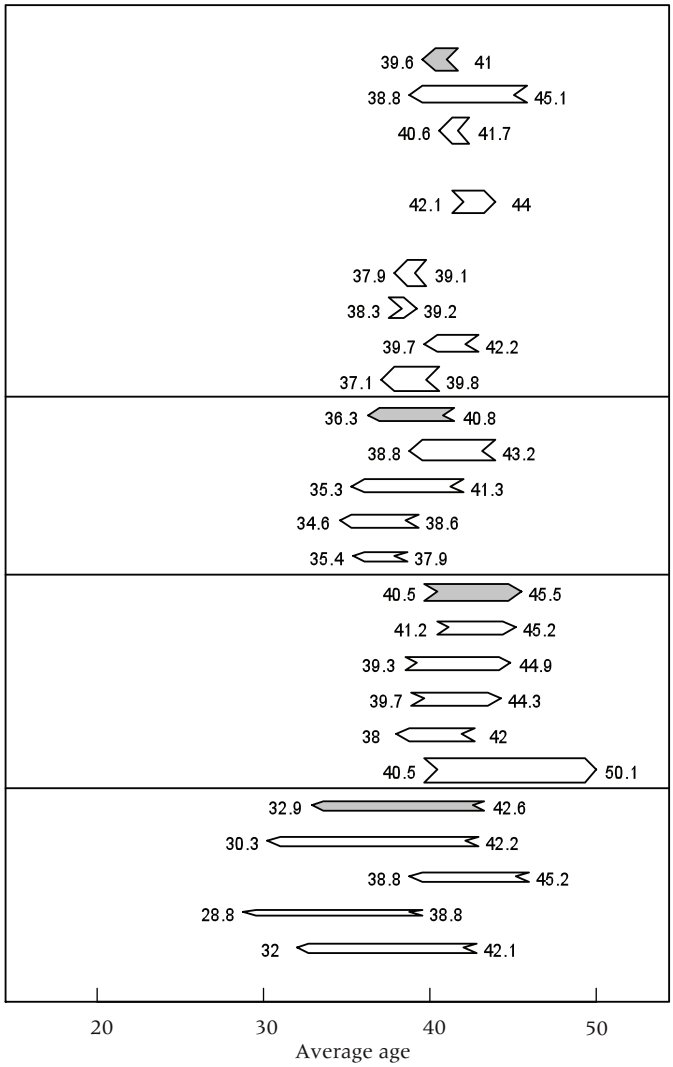


	width	wealth
Europe & US	0.33	0.94
United States	0.24	-0.93
Sweden	0.42	1.77
Germany	-	-
Austria	0.35	1.85
France	-	-
Finland	0.39	1.24
Slovenia	0.30	1.70
Spain	0.26	0.69
Hungary	0.36	0.57
East Asia	0.20	-0.69
Japan	0.30	1.09
Taiwan	0.21	-1.34
South Korea	0.19	-0.80
China	0.13	-0.37
Latin America	0.20	0.28
Chile	0.17	0.03
Uruguay	0.19	1.22
Costa Rica	0.18	-0.04
Mexico	0.17	-1.43
Brazil	0.29	1.16
Southeast Asia	0.11	-1.28
Thailand	0.13	-1.56
Philippines	0.12	-1.27
Indonesia	0.08	-0.93
India	0.12	-1.24

NOTE: Arrow point is average age of TGI; arrow tail is average age of TGO; width is per capita TGI relative to average labor income over ages 30–49. Area within arrow is implied wealth. Within region, country order by ppp-adj avg GDP.

its old population and substantial public transfers to the elderly looks much like the European countries. Aside from Japan, these countries do not have strong public pension programs, and spending on health care is less than in Europe and the United States. Taiwan and South Korea have relatively large familial transfers to the elderly. The upward arrow for Latin America is striking and surprising, because these populations are still young, except for

FIGURE 9 Average age of public transfer inflows (TGI) and public transfer outflows (TGO), using age distribution averaged across all countries



	width	wealth
Europe & US	0.31	-0.42
United States	0.23	-1.44
Sweden	0.38	-0.43
Germany	-	-
Austria	0.32	0.61
France	-	-
Finland	0.37	-0.43
Slovenia	0.28	0.26
Spain	0.24	-0.58
Hungary	0.34	-0.89
East Asia	0.20	-0.88
Japan	0.27	-1.17
Taiwan	0.21	-1.26
South Korea	0.19	-0.75
China	0.13	-0.32
Latin America	0.22	1.08
Chile	0.19	0.75
Uruguay	0.19	1.03
Costa Rica	0.20	0.90
Mexico	0.18	-0.72
Brazil	0.35	3.29
Southeast Asia	0.12	-1.16
Thailand	0.13	-1.53
Philippines	0.14	-0.90
Indonesia	0.08	-0.78
India	0.13	-1.32

NOTE: Arrow point is average age of TGI; arrow tail is average age of TGO; width is the annual per capita flow in the population relative to labor income over ages 30–49. Area within arrow is implied wealth. Within region, country order by ppp-adj avg GDP.

Uruguay. However, the Latin American countries in our sample mostly have strong welfare state programs, including very strong public pension programs. Southeast Asia has by far the strongest downward public flow, reflecting their higher fertility and lack of public pension programs.

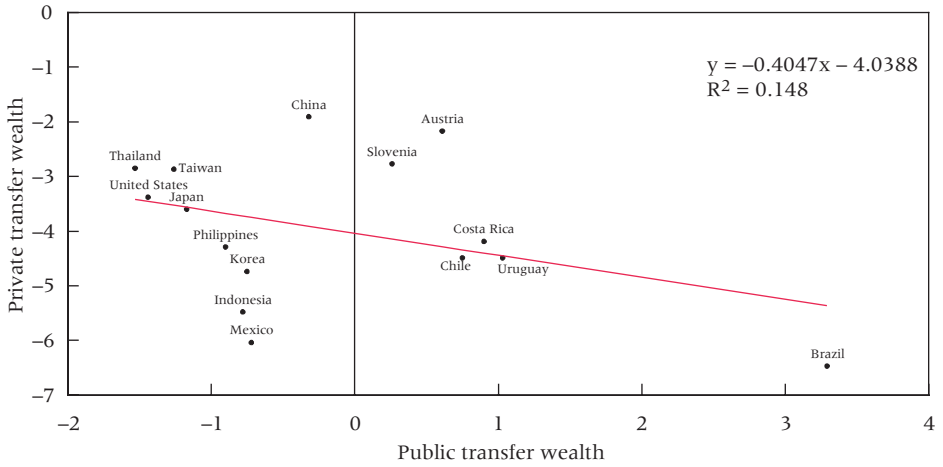
Age standardization (see Figure 9) strengthens the upward direction of public transfers in Latin America and reverses it in the United States and the Europe/US region, since the former becomes older and the latter younger thereby. The positive public transfer wealth in Latin America is expected to displace some of the capital that would otherwise have been saved by workers to provide for retirement in old age. Given the actual age distributions of the United States and Europe, the same is true there. Indeed, a possible adverse effect on incentives to save is one of the concerns about the public pensions of the rich countries.

One important question is whether there is substitution between public and private transfers. Do public transfers crowd out private? For example, it is hard to believe that private spending on education and health care would not be greater if there were no public programs providing them. We also expect that without public pensions, elders would more frequently coreside with their adult children and receive support from them. But it is also possible that the alternative to public pensions would be private ones, or continuing labor effort by the elderly.

While these arguments may seem plausible, national cultures may differ considerably in the significance of spending on children and support for the elderly. Thus the relative level of consumption by the elderly varies substantially from country to country, and the same is true for human capital investments in children (on health and education, see Lee and Mason 2010).

A simple scatter plot of private transfer wealth versus public transfer wealth, using a standard population age distribution, reveals a negative relationship but not a strong or striking one (see Figure 10). The regression coefficient is –.4, indicating that each unit increase of public transfer wealth

FIGURE 10 Public transfer wealth vs. private transfer wealth in standard populations: per capita, in years of average labor income



is associated with .4 units less of negative private transfer wealth, consistent with a crowding out or substitution story. Three of the countries are special cases. China, which is far above the regression line, has unusually low consumption relative to labor income because of the country's exceptionally high saving rate.[12] This leads both private and public transfer wealth to fall closer to zero. Mexico and, to a lesser degree, the Philippines have high remittance income and thus have more negative private transfer wealth than would be expected given their labor income. Without these special countries in the regression, the slope rises to nearly –.5 and R^2 improves to nearly .3, but this sort of selective exclusion exercise is misleading.

We note that Brazil has by far the greatest positive public transfer wealth and by far the most negative private transfer wealth, and perhaps this is not a coincidence.

A closer look at the composition of public transfers

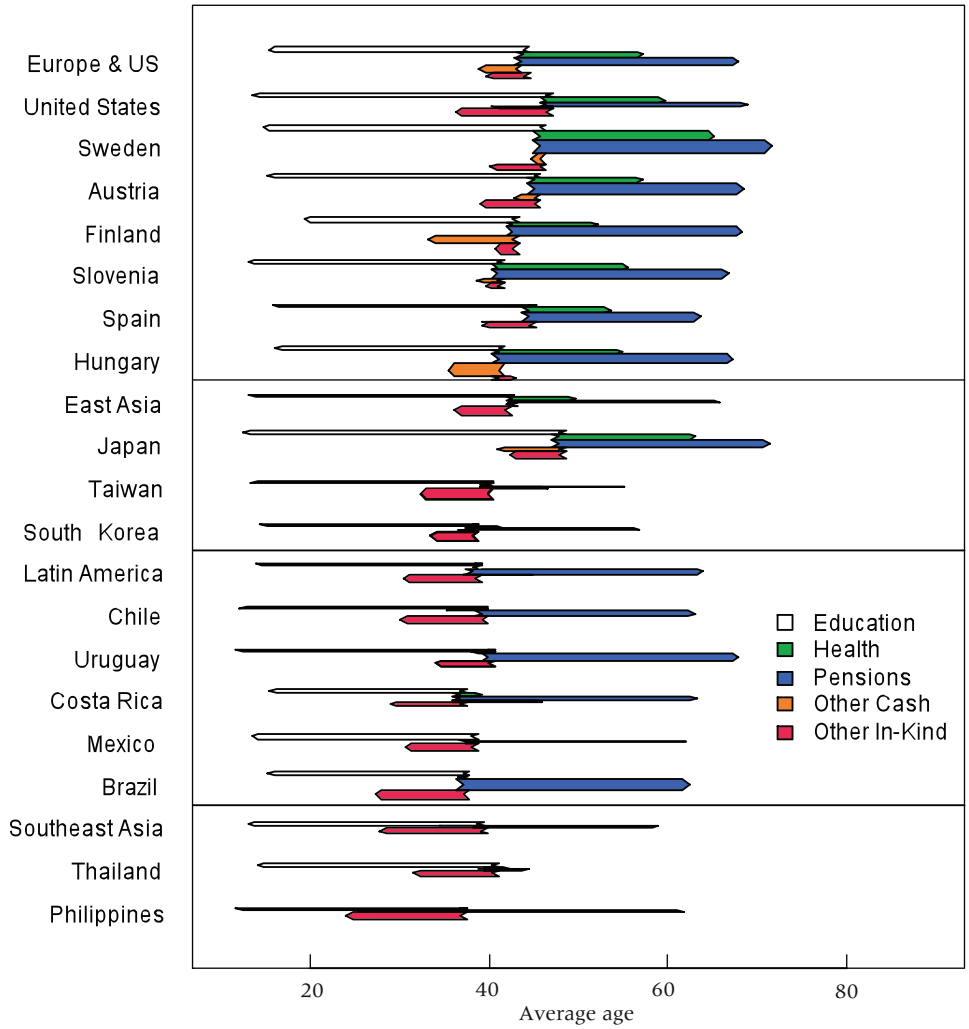
The final two figures, 11 and 12, present arrow diagrams for different components of public transfers: education, health, pensions, other in-cash, and other in-kind. The first three are self-explanatory. Other in-cash includes family allowances and need-based cash transfers. Other in-kind could include some need-based transfers such as food, but the bulk of it is public good expenditures that cannot be allocated to any particular individual or age group, such as military spending, social infrastructure, research, and so on. We treat these as going equally to each individual, but the transfer is made by taxpayers who differ from the average age. The main interest is in education, health care, and pensions. For purposes of these figures, we have placed all the tails of the arrows on the average age of paying all taxes in each country, although in many cases there are special taxes for some programs such as pensions or education. Thus for a given country, the tails of all arrows are located at the same age.

In Figure 11, it is striking that pensions are so meager in the United States, the richest country in the sample, and are so generous in Brazil, the second poorest country in the figure. To remove any effect of the different age structures, Figure 12 uses the standard for all countries. Here there is little change for the United States, but Brazil's pension program now dominates all others in the figure. Both countries are anomalous in this regard. Most poor countries have small pension programs and most rich countries have generous ones, with or without age distribution standardized.

The two figures also reveal that only countries in the Europe/US region, plus Japan, have substantial public health care expenditures. Even relatively rich Taiwan and South Korea have weak public expenditures on health.

For education, Figure 12 shows Sweden with greater expenditures and a younger mean age of receiving education, perhaps reflecting strong public

FIGURE 11 Average age of public transfer flows, using each country's age distribution

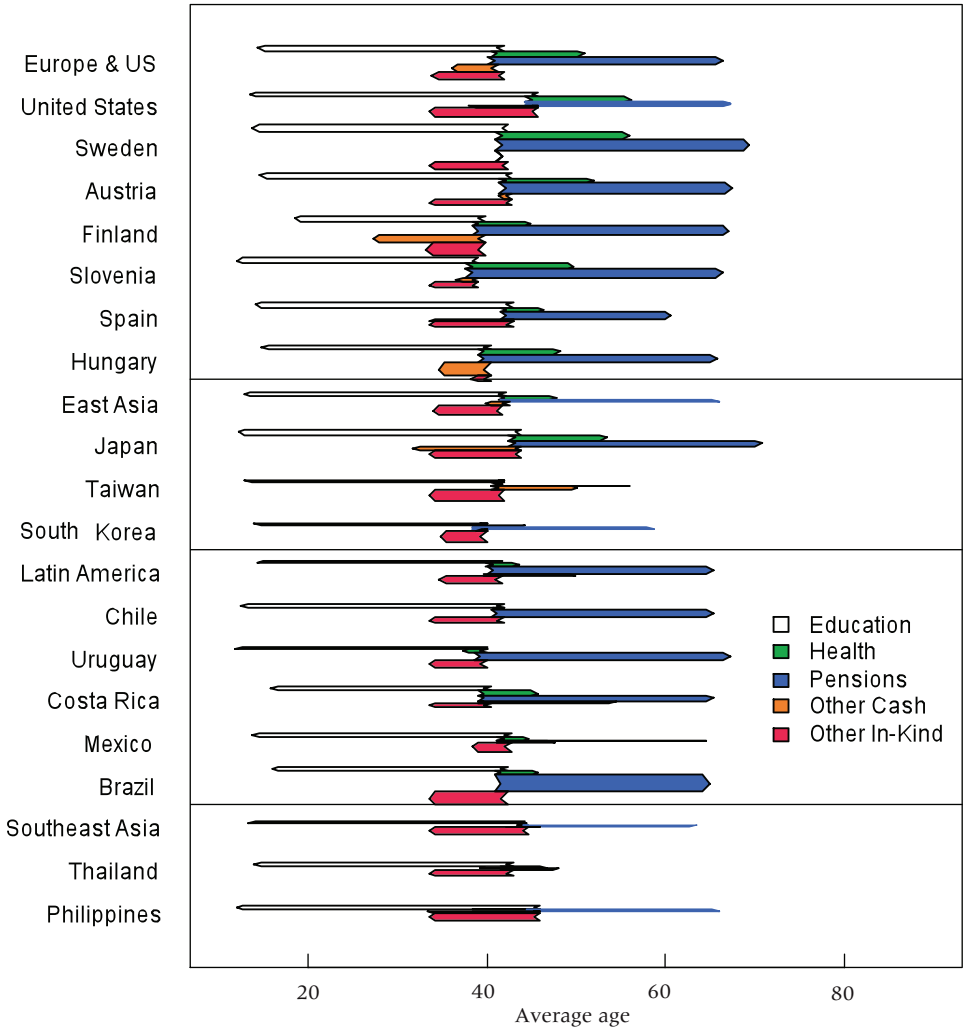


NOTE: Arrow point is average age of inflow; arrow tail is average age of outflow. Outflow age profile same for all sectors, adjusted to match aggregate inflow. Width is per capita inflow relative to average labor income over ages 30–49. Area within arrow is implied wealth. Within region, country order by ppp-adj avg GDP.

childcare expenditures. Taiwan and South Korea both have relatively weak spending on education, but these countries substantially augment public spending with private expenditures for tutoring, cram schools, and other complements to public education (see Lee and Mason 2010).

The average age of paying taxes is particularly high in the United States in Figure 12, and similarly high in the Philippines. This reflects the high labor income earned in old age in these countries.

FIGURE 12 Average age of public sector flows, using age distribution averaged across all countries



NOTE: Arrow point is average age of inflow; arrow tail is average age of outflow. Outflow age profile same for all sectors, adjusted to match aggregate inflow. Width is average of per capita inflow and outflow relative to average labor income over ages 30–49. Area is implied wealth. Within region, country order by ppp-adj avg GDP.

Conclusions and discussion

In every population we have studied, net *familial* transfers are strongly downward from older to younger generations, which is consistent with evolutionary theory and inconsistent with simple versions of wealth flow theory. Even the Asian countries with strong familial old-age support, such as Taiwan, South Korea, China, and Thailand, have downward familial transfers overall.

Parental net transfers to children over the life cycle are also the net cost of children, and they enter into fertility decisions in complicated ways (Becker and Lewis 1973; Willis 1988, 1994). In societies in which the elderly are supported by public unfunded pension and health systems, costs of this support drive a wedge between the public and private cost or benefit of children and might contribute to the low fertility of today's industrial countries, although we offer no evidence on this point here (Lee 1990).

A fundamental change has occurred in the direction of net intergenerational transfers from downward to upward, with most of the change driven by population aging in the later stages of the most advanced demographic transitions. Changes in the shape of the economic life cycle also contributed: old-age consumption rose relative to consumption at other adult ages. At the same time, expenditures per child were raised by increasing per child human capital investment in a smaller number of children per couple. It seems likely that the growing role of the welfare state played an important role in promoting these changes. In particular, substantial public transfers to the elderly have become common, even in some low-income Latin American countries, and these have apparently largely replaced familial support for the elderly. We say "apparently" because we do not have strong evidence of the substitution of public for private transfers. The case of Brazil, with the most generous public transfers to the elderly and the most strongly downward private transfers, is certainly suggestive. However, we do not see net familial support of the elderly in the poorest countries in our sample, which have no appreciable public transfers for the elderly. Income earned by assets of the elderly, such as land and livestock, probably plays a key role in these situations. In rich industrial countries, the demand for leisure at the end of life has risen with income. In the lower-income countries, individuals are more likely to continue to work, and this prolonged work also diminishes the need for family transfers to the elderly.

It is clear that current public transfers to the elderly in rich industrial countries will not be sustainable as populations age further over the next few decades. Patterns of work, consumption, and intergenerational transfers through both public and private sectors will surely change. Already there are important moves to restructure public pension programs and to contain costs in public health care programs. In some rich countries, labor supply of the elderly has begun to rise, at least slightly. It seems unlikely, however, that these changes will prevent more reversals in the direction of flows as rich industrial nations age rapidly. Some less developed Latin American countries have adopted the public transfer programs of Europe, and will experience the resulting fiscal pressures and perhaps similar reversals of flows. Asian countries other than Japan have so far gone a different route, with strong private, but weak public, support of the elderly. Once sustainability problems are resolved, the direction of flows is not in itself an issue. Nonetheless, ris-

ing public expenditures on the elderly may compete with public investment in children, and for countries with declining numbers of workers to support increasing numbers of elderly, underinvestment in children would be a very bad outcome. More generally, policymakers should pay careful attention to levels and trends in the intergenerational and inter-age distribution of consumption, rather than leaving these to be shaped as an incidental byproduct of institutions and policies designed long ago for other purposes.

Notes

Figures in this chapter are available in color in the electronic edition of the volume.

Research for this chapter was funded by parallel grants from the National Institutes of Health to Lee and to Mason, as well as by grants from MEXT.ACADEMIC FRONTIER (2006–2010) and UNFPA to NUPRI in Japan. We are grateful for help from Gretchen Donehower and Amal Harrati, and grateful to all the country research teams in the NTA project for the use of their data. The researchers are identified and more detailed information is available for many countries in working papers on the NTA website: «www.ntaccounts.org». We are also grateful to Tim Dyson and David Reher for their comments on an earlier draft.

1 These caloric-need weights are somewhat different from the equivalent adult consumer weights used by NTA, which will lead to some differences in estimated age profiles. In particular, a decline in estimated consumption at older ages in hunter-gatherer populations is largely explained in this way.

2 However, it is possible that the level of fertility is associated with level of female labor supply, and therefore with the shape of the labor income curve, so this age range is not without its own problem.

3 We value in-kind public transfers at the cost of providing them. However, the elderly, for example, may value the in-kind health care they receive at less than its cost of provision. Put differently, public provision of in-kind transfers may involve greater inefficiencies than private provision by the family. National Transfer Accounts cannot assess the utility or welfare contributions arising from transfers, but they do measure the expenditures involved.

4 Of the 23 contemporary populations studied here, only China funds its life-cycle deficit entirely out of labor income. Mexico and the Philippines are two examples of countries relying heavily on net foreign transfers (remittances) to fund their life-cycle deficit.

5 Let $c(x)$ be the per capita consumption at age x, and let $N(x)$ be the total population at age x. Then aggregate consumption at age x is $c(x)N(x)$. The average age of consumption, A_c, is given by $A_c = \sum_0^\omega xN(x)c(x) \Big/ \sum_0^\omega N(x)c(x)$. The average age of labor income is calculated similarly. Per capita consumption over all ages is given by $c = C/N = \sum_0^\omega N(x)c(x) \Big/ \sum_0^\omega N(x)$.

6 Calculations we have done elsewhere show that the approximation is quite good under the assumption that the discount rate is 3 percent per year and that individuals expect the age profiles of labor income and consumption to rise at 1 percent per year. We did not try other assumptions.

7 The arrow for the !Kung is located farther right than the arrow for the Ache, Piro, and Macheguenga. This is because fertility is considerably lower for the !Kung and consequently the !Kung population is older.

8 For per capita flows, we adjusted the level but not shape of the consumption age profile until the ratio of aggregate consumption to aggregate labor income in this hypothetical simulated economy is the same as it was in the actual economy. The length and direction of the arrows are unaffected by this adjustment; only the width of the arrow and its area are affected.

9 Pretransitional populations had young populations that were proximately the result of their high fertility. Their high fertility fol-

lows from their generally high mortality and non-negative growth rates.

10 We have estimates of bequests for a few countries, based on the assumption (known to be false) that mortality is independent of asset holdings. We plan to estimate bequests more systematically in the future. Note that only the results plotted in Figures 6, 7, and 10, all involving private transfers, would be affected by inclusion of bequests.

11 At lower levels of fertility there is higher investment per child in education and health care. However, total consumption expenditures for children are distinctly lower in populations with lower fertility, because other general consumption is not as responsive to lower fertility.

12 China's very high saving rate will eventually lead to large bequests, either public or private, strengthening downward transfers. We expect this will also occur in a number of other countries, particularly those with high public pensions that are either not fully spent or that permit the preservation of the assets of the elderly. Unfortunately, bequests are not yet included in the National Transfer Accounts.

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Generational Transfers and Population Aging in Latin America

LUIS ROSERO-BIXBY

Population aging, a direct consequence of the demographic transition, is often portrayed in negative, even dire terms. This chapter examines some of the probable effects of population aging in Latin America within the framework of the National Transfer Accounts (NTA) project (NTA 2010).[1] The starting point is the NTA estimates of the life-cycle deficit and intergenerational transfers in five countries: Brazil, Chile, Costa Rica, Mexico, and Uruguay. This information is then combined with long-term demographic trends, primarily in age composition, to estimate expected effects on the economy. These effects, also known as "demographic dividends" (e.g., Mason and Lee 2007), are both positive and negative, meaning that population aging in the region involves not only challenges and constraints but also opportunities for development and gains in standards of living.

In economic terms, the human life cycle typically includes long initial and final periods of dependency in which production, if any, is insufficient to meet consumption, and an intermediate period in which individuals produce more than they consume. The surplus in intermediate ages compensates for the "life-cycle deficit" at early and late ages through public and private transfers across generations, as well as through reallocations within the same generation. This cycle of deficit–surplus–deficit is neatly depicted by the age curves of consumption and production (labor income) in a given society (Lee, Mason, and Miller 2003).

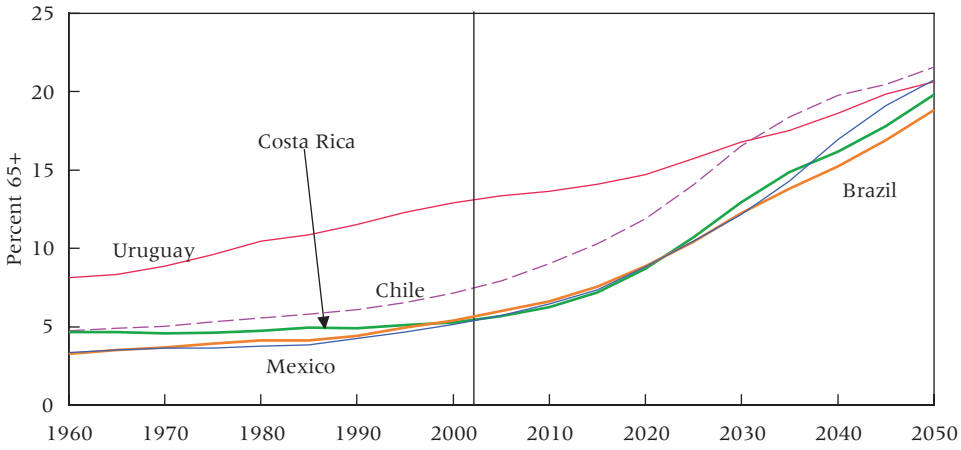
Individuals, families, and societies organize themselves in different ways to meet the life-cycle deficit at young and old ages by means of: (1) intergenerational private transfers (parents taking care of young children and working adults supporting their inactive parents and older relatives), (2) intergenerational public transfers (individuals paying taxes and the government providing services or cash to young or old individuals), and (3) intragenerational reallocations usually from middle to old ages through savings and accumulation of assets.

The existence of life-cycle deficits and surpluses tied to individual aging points up the importance of age structure. The demographic transition and the corresponding process of population aging modify the relative salience of life-cycle deficits with notable impacts on the economy at large, fiscal equilibrium, and economic well-being of families. The system of transfers and reallocations softens these economic impacts.

The second phase of the demographic transition—fertility decline—took place in most Latin American countries during the last three decades of the twentieth century (Chackiel 2006). The exceptions were countries or regions with large numbers of European immigrants, including Argentina, Cuba, Uruguay, and Southern Brazilian states, in which fertility declined and some population aging occurred contemporaneously with Southern Europe in the early twentieth century. In most of Latin America, however, recent fertility decline has resulted in early signs of population aging. This process will increase the proportion of the elderly population (aged 65 years and over) from about 5 percent to 20 percent between the beginning and the middle of the twenty-first century, as shown in Figure 1 for countries included in this chapter. This figure also shows the earlier start of population aging in Uruguay.

The World Bank classifies all five countries as "middle income." Their gross national income (PPP) is about $10,000 per person, less than one-fourth the level in the United States (see Table 1) but higher than the Latin American average ($8,500 in 2005). The year of the NTA estimates ranges from 1996 in Brazil to 2006 in Uruguay. Although this sample of Latin American countries includes the two regional giants—Brazil and Mexico—and thus most of the population in the region, low-income countries are under-

FIGURE 1 Percent of population aged 65 and older in five Latin American countries, actual and projected 1960–2050



SOURCE: CELADE 2009.

TABLE 1 Proportion of the older population within the total population and income per head in five Latin American countries and the United States

Country	NTA estimate year	Population aged 65+ (%)	2005 GNI per capita, US$ PPP
Brazil	1996	5.4	8,120
Chile	1997	7.0	11,100
Costa Rica	2004	5.8	8,650
Mexico	2004	5.1	12,360
Uruguay	2006	13.4	8,960
United States	2003	12.4	42,040

GNI = Gross National Income; PPP = Purchasing Power Parity.
SOURCE: NTA project. GNI from World Bank (2007).

represented and governments with welfare-oriented public policies may be over-represented.

Population aging in Latin America is taking place at a substantially faster pace than it did in Western Europe and the United States (Kinsella and Veloff 2001; Palloni, Pinto, and Pelaez 2002). Some analysts warn that economic growth may not keep pace with this change. Slow economic growth, in combination with a fragile institutional environment and the dismantling of the safety net provided by family and kin, would have deleterious consequences for the region (Palloni et al. 2005; Chackiel 2006).

This chapter argues that the increase in the aggregate life-cycle deficit at late ages will pose serious challenges for Latin American economies and governments. However, the relative increase in the elderly population cannot be taken in isolation from other demographic changes preceding it, namely the fall in the relative proportion of the young population and its corresponding life-cycle deficit. Most importantly, before these countries attain an age pyramid associated with a highly aged population, they will have relatively large numbers of people in the most productive part of the life cycle as well as in ages of maximum accumulation of wealth and capital. These windows of opportunity for the economy represent the aforementioned demographic dividends.

Data and methods

Data on age patterns of the economic life cycle (consumption and labor income), transfers (received from, and given to, the family and the government), and intragenerational reallocations (asset income) come from estimates made by the National Transfer Accounts project. NTA age profiles are mostly derived from national surveys on income and expenditures in house-

holds. The web page of the NTA project (NTA 2010) describes the method, which is also summarized by Lee, Lee, and Mason (2008). (See also Lee and Mason, in this volume.)

To obtain the age profiles of transfers from individuals to government, the NTA method disaggregates macroeconomic data on taxes according to the age profiles of income, property ownership, consumption, payroll, and social contributions. In turn, transfers provided by government include services (education, health, and others) and in-cash payments (mostly pensions) as reported in the national surveys and adjusted to the macro totals of the national accounts. Asset income, which is considered a reallocation from earlier accumulation and savings, includes income from property, imputed rent from an owner-occupied house, interest from bonds and the like, and operating surplus from corporations and small businesses.

This chapter complements NTA data with estimates of the age patterns of elderly recipients of long-term care and the corresponding age patterns of caregivers. The estimate is based on a Costa Rican survey (named CRELES) conducted among a national sample of elderly persons with over-sampling for the oldest old (aged 90 and older) (Rosero-Bixby and Dow 2009). Care-recipients are defined as individuals receiving help with any of four basic activities of daily living: toileting, bathing, bedding, and eating. This survey also identifies the main care-provider and his or her age. The two age profiles from Costa Rica were also used in the other four Latin American countries.

Population estimates and projections by age come from the United Nations Latin American Center for Demography (CELADE 2009) spanning the century 1950–2050. Population estimates for the age bracket 80+ were disaggregated into age groups 80–84, 85–89, and 90+, extrapolating the five-year survival ratios of age groups 65–69, 70–74, and 75+ under the assumption that mortality at those ages follows a Gompertz function.

Assuming that the NTA-estimated age pattern changes are essentially accurate, this chapter estimates or simulates trends in the demographically induced growth of several macroeconomic indicators. In these simulations the only elements changing over time are population size and age composition. By comparing these growth rates to each other, one can derive conclusions on whether demographic change is having positive or negative effects on several aspects of the economy. For example, if growth of labor income is larger than growth of consumption, the demographic change is opening a window of opportunity to improve standards of living by increasing per capita consumption now or in the future by investing the surplus. The following demographically induced growth rates were computed: consumption, labor income, asset income (which is considered a proxy of capital growth), tax revenue, transfers from government, private transfer receivers, private transfer providers, eldercare recipients, and potential eldercare providers.

Results

The economic life cycle and asset income in Latin America

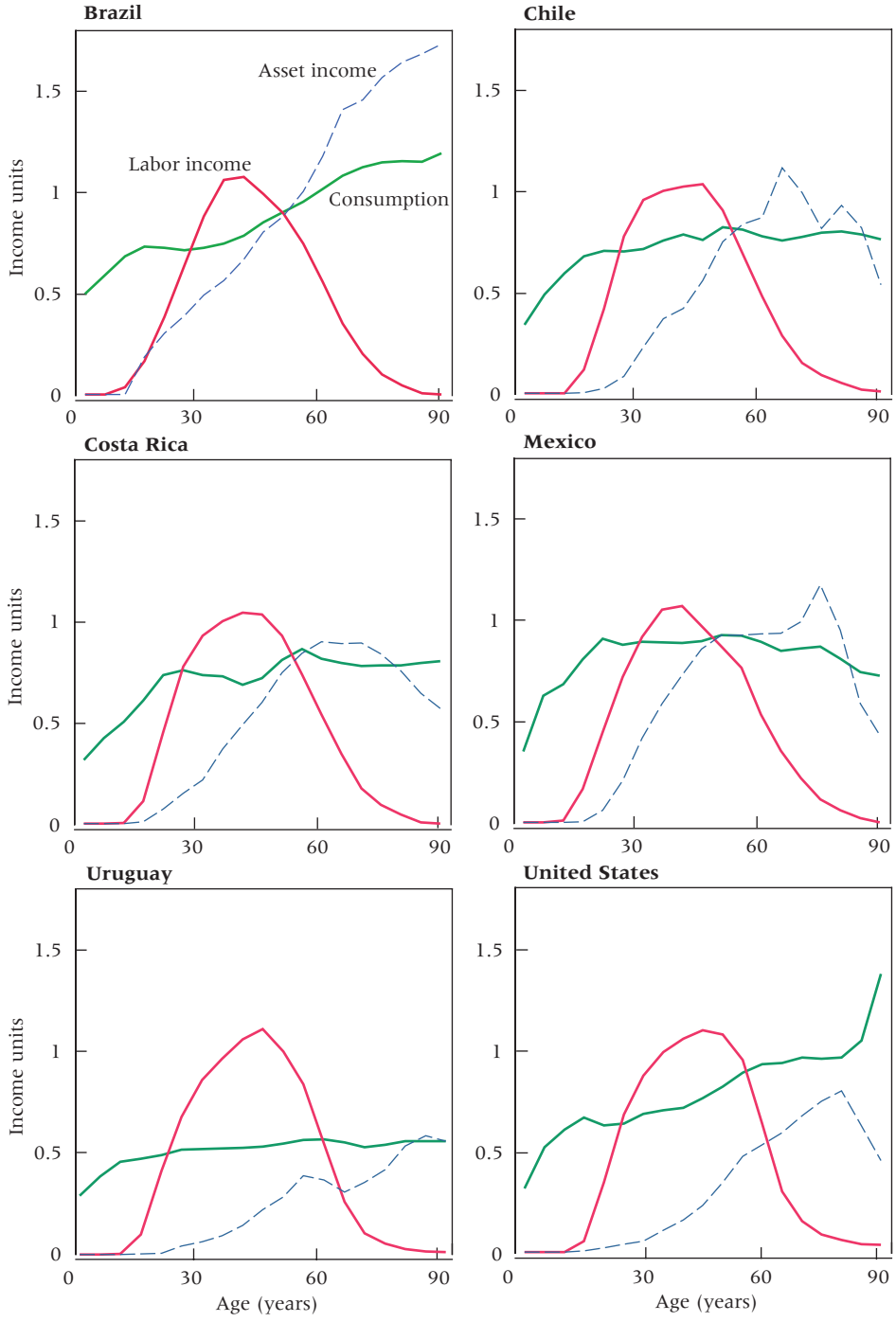
The NTA project's estimates of the two components of the life-cycle deficit (consumption and labor income) show that the "surplus" age span is surprisingly narrow in Latin America, ranging from 18 years in Mexico to 38 years in Uruguay (see Figure 2). This result originates in the late ages at which young people start producing a surplus (from age 23 in Uruguay to age 32 in Mexico) and the early age at which Latin American adults stop producing a surplus (from age 50 years in Mexico to 57 in Brazil). Most of the life cycle of a typical Latin American, with a life expectancy of 75 years, is thus spent in deficit. This result does not greatly differ, however, from the US pattern with a surplus age span of just 33 years. For all countries in Figure 2, ages above 65 are in deficit, which, in turn, is substantially larger than the deficit at young ages. Note, however, that these are per capita figures and, given that population numbers at old ages are relatively small, the corresponding total deficit may not be too big compared to the aggregated deficit for the young population.

Per capita income from assets is surprisingly high (Figure 2), especially in Brazil, where at ages 60 and above it exceeds 1.0, meaning that it surpasses labor income at peak ages.[2] In Chile, Costa Rica, and Mexico, asset income is about 1.0 by age 60, a higher level than in the United States. In Uruguay it is lower but still considerable. More important than the level of the curve is the shape, with maximum values at old ages (although at extreme old ages values tend to decline.) Because asset income likely mirrors productive assets owned by individuals (capital), population aging will result in substantial increases in capital.

The two demographic dividends

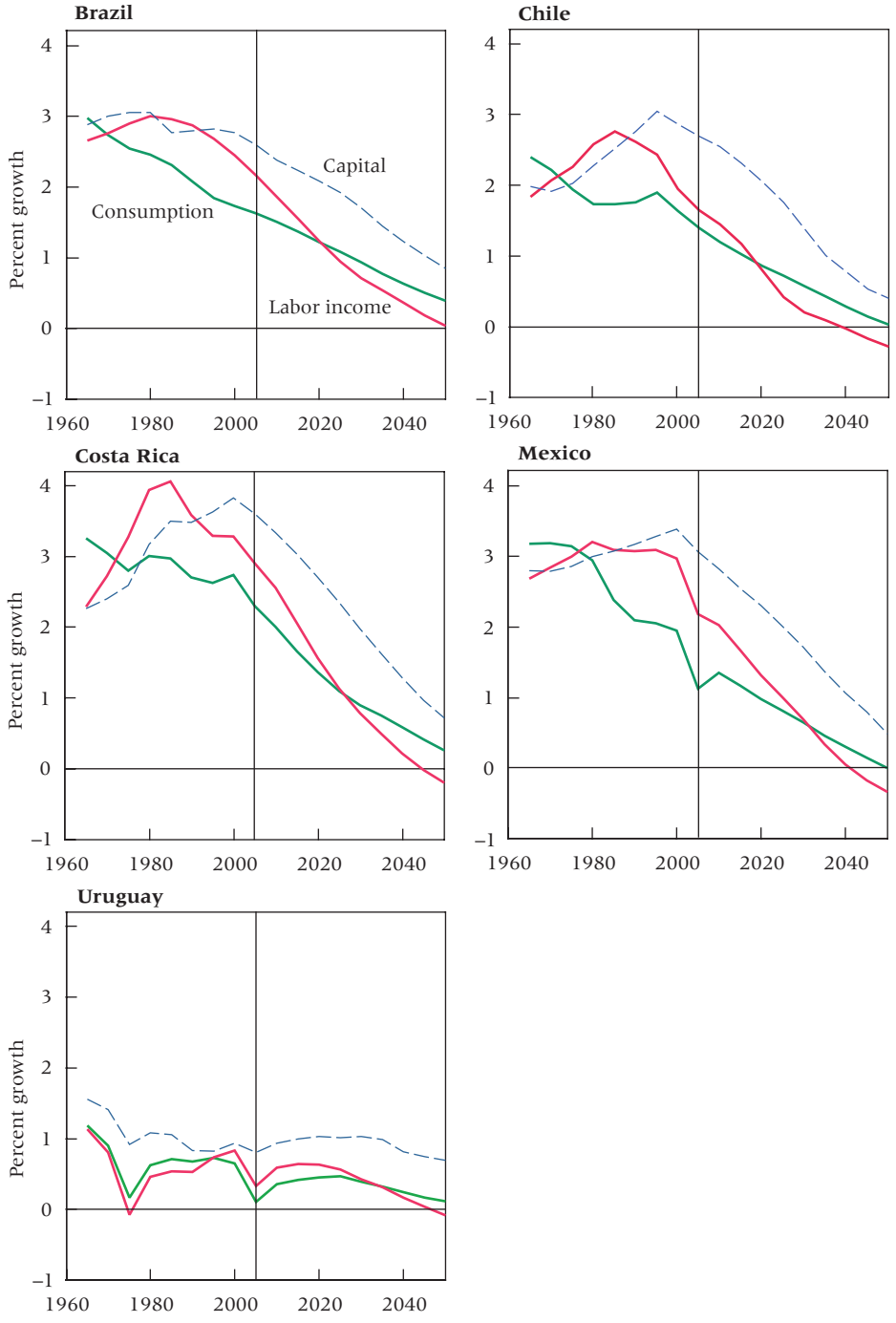
The demographically induced growth in consumption, labor income, and capital is estimated (see Figure 3) by combining the NTA age profiles (which are kept constant over time) with the observed and projected age-specific population trends. In four of the five countries, demographically induced growth in consumption has been smaller than growth in labor income in the last two or three decades, and it will continue to be so for several more years. The difference between growth in these two categories is an estimate of the first demographic dividend (Mason and Lee 2007), which arises from a transitional stage when relatively large numbers of individuals (born during periods of high birth rates) are in the highly productive and surplus-producing ages. Faster potential growth in labor income than in consumption might translate into higher living standards or might result in higher investment levels in physical or human capital that will improve future living standards.

FIGURE 2 The life-cycle deficit and asset income in five Latin American countries and the United States around the turn of the millennium[a]



[a]For years see first column of Table 1.
SOURCE: NTA project.

FIGURE 3 Growth rates in labor income, consumption, and capital in five Latin American countries, actual and estimated 1960–2050



SOURCE: NTA project.

The description above, however, does not fit Uruguay. This country displays no clear difference between the two growth curves. There is no first dividend because the process of population aging began several decades ago. The Uruguayan curves represent what will be observed in Latin America after the first quarter of the twenty-first century. The first demographic dividend will disappear by 2020 in Brazil and Chile, 2025 in Costa Rica, and 2030 in Mexico.

Figure 3 also shows that asset income is growing faster than labor income, an indication that the capital/labor ratio is increasing, which in turn should result in increasing labor productivity. This demographically induced growth in capital per worker, the second demographic dividend, has been increasing in the last few decades and will continue to do so up to 2050 and beyond. Even Uruguay is benefiting from this dividend.

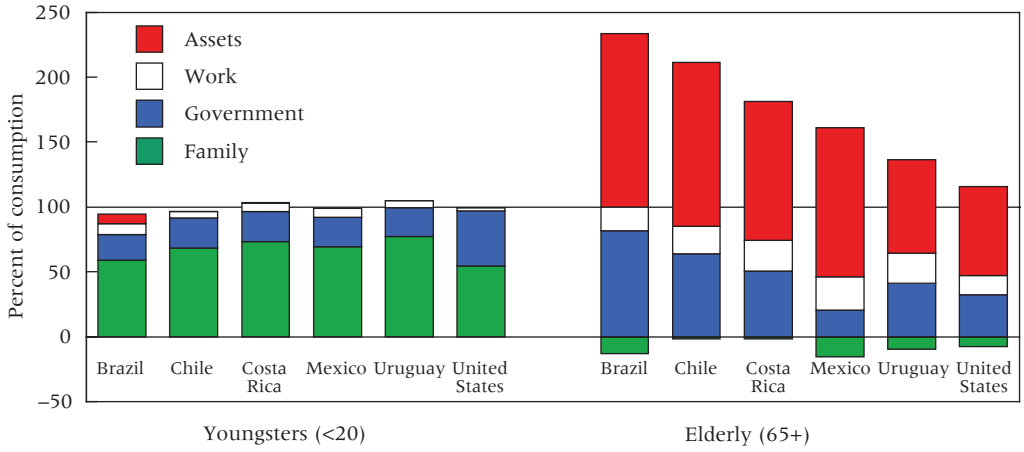
Generational transfers to young and old ages

How have governments, families, and individuals managed to finance consumption in deficit ages? There are only three possibilities, in addition to the scant labor income generated at those ages: public and private transfers and returns from assets. The relative importance of these funding sources varies substantially across the life cycle. Figure 4 shows the sharp contrast between young (under 20) and old (65 and over) ages. Among the young, family transfers are the most important source to fund consumption, ranging from about 60 percent in Brazil to 77 percent in Uruguay. Public transfers account for about one-fourth of the consumption of young people, mostly by providing public education. This share in Latin America is smaller than in the United States and other developed countries, where governments spend substantially more on public education in absolute and relative terms.

In contrast, asset income is the most prominent source of consumption by the elderly in Latin America (and in the United States). Asset income accounts for more than 100 percent of consumption at old ages in Brazil. Adding asset income to other income sources and transfers results in figures larger than consumption in the five countries, meaning that elderly Latin Americans have, on average, a critical surplus for savings, which they appear to continue accumulating until death.

The elderly in these countries, with the exception of Mexico, receive large net transfers from government. In per capita terms, they receive substantially higher public transfers than young people. At the same time, the total amount transferred to elderly persons is small because of the relatively small numbers at these ages. An extreme case is Brazil, where net public transfers (what is received from government minus what is paid in taxes) represent 81 percent of consumption among people over age 65. In Uruguay, Costa Rica, and Chile the corresponding figure ranges from 41 to 64 percent.

FIGURE 4 Sources of financing consumption of the young and the elderly population, five Latin American countries and the United States, 2000



SOURCE: NTA project.

In Mexico, the least welfare-oriented state in the group and perhaps more representative of other Latin American countries, net public transfers to the elderly population represent only 21 percent of their consumption, compared to 32 percent in the United States (Figure 4).

Labor income, in turn, funds between 20 and 25 percent of the consumption of elderly Latin Americans, substantially less than the share of asset income and even public transfers, except in Mexico where labor income at these ages is somewhat higher than net public transfers (Figure 4).

Contrary to popular belief, private transfers to the elderly, on balance, are null (Chile and Costa Rica) or even negative (indicating transfers from the old to the younger generations) in these estimates. The elderly in Latin America (and also in the United States), far from being an economic burden to their families, are an economic asset. On balance, they do not rely on contributions from their children to meet consumption needs. In other regions of the world this may not the case and net private transfers may play a key role in supporting older adults.

Generational transfers and sectoral demographic dividends

In analogy to the life-cycle deficit defined for the economy as a whole by comparing the labor income and consumption curves in Figure 2, one can define life-cycle deficits separately for government and families, as shown in the upper panels of Figure 5 for Costa Rica for 2004 (the curves are broadly similar for the other four countries).

Transfers paid by particulars to the government—that is, the tax curve in Figure 5—mirror the age pattern of labor income. This is not surprising given the importance of income taxes and automatic deductions from salaries for social security (which in Costa Rica includes health insurance) and the insignificance of taxes on income from assets (mostly owned by the elderly) in Latin America. In turn, the age curve of transfers paid by the government differs substantially from the consumption curve. It has a bump at young ages (attributable to public education transfers) and a steep upward slope at old ages (attributable to public pensions and public health expenditures.) The per capita fiscal deficit is thus huge at old ages, and population aging will be especially problematic for governments if these age profiles stay constant.

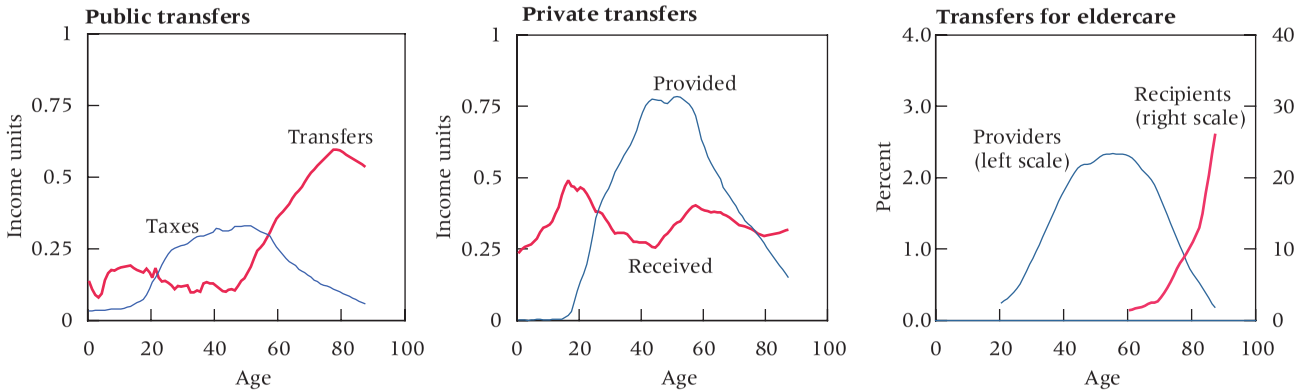
The age profiles of private transfers, both received and provided, define a life-cycle deficit for families. (The great majority of these transfers occur within households: less than 10 percent take place between households.) As shown in Figure 5 for Costa Rica, per capita transfers received are higher at young ages, whereas the age curve of transfers provided resembles the labor income curve, with the difference that the deficit appears only at very old ages (near 80 years of age in Costa Rica and even later in other countries). Elderly individuals in Costa Rica and elsewhere in Latin America give their families and kin substantially more than they receive in their 60s and 70s. At very old ages a deficit may occur but this is rather small. Given these age profiles of private transfers, population aging has the potential of improving families' standard of living.

A third type of generational transfer, not considered in the NTA project, involves informal transfers of nonmarket services. The two most important are infant and child domestic care and unpaid long-term care provided to the elderly, especially the infirm. This chapter considers only eldercare. In Costa Rica, the proportion of the elderly receiving assistance in daily life activities is less than 5 percent until about age 75 (Figure 5). After this age the proportion increases rapidly. Care providers are usually spouses, children, and, to a lesser extent, grandchildren and others. The estimated age distribution of caregivers in Costa Rica resembles a bell shape, with a median age of 54 (Figure 5). The proportion of individuals providing care is very small in the Costa Rican population (shown with a left scale that is amplified ten times in comparison to the right scale for Receivers in Figure 3), peaking around 3 percent by ages 65–70. This proportion will rise quickly with population aging, reaching about 20 percent by 2060 if provision for eldercare remains unchanged with almost no public services.

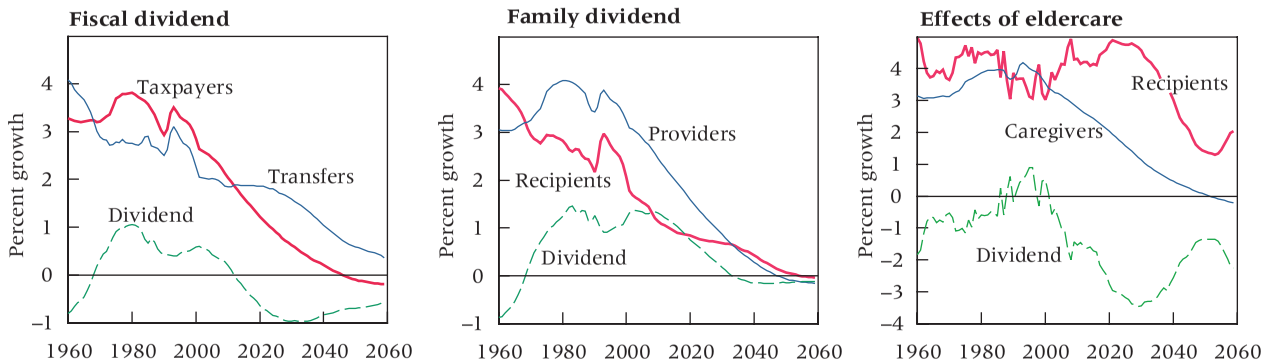
The lower panels of Figure 5 show the demographically induced growth in these three types of transfers and the corresponding demographic effects. Negative differences indicate that instead of a demographic dividend, demographic change is taking a toll from the corresponding sector. Table 2 sum-

FIGURE 5 Generational transfers estimated in 2004 and demographic effect of transfers, actual and projected, 1960–2060, in Costa Rica

a. Intergenerational transfers by age, 2004



b. Two dividends and effects of eldercare, 1960–2060



SOURCE: NTA project.

marizes these effects for the five countries and three periods: (1) 1975–2000, recent history; (2) 2001–2025, contemporary effects; and (3) 2026–2050, the medium-term future.

The fiscal demographic effect is generally smaller and of shorter duration than the first general demographic dividend and the family dividend. In Costa Rica it lasts from 1970 to 2012, with a peak in 1980. In these years, demographic change probably resulted in increases in tax revenues larger than the increases in public obligations to the population. This dividend has largely expired. Starting in 2013 Costa Rica's government will face a relative shrinkage of its tax base and an increase in its obligations. The trends in other countries are analogous. As shown in Table 2, in the first quarter of this century governments in Brazil and Chile face a negative fiscal dividend growing at the annual rate of about –0.5 percent per year; Mexico still has a positive fiscal dividend growing at the annual rate of 0.6 percent, while in Costa Rica and Uruguay the situation is neutral. In the years 2026–2050 governments in all five countries will face adverse fiscal conditions, although these will be less severe in Uruguay (where much of population aging happened decades ago) and Mexico (where transfers to the elderly are less generous).

TABLE 2 The demographic effects on the economy in five Latin American countries in three periods

	Demographic dividends (annual percent growth)				
Period and country	**Labor minus consumption**	**Capital/ labor ratio**	**Fiscal dividend**	**Family dividend**	**Elder care**
1975–2000					
Brazil	0.71	0.05	0.36	1.02	–0.77
Chile	0.71	0.23	0.61	1.37	–0.47
Costa Rica	0.82	–0.11	0.74	1.10	0.05
Mexico	0.80	0.10	0.84	1.01	–0.48
Uruguay	–0.06	0.32	–0.16	0.11	–1.47
2001–2025					
Brazil	0.19	0.69	–0.52	0.76	–1.87
Chile	0.05	1.18	–0.49	0.77	–2.12
Costa Rica	0.35	0.96	–0.07	0.96	–1.42
Mexico	0.55	0.91	0.59	1.15	–1.49
Uruguay	0.19	0.41	0.05	0.59	–0.78
2026–2050					
Brazil	–0.28	0.88	–0.81	0.23	–2.55
Chile	–0.33	0.86	–0.77	0.04	–2.49
Costa Rica	–0.33	1.06	–0.82	0.14	–2.86
Mexico	–0.20	0.97	–0.36	0.28	–2.92
Uruguay	–0.08	0.68	–0.28	0.33	–1.17

SOURCE: NTA project.

The family demographic dividend is much larger and longer lasting than other effects. The growth in private transfer-givers is faster than the growth in transfer-recipients since 1970, a situation that will last until around 2034 in Costa Rica. Thereafter the differential growth is close to zero (Figure 5). In the more than six decades from 1970 to 2034, demographic change might be expected to generate improvements in the living standards of Costa Rican families. The situation is similar for families in all five countries (Table 2). In the first quarter of the current century, annual growth in the family dividend ranges from 0.6 percent in Uruguay to 1.15 percent in Mexico. The figures were higher in the previous 25 years, and they will be smaller in 2026–50. No country will have negative figures (Table 2).

Regarding the eldercare effect, it is not surprising that population aging renders it mostly negative. Costa Rica's growth in eldercare recipients hovers around high annual rates of 4 percent from 1960 to 2040 (Figure 5). Given that the growth of the pool of caregivers was between 3 percent and 4 percent until 2008, the economic effect was negative, but this toll was not large. Starting in 2009, however, this demographic penalty exceeded 1 percent and will continue growing until about 2030 when the trend will reverse. Analogous trends can be described for the other countries. The summary in Table 2 shows that in 2001–25 eldercare needs are having a negative impact ranging from 0.8 percent per year in Uruguay to 2.1 percent in Chile. These figures will be even higher in 2026–50. These trends indicate that higher and higher proportions of the population, mostly at ages 45–65, will have to provide unpaid care to one or more elderly relatives.

Discussion

Estimates from the National Transfer Accounts project for five Latin American countries show some surprising or little-known circumstances regarding the systems of intergenerational transfers and intragenerational reallocations that deal with their life-cycle deficits, namely:

1. The elderly (those 65 or older) in Latin America are far from being a net economic burden to their families; the economic transfers they provide to their family members are larger than those they receive from them.

2. Elderly Latin Americans are relatively wealthy. Their per capita income from assets by age 65 is as high as (or even higher than) labor income at peak working ages.

3. Elderly Latin Americans receive a disproportionately high share of per capita public transfers. Population aging, however, may render this circumstance unsustainable.

4. While family transfers are by far the main source of consumption needs at young ages, asset income and public transfers (especially pensions) fund most consumption at old ages, and these even allow for substantial savings and transfers to other family members.

A United Nations (2005) study on living arrangements of the elderly around the world found that, in Latin America, about 71 percent co-reside with children or grandchildren, well above the 20 percent level of co-residence in North America and Europe. This high level of co-residence with young generations (in part a reflection of high fertility in the past) results in higher intensity of family transfers per elderly person. The generational direction of these transfers, however, is mainly downward. Moreover, a survey of the Costa Rican population aged 60 and over found that in 96 percent of cases, children were the ones living with their parents (either they never left the parental home or at some point they returned to it). The perception of the elderly population as a burden for their adult children appears to be a myth in Latin America. Perhaps that is true for the oldest-old population. In the five countries examined here, however, men and women aged 65–79 years—that is, 80 percent of the population aged 65 and older—are relatively well off, receive substantial government transfers, and in some cases even have labor income.

The generational transfer system prevalent in Latin America will make the national treasury the most important (and maybe the only) economic casualty of population aging. Changes in the age patterns of taxation and/or public transfers, however, such as increasing taxes on wealth or increasing retirement ages, can reduce this fiscal burden. High rates of economic growth brought about in part by the demographic dividends can also help to finance public transfers to the elderly. Moreover, the eventual burden of an aged population for taxpayers will probably be compensated by the greater contribution of the elderly to the well-being of families, since the elderly provide on average more than they receive from children. Bequests from parents who continue to save can also provide relief.

Before the recent rise in the proportion of the elderly population, Latin American economies have benefited from the relatively faster increase in the population at ages contributing to the life-cycle surplus. This demographic dividend is, however, almost over. A second demographic dividend will continue for many years, resulting from the relatively faster growth of the population in ages of maximum accumulation of wealth and the corresponding increase in the capital/labor ratio that should improve productivity. Some of the potential consequences of demographically induced growth rates might prove to be unsustainable, however, and policy changes will be proposed to avoid them. The government, for example, might seek to reduce public transfers to the elderly and increase tax revenues from them in order to avoid the negative fiscal effects associated with population aging. Nevertheless, the only major burden confronting Latin American families is the quickly growing need for long-term care for elderly relatives.

Notes

Figures in this chapter are available in color in the electronic edition of the volume.

1 This chapter is based mainly on data from the National Transfer Accounts (NTA) Project, which is an international collaboration of research teams in more than 30 countries to measure, analyze, and interpret macroeconomic aspects of age and population aging around the world. Ronald Lee from the University of California at Berkeley and Andrew Mason from the East-West Center in Hawaii are co-principal investigators. This project started in 2004. Its Latin American component is funded by the Canadian International Development Research Center (IDRC) and coordinated by the UN Economic Commission for Latin America and the Caribbean (ECLAC) under the coordination of Jorge Bravo, Dirk Jaspers, and Paulo Saad. The local research teams are headed by: Ivan Mejia Guevara and Juan Enrique Garcia, CONAPO, Mexico; Luis Rosero-Bixby and Paola Zuñiga, University of Costa Rica, Costa Rica; Cassio M. Turra and Bernardo Lanza Queiroz, CEDEPLAR, Brazil; Jorge Bravo and Mauricio Holz, CELADE, Chile; and Marisa Bucheli, Universidad de la República, Uruguay.

2 Note that the figure uses a normalized monetary scale of "income units" in which one income unit is the average labor income at ages 30 to 49, also referred to as income at peak ages. In the Latin American countries each unit is about US$5,000 per year, whereas in the United States it is $42,000.

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Population Aging and the Future of the Welfare State: The Example of Sweden

Tommy Bengtsson
Kirk Scott

Sweden was the world leader in population aging for a good portion of the twentieth century. During that century, the share of the elderly doubled in Sweden, with 18 percent aged 65 years and older in year 2000. While no longer at the forefront of population aging, the country's share of elderly is still very high and is estimated to increase to 26 percent by 2050. The question is whether the next step toward population aging will continue as smoothly as the first step, when the increase in the share of elderly was paralleled by an expansion of the welfare state and increasing living standards for all age groups. Will it be possible to maintain and improve living standards in all age groups, and will the various welfare systems be able to handle future population aging? Already in the 1990s, the pension system underwent a change to make it more robust. Today, the organization and funding of elderly support and health care are major concerns as the share of elderly increases. Can Sweden simply increase taxes or must there be a substantial long-term increase in labor productivity? Will immigration or an increase in fertility be the answer or must the working life be extended? While this chapter examines the challenge of population aging in the years to come, it starts with an overview of how Sweden got to this point to see what we can learn from history.

Population aging in Sweden

The reason why the share of elderly has increased may appear obvious: people live longer and longer. During the twentieth century average life expectancy in Sweden rose from 51 years for males and 54 years for females to 77 and 82 years, respectively (Statistics Sweden 2004). This is part of a long-term process that started during the first half of the nineteenth century with an average

increase in life expectancy in highest-achieving countries of approximately three months per year (Oeppen and Vaupel 2002). While these developments have been impressive, they have not had any major impact on population aging so far. In fact, the improvements in life expectancy initially rejuvenated the population, since the early increases in life expectancy were driven by a decline in infant and child mortality. Consequently, most of the years gained by prolonging life were below age 65 years. For Western countries, it was not until life expectancy at birth passed approximately 72 years that the increase in life expectancy was driven by a reduction in mortality among the elderly, thus contributing to population aging (Lee 1994). This took place in the 1970s in Sweden.

The primary cause of population aging in Sweden up to now was, as elsewhere, declining fertility. The overarching influence of fertility decline on population age structure was highlighted by Ansley Coale in 1957, with the help of Swedish data (Coale 1957). Coale showed that, had fertility rates remained unchanged, the age structure would have been largely the same in 1950 as in 1860, despite substantial increases in life expectancy during this period. To identify the causes of continued population aging through the remainder of the century, Bengtsson and Scott (2005, 2010) repeated Coale's calculations using one-year age-group data for the entire twentieth century. The results were similar to those found by Coale; with constant fertility, the share of persons 65 years and older would have been 8 percent in the year 2000, exactly the same as in 1900. Thus population aging in Sweden was primarily driven by the decline in fertility throughout the twentieth century. If fertility levels stabilize over a longer period, however, other factors, such as mortality decline in adult ages, will increase in importance. Over the last decades of the twentieth century, declining mortality began to exert an influence on the age structure, indicating that this process has already begun (Lee 1994; Preston et al. 2001; Bengtsson and Scott 2005, 2010).

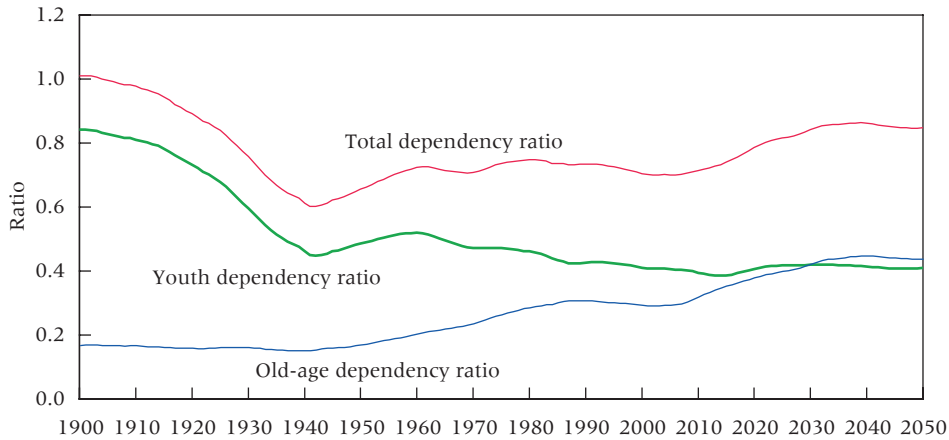
Consequences of an aging population

Population aging was initially not a problem for society since the factor that caused it, the decline in fertility, was also its solution. First, there is considerable evidence that the drop in fertility had positive effects on economic growth (see Bloom et al. 2003 for discussion of the potential economic benefits of the first demographic dividend). Population growth implies capital dilution, unless capital is augmented, which means that per capita consumption is restrained. Consequently, when population growth rates decline, less output needs to be allocated to investment in order to supply each worker with a given amount of capital. Second, the reduction in fertility during the early decades of the twentieth century was so rapid that it more than compensated for the increased share of elderly. The total dependency ratio—the number of persons either too

young or too old to work relative to the number of persons in working ages—declined, as shown in Figure 1. In the future, however, assuming that fertility rates stabilize at a lower level and mortality shifts turn from rejuvenating to aging the population, not only will the share of elderly in the population increase but so will the total dependency ratio. While this process started in Sweden in the 1970s, it will become more pronounced in the next 40 years according to official population forecasts. These forecasts, which we use in Figure 1, are based on the assumptions that life expectancy will increase to 83 years for men and 85.5 years for women, and that the total fertility rate will stabilize at 1.83 from 2009 onward. This puts Sweden into an entirely different situation than during the first stage of population aging, when the increasing share of elderly was more than compensated for by a declining share of young people.

Paul Samuelson discussed how consumption might be maintained throughout the life cycle via a distribution between generations (Samuelson 1958).[1] His overlapping-generations theory sees an individual's life cycle as consisting of two periods: a productive worker phase and an unproductive retiree phase. Samuelson assumes that the products of a worker's labor cannot be saved, but must be consumed immediately, thereby making a worker incapable of saving for his/her own retirement. This leads to a situation where retirees must rely upon those still in the workforce for their sustenance. Samuelson argues that the situation cannot be solved by the market, and provides three potential resolutions: (1) a family system, where working children transfer a portion of their income to their retired parents, (2) the creation of "fiat money"[2] as a store of value that can be saved by workers, or (3) a social transfer system in which pensions are paid for by a tax on workers. A system of transfers from worker to retiree through any of these means will

FIGURE 1 Young-age, old-age, and total dependency ratios for persons aged 20–65 years, Sweden 1900–2008 and estimates to 2050



SOURCE: Statistics Sweden (2004).

improve the welfare of all persons in current and future generations. Since each person has an incentive to renege on a tax-based system, it needs to be supported by a "social compact."

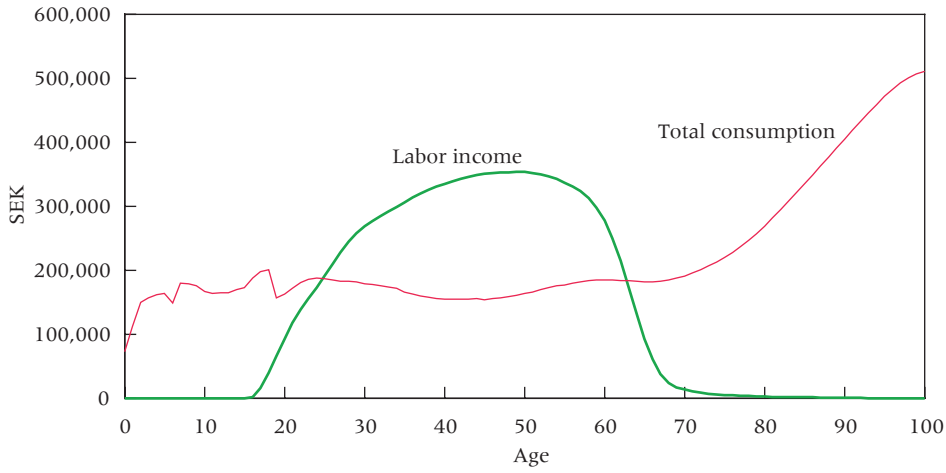
Samuelson (1975) later used this model to explore the impact of population growth on economic welfare. He showed that population growth has a positive influence on average economic welfare because the tax base providing for intergenerational transfers grows more rapidly than pension costs, since the ratio of workers to retirees increases. This increase can offset the negative effects of population growth caused by capital dilution. Samuelson's work helps us to understand transfers between generations, and served as the foundation for a generalization that is even more useful, if also less known.

Arthur and McNicoll expanded on Samuelson's two-generation model to include the entire population, not only workers and retirees (Arthur and McNicoll 1978). This was done by including age-specific labor productivity and consumption throughout the life cycle. They showed that, as long as the interest rate is equal to the population growth rate, population growth will lead to economic growth in countries where the average age of productive individuals is lower than the average age of consumers. The fundamental conclusion is the same as Samuelson's: population growth will have a positive influence on economic welfare as long as the mean age of the producer is lower than the mean age of the consumer.

This was exactly the age structure that prevailed in Sweden at the beginning of the twentieth century. Declining fertility led to a declining share of children in the population, thereby increasing the average age of the consumer. The smaller family sizes resulting from lower birth rates enabled women to work outside the household, increasing family incomes. Fertility levels were still above replacement, leading to substantial population growth, with each generation still larger than the preceding one. Together with strong economic growth following World War II, population growth allowed for reforms of the pension system as well as other, more general welfare reforms. A beneficial demographic situation such as this ends when new generations of workers become smaller than those retiring and when population aging becomes driven by the decline of mortality among the elderly.

Figure 2 presents earnings and consumption over an individual life cycle in Sweden. These figures, derived from recorded earnings and consumption in 2003, are a snapshot of all age-specific values in that year. It is clear that costs increase toward the end of the life cycle. From their early 20s through age 70, the average Swede consumed 200,000 SEK (roughly, US$26,000) per year in both private and public consumption. This consumption is more than offset during the productive years by labor income, and it is not until the individual reaches the second half of his/her 60s that consumption exceeds income. At this point, consumption begins to rise in a monotonic fashion, to the point where individuals in their 90s consume 400,000–500,000 SEK per year not offset by any increase in labor income.

FIGURE 2 Age-specific consumption and labor income, Sweden 2003, measured in 2003 SEK

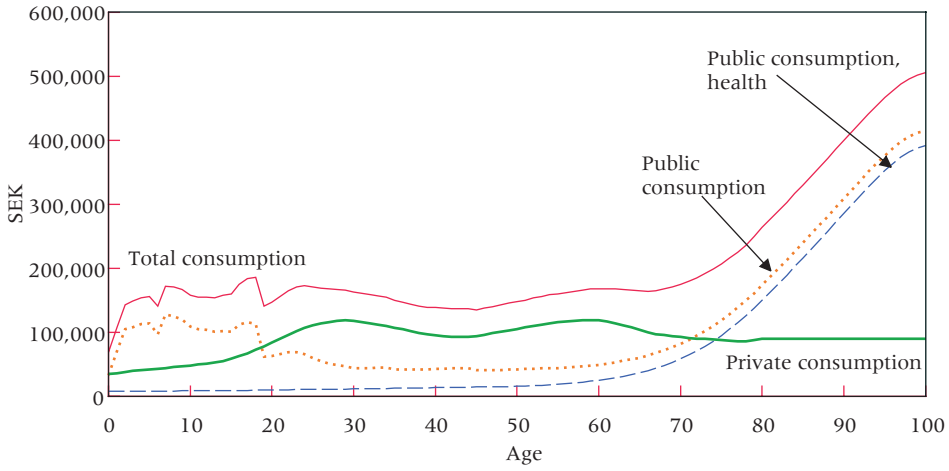


NOTE: SEK 100,000 ~ US$13,000 in 2003.
SOURCE: Forsell et al. (2008).

A closer look at age-specific consumption indicates that the increase at older ages is almost entirely due to an expansion of publicly funded social and health care, shown in Figure 3. This figure makes it clear that the costs of health care completely dominate consumption at higher ages.

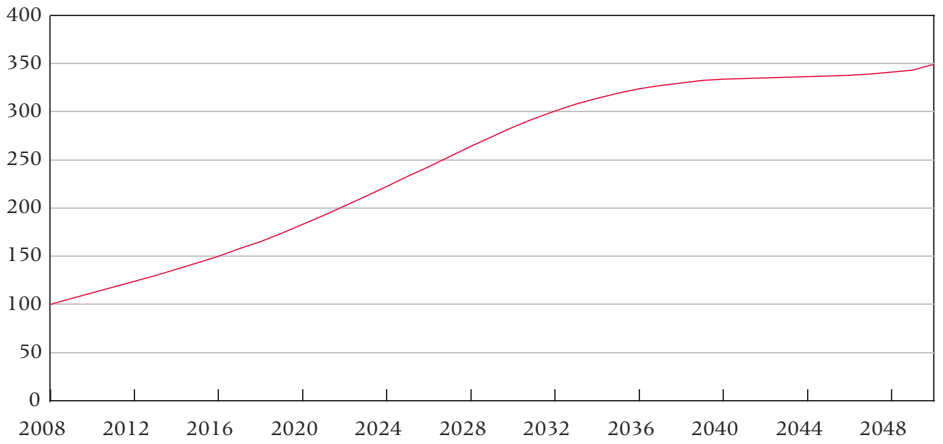
The life-cycle balance is calculated as a summation of consumption minus labor income across all ages in a given year. As such, it does not refer to any

FIGURE 3 Age-specific consumption, by type, Sweden 2003, measured in 2003 SEK



NOTE: SEK 100,000 ~ US$13,000 in 2003.
SOURCE: Forsell et al. (2008).

FIGURE 4 Life-cycle deficit, Sweden 2008–2050 (index, 2008 = 100)



SOURCE: Own calculations based on Forsell et al. (2008) and Statistics Sweden (2008).

particular birth cohort but to the situation in a given year. While the life-cycle balances change from year to year depending on business cycles, on average consumption exceeds earnings. The deficit is paid through positive international transfers, consisting largely of positive income from foreign investments. When indexed to 100 in 2008, the life-cycle deficit is expected to increase to 350 by 2050, with the major increase taking place before 2040, as shown in Figure 4. Thus the shifting age structure, with an increasing share of elderly, will, in light of the age-specific consumption profile seen in Figure 2, lead to a sharp increase in costs that may not be fully covered by labor income.

How big is this increase in real terms? Labor productivity must rise by approximately 0.3 percent per year, a substantial increase, simply to cover the consumption deficit until 2050. It needs to be slightly higher in the next decades, however, since the pace of the increase in population aging is even faster until about 2040. This implies that an appreciable share of future productivity improvements will have to be diverted to simply maintaining age-specific consumption at the same relative levels as in 2008. This is a very optimistic scenario, since per capita costs for the elderly, especially costs for health care, have been increasing steadily over the past several decades. Additionally, productivity increases tend to be accompanied by demands for higher wages. "Baumol's disease," referring to the tendency for these wage increases to occur in *all* sectors, not merely those experiencing productivity increases, points to another challenge associated with financing population aging solely through productivity increases (Baumol and Bowen 1966). Can we safely rely on future productivity gains to cover the increasing costs for consumption by the elderly or is there a need to look for other solutions, like expansion of the workforce?

Demographic solutions to population aging

Population aging is a demographic process; thus it seems logical to begin by examining potential demographic solutions. These possibilities are mainly restricted to an internal solution of reversing the downward trend in fertility, and an external solution of altering the age structure through immigration.

Future increases in fertility would initially lead to an even less desirable dependency ratio, because very few individuals work before age 20 and parents of young children tend to reduce their own supply of market labor. In the long run, however, an increase in fertility can counterbalance an increasing share of elderly in the population. A big question here is how to raise fertility levels. One possibility is to implement policies that increase the compatibility between labor force participation and childrearing. Another is to redistribute some portion of consumption to childrearing. It is uncontroversial to state that the economic preconditions for increased levels of fertility exist. Nevertheless, very few scholars today believe that fertility rates will increase more than marginally in the future. Even if fertility levels do rise, this will have a small impact during the period up to 2040, which is the time when the share of elderly has its sharpest increase.

Immigration is another means to counter the effects of population aging. The Swedish political debate seems to focus on immigration as the one viable solution to bottlenecks in productivity caused by an aging society (Swedish government proposition 2007/08: 147). The logic behind this line of thought is that migrants are overrepresented in the lower working ages, and thus immigration would lower the average age of the producer without increasing the population share that is below working age. However intuitive this understanding is, the reality is not so straightforward.

Sweden has been a country of net immigration since the 1930s (Lundh and Ohlsson 1999; Statistics Sweden 1999: 130). Roughly 25 percent of the Swedish population today was either born abroad or has at least one parent who was born abroad, with 14 percent being first-generation immigrants. To put this in wider perspective, international migrants in Europe as a whole account for only 9.5 percent of the population. This raises the question of how the age structure in Sweden would have looked in the absence of migration.

Bengtsson and Scott (2005, 2010) find that net immigration to Sweden has had a restraining effect on the share of elderly in the population, but this effect has not been very pronounced. If Sweden had not experienced any migration after the 1930s, when immigrants started to outnumber emigrants, the share of the population above age 65 would be only 2.5 percentage points higher than it actually is, resulting in a share of 20.2 percent instead of 17.7 percent. These calculations take into account both immigration and the effects of immigrant fertility. Thus while immigration has an effect on population aging, it is rather small. Calculations for Europe (Bengtsson and Scott 2005, 2009) and Japan (UN 2007) yield similar results.

One of the arguments for immigration serving to "correct" the age structure is that immigrants tend to arrive during their childbearing years and generally have more children per family than native Swedes. One reason is that immigrants are more likely to be married or cohabiting than native Swedes. However, while fertility among immigrants initially is higher than among natives, migrants on average adopt to Swedish patterns very quickly. In fact, an examination of birth rates shows that foreign-born women tend to have *fewer* children than Swedish women of the same age. While fertility patterns vary widely among women of different national origins, evidence suggests that even women from countries with high fertility rates adapt quickly to Swedish fertility patterns (Andersson 2004; Andersson and Scott 2005, 2007).

Stable population theory has been expanded in recent decades to account for the effects of migration. Empirical studies show that the potential effects of immigration on the age structure of the receiving society vary greatly, depending on the projected fertility of migrants. Thomas Espenshade (1994) found only a marginal effect of immigration on the US age structure, under the assumption that immigrants adjusted their fertility to American levels. Using instead an assumption that immigrants retain home-country fertility levels, Stefan Jonsson and Michael Rendell (2004) came to the opposite conclusion. These contrasting results demonstrate that the potential impact of immigration is highly dependent upon the assumptions made regarding post-migration fertility. Given existing studies showing an adjustment process toward Swedish levels, we lean toward the conclusion that future immigration will not provide the changes necessary to reverse population aging. A "migration solution" to the issues associated with aging also implies much more than an increase in the number of people in fertile ages or below.

The primary problem associated with population aging is the increased costs linked to an elderly population in the face of a declining workforce. For the migration solution to be effective, the potential immigrants must become well-integrated into the Swedish labor force. Sweden's experience with immigration over the past two decades provides many reasons to be pessimistic on this count. Since the 1970s, immigrant integration in Sweden has not been as successful as it had been earlier.

Unemployment among foreign-born men was 7 percentage points higher than for native males in 2001 (Bennich-Björkman et al. 2002), but this is only part of the problem. Unemployment figures are based on individuals who are currently in the labor force, making the problem look less severe than it actually is. Only 78 percent of all foreign-born men were in the labor force in 2001, compared to 86 percent for Swedish-born men. Thus, 22 percent of all foreign-born men aged 20–59 were either in labor market retraining programs or completely outside the labor force in 2001. This gives an actual unemployment rate (redefined as those without employment as a proportion of all those aged 20–59) of roughly 30 percent for immigrants and around 18 percent for natives. These figures have improved somewhat, but

in 2008 the foreign-born aged 20–64 still had an employment rate of only 67 percent, compared to a native rate of 85 percent (Statistics Sweden 2010).

This concern has been partially refuted in the media by claims that new immigrants will be recruited for existing jobs, thereby avoiding the integration issues faced by refugees and others arriving without prenegotiated employment. While this argument sounds reasonable, there are historical reasons for doubting its long-term validity. Swedish migration following World War II up to 1970 was dominated by labor migration for prenegotiated employment. Today we can see that the labor migrants from that period experienced higher unemployment rates than natives, had higher rates of sickness absence (Bengtsson and Scott 2006), and were over-represented among those who collected disability pensions (Hammarstedt 2000).

Even if it is possible to successfully navigate all potential integration problems, one problem remains regarding immigration as a solution to population aging, namely whether the Swedish economy would be able to absorb the massive increase in the labor force necessary to offset population aging. The recent phenomenon of "jobless growth" in Sweden points to a further obstacle to this massive import of labor. It is possible to continue financing the Swedish welfare state through the same means as today, but this possibility is intrinsically related to the creation of new employment.

Financial solutions to population aging

While the costs of health care at older ages appear particularly daunting, the pension system is also an important issue with an increasing share of the population spending a longer period of time in retirement. This is the case with the "pay-as-you-go" system of financing pensions, but the problem could be alleviated through the recent introduction of a notional defined-contribution system (i.e., one in which individuals in effect finance their own pensions) (Kruse 2010).[3] The new pension system is designed to keep the total costs of public pensions at a fixed rate of about 11 percent of gross domestic product. To keep the value of pensions from falling relative to the income of other age groups, the share of pensioners must remain stable at its current level of around 18 percent.

The Swedish system of publicly funded pensions and health care has historically been supported largely through the taxation of individual income. In periods where changes in the age structure are insignificant, it is conceivable that costs could be financed simply through an adjustment of the rates of taxation. This solution is discussed in detail by Hansson (2010), who concludes that there is very little room for the Swedish government to use taxation as a tool to alleviate the economic demands of population aging. Because the European Union is becoming more integrated, movement of both workers and capital between member states is being facilitated. Although there is a movement toward tax harmonization, Sweden is currently one of

the EU member countries with the highest rates of taxation. Any potential gain from increased taxes would most likely be offset by a reduction in the tax base through migration to a member state with a lower tax burden. Hansson concludes that the only form of taxation that could conceivably be raised without considerable population outflow is the property tax, since property cannot be relocated. The potential to finance costs associated with aging through increased property taxes is not seen as a viable solution, however. Given the inability to increase taxes sufficiently, the remaining solution is to increase the tax base.

Enormous potential exists to increase the tax base by raising the number of hours worked. Swedes work on average 3.5 weeks less per year than their American counterparts—40.6 weeks compared with 44.2 (OECD 2009). The difference between weeks worked in the United States and Europe is largely found in longer vacations for Europeans, while the differences within Europe have different explanations. These figures are only applicable for those who are employed. Taking the Swedish case, about 80 percent of those in working ages were actually employed until 1990, at which time the share dropped to about 75 percent. This implies that a considerable share of the potential workforce was outside the labor market. Reasons for this can be traced to early retirement due to illness or injury, or simply to the fact that a share of the population has never successfully established a foothold in the labor market. A few of the more obvious ways to increase the tax base are more rapid completion of education, reduced unemployment, reduced size of the informal labor market, a shift from home to market work, reductions in sickness absence, and an increase in the retirement age. All of these steps would be helpful, but one of the most helpful steps would be getting young adults into the labor market as quickly and completely as possible.

Another possibility that would contribute while keeping the number of hours worked per year constant is to raise the retirement age. Based on the income and consumption patterns shown in Figure 2, we have calculated the number of extra years individuals would have to remain employed to keep consumption at 2008 levels. Under the assumption that it would be possible to add an additional year of labor income and consumption at the levels seen for 50-year-olds and simultaneously shift the age-specific consumption pattern by one year, we can roughly estimate how much the pension age should be increased. If the minimum pension age had been raised by one year in 2008, from its current level of 65 years, the aggregated lifetime consumption deficit would decline and would not return to its 2008 level until 2017. At that time, another one-year increase would keep the ratio below today's level until 2024. Another one-year increase in 2024 would sustain the system until 2031, at which time a fourth one-year increase (to 69 years) would do so until 2050.

How realistic is it, then, to (continue to) postpone retirement? For one thing, life expectancy is likely to continue to increase by several months

per year at least into the near future. Our calculation shows that retirement needs to be postponed by about one month per year, which seems possible given that at least as many "good" (i.e., healthy) months as "bad" months are added to our lives when life expectancy increases. Because a large part of the costs for hospital care stems from the last few years or months of life, it seems reasonable to assume that the increase in the consumption curve could be shifted toward higher ages. As for the production curve, it seems reasonable to assume that the ability to work expands. The question is whether enough job opportunities for the elderly can be created.

Summary and discussion

The rapid increase in life expectancy over the past century has had a relatively small impact on the increasing share of elderly during the twentieth century. The true culprit has been the declining fertility rate, which has led to fewer persons being born into the base of the population pyramid. The level of immigration since the 1930s, increasing after World War II, has not had much effect on slowing population aging and cannot be expected to play a major role in the future. If fertility rates stabilize, as is projected, then we will see a new situation where increasing life expectancy caused by falling mortality at older ages will become the primary factor influencing population aging.

The Swedish population pyramid will become increasingly rectangular and possibly even have a shrinking base. This will lead to heightened challenges in terms of financing pensions, social care, and health care, as well as supplying the economy with labor. These problems will continue for at least the next 30 years with no demographic solution available. Immigration is not likely to offset population aging significantly, and even unexpected substantial increases in fertility rates will not have any impact until after population aging levels off in the 2040s.

Given this change in age structure, the welfare state will face increasing challenges to financing benefits at their current levels. Reduction in the level of public services provided will be difficult, especially in the area of health care. Given the political opposition to reduction or elimination of public services, we see the most likely solution to population aging to be an increase in the tax base rather than a decrease in welfare provision. One route lies in mobilizing the potential workforce so that a greater share of those of working age actually work, while another can be found in productivity growth. Yet another route is raising the retirement age in response to longer and healthier life expectancy.

The challenge of funding the pension system appears particularly daunting, with an increasing share of the population spending a longer period of time in retirement. Pensions could be kept at the same level as today by increasing the age at retirement. Another approach is to keep the share of

the retired population stable despite population aging. The age of retirement would then have to increase to about 70.5 years in 2050. Taking age-specific consumption and labor income patterns into account points in the same direction. The age of retirement would have to increase gradually to about 70 years by 2050 to keep the ratio of consumption and labor income stable. Keeping the age of retirement the same as today requires an increase in transfers corresponding to an average productivity growth of 0.3 percent per year until 2050 to keep consumption from falling. In fact, the growth rate would need to be higher in the first decades, since the pace of increase in population aging will only begin to slow after about 2040. It is unlikely, however, that Sweden will rely entirely on economic and tax solutions to the aging problem, the main reason being the assumption that workers will not be satisfied keeping consumption at the same levels as today but will expect living standards to increase as productivity rises. More likely, we will see a combination of solutions in which an increase in retirement age and in the number of working hours will be essential parts.

Notes

Figures in this chapter are available in color in the electronic edition of the volume.

1 This section is based on the excellent overview in Willis (1994).

2 Fiat money, or currency, is money backed by an authority, usually a government, for use in exchange of goods and services or to pay a debt.

3 For an analysis of the demographic impact on the previous pay-as-you-go pension system, see Bengtsson and Kruse 1995.

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REGIONAL PERSPECTIVES

The Future of a Demographic Overachiever: Long-Term Implications of the Demographic Transition in China

WANG FENG

China has been an overachiever in the global process of demographic transition in the second half of the twentieth century. Its mortality decline was unparalleled in human history among populations of significant size, consequently setting the stage for rapid population growth. In turn, rapid population growth laid the foundation for an unprecedented state intervention in birth control. China's fertility decline in the closing decades of the twentieth century was perhaps even more extraordinary for its speed and especially for the measures taken and the authorities involved. With China's fertility now well below replacement level, what lies ahead for this demographic overachiever? In this chapter I examine three issues related to China's demographic transition. First, I briefly review the demographic transition in China. Second, I discuss the role of the Chinese state, a particularly salient aspect of the demographic transition and one that has attracted much attention and caused a good deal of confusion. Third, using population projections, I highlight a few important features of China's demographic future, deriving in large part from its status as a demographic overachiever.

China: The demographic overachiever

Demographic transition in China began with a highly compressed process of mortality decline, with a substantial improvement in life expectancy in a matter of two decades (see Table 1). Around 1950 life expectancy at birth for Chinese females, a major indicator of the mortality level of the population, was 46 years. This was the level achieved by the more developed European countries and the United States a century earlier (see Figure 1), and it was

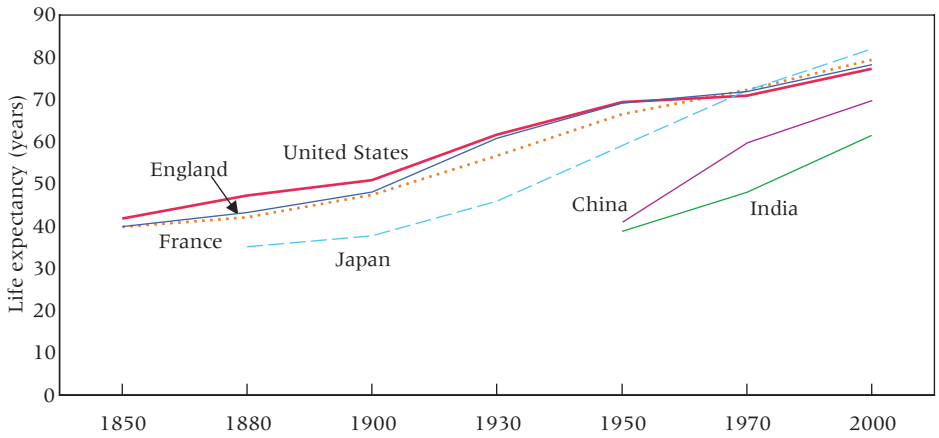
TABLE 1 Major indicators of China's demographic transition

Indicator	1950	1970	1980	1990	2000	2005
Population size (millions)	552.0	829.9	987.1	1,143.3	1,265.8	1,307.6
Birth rate (per thousand)	37	33.4	18.2	21.1	14.0	12.4
Death rate (per thousand)	18	7.6	6.3	6.7	6.5	6.5
Natural increase (per thousand)	19	25.8	11.9	14.4	7.6	5.9
Total fertility rate	5.8	5.8	2.3	2.3	1.6	1.5
Life expectancy, female (years)	45.6	63.2	69.3	70.5	73.3	74.5
Life expectancy, male (years)	42.2	61	66.4	66.8	69.6	70.7
Infant mortality rate, female	130.2	48.6	33.7	33.5	33.8	22.3
Infant mortality rate, male	145.9	54.2	35.6	32.4	23.9	18.5
Illiteracy (% of population at ages 15+)			22.8	15.9	9.0	7.9
Percent urban	11.2	17.4	19.4	26.4	36.2	43.0
GDP per capita (RMB yuan)	119	275	463	1,644	7,858	14,065

SOURCES: SPFPC 2009.

nearly 30 years below the level of life expectancy achieved in industrialized European countries and in the United States in 1950. In the next 50 years, China accomplished what it took these other countries a century to achieve, an increase in life expectancy from the 40s to over 70 years. In 2000, whereas the gap in income level between China and the United States was still around 1:10,[1] female life expectancy in China was only about five years below the US level, about 75 versus 80. China thus completed its mortality decline while

FIGURE 1 Paths to rising life expectancy, China and selected other countries, 1850–2000



SOURCES: England, France, United States, and Japan: Livi-Bacci 2007: 106, except for 1970, from United Nations 1997; China and India, Livi-Bacci 2007: 162.

per capita income was at a very low level. Whereas China's experience closely parallels the pattern of mortality decline in many other developing countries, its success is an extreme example. Government-led efforts in public health relying on simple preventive measures and widespread access to primary care are credited for such broad and significant improvements in life expectancy (Banister 1987; Lee and Wang 1999).

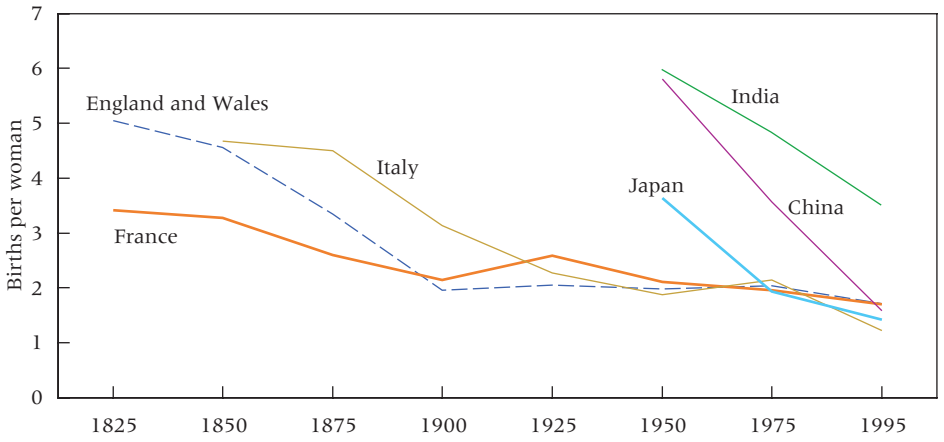
The remarkable improvement in life expectancy set the stage for rapid population growth in China. In the two decades after 1950, the crude death rate of the Chinese population was reduced by nearly 60 percent, from 18 per thousand in 1950 to 7.6 in 1970. At the same time, fertility remained at roughly the same level, around 5.8 children per woman (Table 1). In the absence of a sharp drop in fertility corresponding to the rapid mortality decline, and in particular following a fertility rebound in the wake of the Great Leap Forward famine of 1959–61, China had a rate of natural increase mostly in the high 20s per thousand in the late 1960s, a level implying a population doubling every 25 years (Table 1). Indeed, while China's population grew from 600 million in 1954 to 700 million in 1964, it took only a decade to add the next 200 million. Such a rate and the magnitude of population growth were unprecedented in Chinese history and contributed to the worldwide concerns of population explosion in the 1970s and 1980s.

Yet, once it began, China's fertility decline was even more compressed than its record mortality decline. As shown in Table 1, major fertility reduction in China took only half of the time required for mortality. In the decade from 1970 to 1980, the total fertility rate was more than halved, from 5.8 to 2.3, a record largely unmatched elsewhere. In contrast to Western European countries, where it took 75 years or longer to complete a fertility transition from a TFR of around 5 to the replacement level, in China a similar decline took only about two decades. Moreover, whereas in some European countries fertility stayed at replacement level for half a century or longer before dipping below that level, in China the time lag for that further decline was only about one decade (Table 1 and Figure 2).

The new phase of fertility decline in China began quietly and remained unnoticed for almost a decade. The first signs that China's fertility had dropped below replacement level came in the early 1990s, when a national survey of fertility and contraception conducted by China's National Population and Family Planning Commission reported a fertility level considerably below replacement. The finding was quickly dismissed in the context of what was believed to be the widespread practice of birth underreporting. Nevertheless, in all surveys since then, the national fertility level has never been found to exceed replacement.

By the turn of the twenty-first century, it was beyond question that China had entered its post–demographic transition stage. It is now widely believed that fertility in China nationally fell below replacement in the early

FIGURE 2 Paths to below-replacement fertility, China and selected other countries, 1925–1995



SOURCES: 1950 and before, Livi-Bacci 2007: 114; 1975 and 1995, United Nations 1997.

1990s (Cai 2008; Gu 2008; Gu and Cai 2009; Guo 2004a, 2004b, 2008; Guo and Chen 2007; Retherford et al. 2005; Zhang and Zhao 2006; Morgan, Guo, and Hayford 2009). By 2005, the TFR was around 1.5 and possibly lower. In China's more developed regions, fertility has been even lower for more than a decade, barely above the level of one child per couple. In ten of China's 29 mainland provinces and municipalities, fertility based on China's 2000 population census was 1.1 children per couple or below, a level that rivals the ultra-low-fertility countries (Gu et al. 2007; Chen et al. 2009).

In roughly half a century, China completed its transition from a low rate of natural increase due to high mortality and high fertility to a low rate of natural increase as a result of low mortality and low fertility. In 2005, China's rate of population growth was around 0.5 percent, down from over 2.5 percent in 1970. For China, the historical importance of completing its demographic transition in such a compressed fashion has many dimensions. One of these is that in less than 15 years from now, for the first time in history, China will no longer be the most populous country in the world.[2]

The Chinese state in demographic transition: Instigator or accelerator?

China's compressed demographic transition under a strong centralized state has often led to the belief that China has been an exception in the global process of demographic transition. Undoubtedly the role of the Chinese state was central in establishing the systems of national welfare and public health that contributed to China's vast improvement in life expectancy in a short time,

and a birth control policy that is sustained by layers of bureaucratic oversight unequaled in the world.

To credit China's demographic transition entirely or even mostly to the Chinese state, however, would be greatly mistaken. A careful look at the timing and underlying process of China's demographic transition shows that in terms of both origin and agency, it is the Chinese people, not the Chinese state, who are the main motors behind China's demographic transition.

Origins

Looking more closely at the main indicators of China's demographic transition, the most impressive mortality reduction was completed by 1970, with a gain in life expectancy between 1950 and 1970 of roughly one year per calendar year, with the female infant mortality rate dropping from around 130 per thousand to less than 50, and the crude death rate dropping below 10 per thousand. While mortality decline has continued since 1970, it has never matched the pace of the two decades between 1950 and 1970.

What accounts for the drastic mortality decline in those two decades? Studies have paid special attention to three factors: a socialist welfare distribution system that sharply reduced poverty and increased economic equality; a government-initiated public health system that focused on prevention and provision of basic care at low or no cost; and the spread of modern health and medical knowledge that began nationally in the early twentieth century (Banister and Preston 1981; Jamison et al. 1984; Banister 1987; Rogaski 2004). Of the three factors, the least known is the last, namely the long process of mortality decline that began prior to the Communist takeover in 1949. Modern mortality decline in China began at the start of the twentieth century, with the adoption of public health measures in selected populations. Studies during the last decade or so of historical populations in the Republic Era (1911–49) provide much evidence of such an origin. Substantial mortality decline began first in Beijing, Tianjin, and other port cities (Benedict 1996; Campbell 1997, 2001; Rogaski 2004). A major contributor was abandonment of the practice of female infanticide and child neglect. Calculations by Ansley Coale and Judith Banister show that by 1950, the level of excess female deaths had dropped to 5 percent, from over 15 percent before 1940 (Coale and Banister 1994). A proactive culture of mortality control, long-standing in the Chinese population, facilitated the early adoption of public health measures in selected cities in the early twentieth century, and these measures were introduced nationwide once the socialist government took control in the second half of the twentieth century. The historical roots of the culture of mortality control were summarized in Lee and Wang (1999) and further explored by other studies (Campbell and Lee 2004; Derosas and Tsuya 2010).

Processes

China's fertility decline shows even stronger evidence of origins that predate strong state intervention and control. The first noteworthy feature of China's fertility decline is that it preceded the completion of the major mortality decline. In fact, fertility decline started in selected regions and among some segments of the population simultaneously with rapid mortality decline, in the 1950s. By the early 1960s, birth control in urban China was no longer limited to a minority of the population. Soon after the compensatory baby boom following the Great Leap Forward famine, fertility in urban China started its precipitous fall, to a total fertility rate of only three births per woman in 1966. In his study of regional variations in fertility decline, Peng Xizhe marked 1964 as the onset of fertility decline for urban China and 1972 for rural China (Peng 1993: 104). By 1974, fertility in urban China had fallen below replacement level and for the last three and half decades has never risen above that level. Since 1980 and for nearly three decades, in the wake of China's one-child policy, fertility in urban China has stayed barely over one child per woman, a level that rivals the lowest in the world. The similarity between the trajectory of fertility decline in China and in other regions in Asia without strong government intervention was documented by Ansley Coale and Ronald Freedman in a paper first presented in 1988. They observed that "the similarity in the demographic changes that took place between the 1950s and 1980s in these populations is striking," and concluded that "fertility in mainland China may have been brought down by intensive government programs, but the culture that led other 'Confucian' populations to reduce fertility without such strong government intervention may have helped make the Chinese policy very effective" (Coale and Freedman 1993: 218).

The second less noticed feature of China's fertility decline is that the country as a whole largely completed the fertility transition in the 1970s, prior to the launching of China's ambitious and controversial one-child-per-couple policy in 1979. As mentioned earlier, total fertility was more than halved between 1970 and 1980. The starting point of 1970 is arbitrary, since this year is not the starting point of China's demographic transition. It is simply a time point when the national fertility level entered a mostly consistently downward trend. The choice of the end point, however, is deliberate. This is the year when China began its one-child birth control policy, a policy that is not only unique, but also has often obscured the underlying processes and causes of China's fertility decline. Fertility decline during the 1970s was accelerated by a national birth control program under the slogan of later (marriage), longer (birth intervals), fewer (births), but enforcement of the program was far less stringent than what followed with the one-child policy.

Not only did China's most significant fertility decline take place prior to the government's draconian birth control policy, but in the decade imme-

diately following the announcement of that policy, the fertility level for the country as a whole hardly changed. The 1980s was a decade of fluctuations, with fertility hovering around 2.5 births per woman. As shown in Table 1, the TFR was the same in 1980 and 1990. The role of government intervention was prominent in certain respects. For instance, the fluctuation in the fertility trend was in part the effect of relaxing the late-marriage age rule, with earlier marriage age causing birth-heaping (Feeney and Wang 1993). Another important factor was a backlash against the initial forceful implementation of the one-child policy, leading to small baby booms following the government's adjustment of the policy in the mid-1980s (Greenhalgh 1986). In contrast to the 1970s, when the government's birth control program served largely the unmet need for contraceptive use and birth control, in the 1980s, when confronted by an unusually restrictive policy that ran directly contrary to the fundamental interests of Chinese families, the Chinese population resisted and in some cases revolted, and the Chinese state backed off.

The most recent evidence supporting the independent role of the Chinese population in China's demographic transition and especially its fertility transition comes from studies of Chinese couples who are not subject to the one-child policy. China's one-child policy covers the majority of the Chinese population, with some 63 percent of Chinese couples currently subject to the one-child restriction (Gu et al. 2007). At the same time the policy contains numerous exemptions that allow the other third of Chinese couples to have two children (Wang 2005; Gu et al. 2007). A number of locales in China have been exempt from the policy for a variety of historical reasons, and couples who are only children themselves can have two children. In four largely rural areas with a combined population of over 8 million that is largely exempt from the one-child policy, studies show that fertility has dropped below replacement level and often to a level lower than in the surrounding areas. Moreover, while the provinces in which these areas are situated all have an abnormally high sex ratio at birth—one of the often-discussed negative consequences of the one-child policy—in those areas exempt from the one-child policy the sex ratio at birth has remained within the normal range (Gu and Wang 2009). In a separate study of fertility intention and behavior in six largely rural counties in Jiangsu province with a combined population exceeding 5 million, over half of couples who are qualified to have two children report that they intend to have only one child, citing mostly economic and financial concerns (Zheng et al. 2009). Recent analysis of fertility variations across China's different geographic regions reaches the same conclusion that local economy and other factors, not policy, explain much of the fertility variations (Chen 2005; Cai 2010).

As my colleagues and I have documented elsewhere on the basis of historical population records, China's fertility transition traces its roots to a cultural tradition of proactive reproductive control long before the modern

fertility decline (Wang, Lee, and Campbell 1995; Lee and Wang 1999; Campbell, Wang, and Lee 2002; Lee, Campbell, and Wang 2002; Wang, Campbell, and Lee 2010). The Chinese population did not exhibit marital control, that is, curtailing fertility by delaying or forgoing marriage, as seen in historical European populations; rather it relied on other forms of control, mostly within the institution of marriage. Means of control ranged from female infanticide (which also results in male celibacy) to birth spacing and, in some cases, early stopping. Regulating marital sexual life was a major mechanism to achieve the goal of fertility control. Such a practice persists today in the aftermath of the demographic transition. Couples who have not achieved their preferred size and sex composition of offspring have a higher frequency of sexual intercourse than those who have (Lavely 2007).

Before the demographic transition, the Chinese family was the foundation for the behavioral pattern of multiple fertility controls. The family was replaced by the state—or its lower-level agency, the collective—during China's socialist years (Lee and Wang 1999). In dismantling the socialist planned economy in the last 30 years, the Chinese state has also returned the rights and responsibilities of economic production to the family, although to date the state has not relinquished its control over reproduction. Continuing the draconian one-child policy, therefore, presents a fundamental inconsistency between economic and reproductive rights, as the policy itself was formulated in part on the assumption that the earlier socialist planned economy encouraged reproductive free riding and sustained high fertility in rural China (Johnson 1994; Lee and Wang 1999).

To summarize, China's demographic transition shares many characteristics of the transition seen elsewhere in the world. Such similarities have often gone unrecognized, overshadowed by the extraordinary intervention in reproduction by the Chinese state. It is unquestioned that the modern Chinese state played a prominent role in facilitating both the mortality and fertility declines, but the Chinese, like most people everywhere, are keenly aware of the consequences of their reproductive decisions and regulate their fertility accordingly. The state did not start the demographic transition but greatly accelerated it, sometimes through the use of force. To credit China's demographic transition entirely to the Chinese state, however, obscures important historical facts and contributes to a misguided view that exaggerates the role of the state and justifies continued state intervention in reproduction.

Long-term implications of China's demographic transition

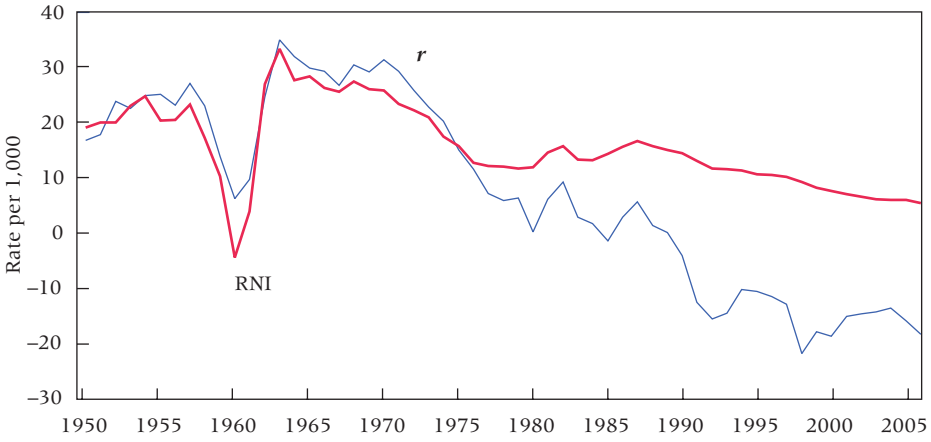
Clarifying the state's role in China's demographic transition, especially its role in achieving very low fertility, has significant implications for understanding

China's demographic, social, and economic future. If China's demographic transition was achieved largely by individual volition, then the long-term demographic prospect in China may not differ from that of other populations where the transition had been completed earlier. Moreover, because China's demographic transition took place within a relatively short time frame, many of the often-problematic consequences of the demographic transition that have been observed elsewhere have also emerged sooner and are unfolding at a faster pace. China, in other words, is destined to pay a price for being a demographic overachiever.

Prospects for population decline and accelerated aging

With fertility below the replacement level for nearly two decades, the momentum of population decline has already begun in China. To illustrate the prospects for China, we use two common tools of demographic analysis: calculating the intrinsic rate of population growth and carrying out population projections. The intrinsic rate of growth (r) is a measure of population growth based solely on fertility and mortality levels of the population, omitting the effect of population age composition. It shows the underlying rate of growth implied by the level of fertility and mortality.[3] Figure 3 presents the results of our calculation for China for the period 1950–2006. To compare this rate with the observed trajectory of population growth, we also plot the rate of natural increase (RNI). The rate of natural increase has dropped precipitously from the early 1960s to its current low level of around 5 per thousand, but it is still

FIGURE 3 Intrinsic rate of growth (r) and observed rate of natural increase (RNI), China 1950–2006



SOURCE: Wang, Guo, and Mao 2008.

positive, indicating net population growth. The intrinsic rate of population growth, however, shows a complete reversal in a 30-year time period: from around 20 per thousand in the mid-1970s to roughly –20 per thousand in 2005. Just as a rate of growth of 20 per thousand implies a population doubling time of about 30 years, a rate of –20 per thousand means the population size is halved every 30 years.

China's population size, however, will not be halved in the next 30 years, because of the effect of its population age structure, or the momentum of population growth. A relatively young population age structure, even with below-replacement fertility, still produces more births than deaths, hence net population gain. This momentum is evident in each of our three population projections, shown in Table 2. Even if China maintains its policy-dictated TFR of 1.47, its population will continue to grow for another decade or so, to 1.35 billion in 2023.[4] If China's currently fertility rate is 1.6, the officially recognized level, its maximum population size will be 1.38 billion, reached in 2026, less than 20 years from now.

As the population ages, the momentum of negative growth will eventually predominate. The prospect of population decline and aging is also shown in the projection results in Table 2. Should China's fertility remain low, population decline and aging will undoubtedly characterize China's demographic prospects for much of the twenty-first century, if not longer. We assumed in the first two scenarios in Table 2 that by 2037 China's fertility will be raised to replacement level, and in the third scenario we assumed the indefinite continuation of fertility at the level implied by the current policy, which requires on average that couples have 1.47 children. Even under the first two scenarios, once fertility is restored to replacement level, China's

TABLE 2 Post-transition demographic prospects for China under three scenarios for TFR over 2007–2100

	Scenario		
	I	II	III
Momentum of population growth			
Peak population size (millions)	1,350	1,382	1,350
Year peak reached	2023	2026	2023
Momentum of population decline			
Duration of population decline after TFR = 2.1 (years)	54	49	70+
Reduction in population size (millions)	308	220	673
Highest median age (years)	47.6	45.6	52.9
Year highest median age reached	2047	2044	2100

NOTES: Scenario I assumes that TFR remains at 1.47 for 30 years from 2007 and then rebounds to the replacement level of 2.1; Scenario II assumes that TFR remains at 1.6 for 30 years and then rebounds to 2.1. Scenario III assumes TFR remains at 1.47 indefinitely.
SOURCE: Wang, Guo, and Mao 2008.

population decline will continue for another half century or more. In the process, China's population will be reduced by between 220 and 308 million from its peak, and the median age of the population will increase steeply, from 30 years in 2000 to close to 50 years in the next four decades. If fertility remains below replacement level, by the end of the century China will have a population size only about half of what it is now.

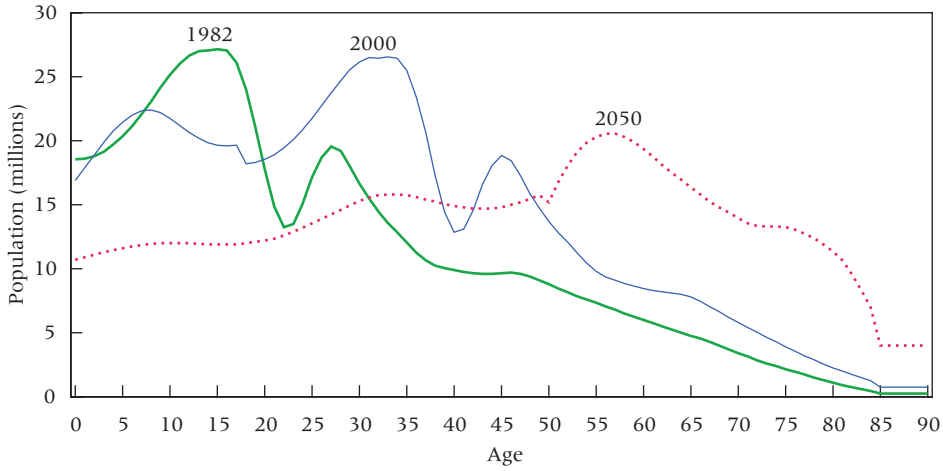
Economic implications: Dwindling demographic fortune

Rapid population aging and sustained population decline in China have far-reaching implications for China's and the world's economy. In the last 25 years China has witnessed unprecedented economic growth and increase in the standard of living. As China enters a new era of low fertility and accelerated population aging, its economy will have to undergo a fundamental transformation to respond to the underlying demographic shifts.

The economic boom in China in the last three decades has been driven by many factors. If one focuses on the key factors for economic growth, aside from institutional changes, the role of capital investment is salient. Foreign direct investment, especially from overseas Chinese, brought in not only capital but also technology and management acumen (Huang 2003; Arrighi 2007). Foreign consumer demand, especially in the United States, supplied a huge market for China's export industries. Capital, technology, and overseas markets alone, however, did not make China the world's factory starting in the last two decades of the twentieth century. China's economic boom has relied on another crucial factor, namely a young and productive labor force. This large labor force, a non-repeatable historical product of the rapid demographic transition, was present fortuitously as the Chinese economy was about to take off. As shown in Figure 4, the large birth cohorts of the 1960s and 1970s were at their peak productive ages when the recent economic boom began. The benefit of this demographic dividend is estimated to have accounted for 15 to 25 percent of China's economic growth between 1980 and 2000 (Cai and Wang 1999; Cai 2004; Wang and Mason 2008).

By now, China has largely exhausted its demographic dividend, as indicated by the decline in the support ratio between effective producers and effective consumers (Wang and Mason 2008). As shown in Table 3, between 1982 and 2000 China enjoyed an average annual rate of growth in the support ratio of 1.28 percent, a number that is known as the demographic dividend, or the demographic contribution to the growth rate of the economy. Currently, that net gain attributable to favorable demographic conditions has been reduced to only one-fifth of its earlier level, about 0.28 percent per year. In the immediate future, the growth rate will turn negative, that is, the growth rate of net consumers will exceed that of net producers. Our estimate is that this

FIGURE 4 Population age structure, China, 1982, 2000, 2050



SOURCE: Wang and Mason 2008.

negative growth rate will result in a decline of at least 0.5 percentage points in China's annual economic growth rate.[5] Compared with other economies, China will not fare much better than Japan or Taiwan between 2013 and 2050 and will fare much worse than the United States and France.

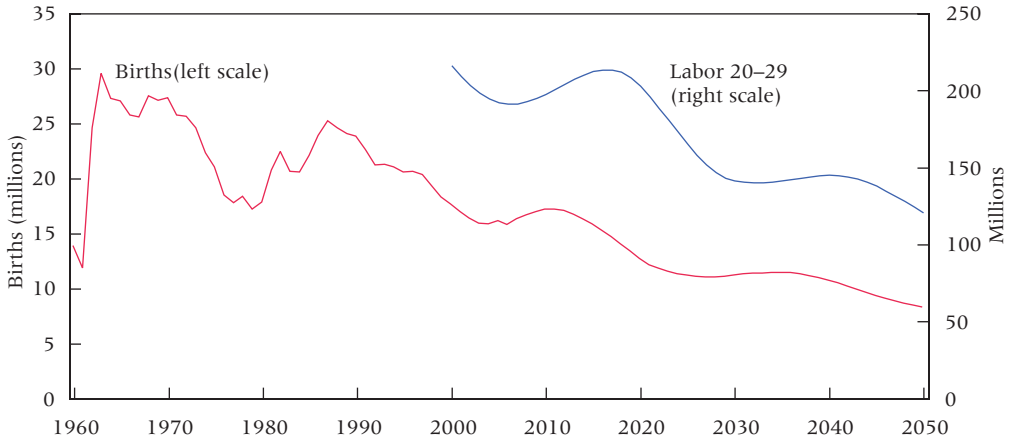
As a result of China's very low fertility in the last two decades, the era of abundant young and inexpensive labor will soon end. The number of young workers aged 20–29 will plateau over the next few years and drop precipitously beginning around 2025. In the ten years between 2016 and 2026, the size of the population in this age range will be reduced by about one quarter, from 200 million to 150 million (Figure 5). For the younger age group, aged 20–24, that decline will come sooner and be steeper: in the next decade, its size will be reduced by 50 percent. Such a steep decline in the young labor force not only will usher in for the first time in recent Chi-

TABLE 3 Average annual rate of growth in the support ratio[a] (percent), 1982–2050, China and selected other countries

	1982–2000	2000–2013	2013–2050	1982–2050
China	1.28	0.28	–0.45	0.15
Taiwan	1.07	0.01	–0.60	–0.04
Japan	–0.18	–0.24	–0.60	–0.42
United States	0.44	–0.46	–0.04	0.01
France	0.4	–0.41	–0.17	–0.06

[a]Effective producers ÷ effective consumers.
SOURCE: Wang and Mason 2008: 149.

FIGURE 5 Declines in the number of births and in population aged 20–29 years (labor 20–29), China, 1960–2050



SOURCE: Author's calculations.

nese history successive shrinking cohorts of labor force entrants; it will also have profound consequences for labor productivity, because these cohorts are the most recently educated. As the young population declines, domestic demand for consumption may weaken as well, because young people are also the most active consumers. And because of its major role in the global economy, the impact of China's demographic change will not be limited to its own geographic boundaries.

Social implications: The vulnerable family

China will face familiar social consequences of the global demographic transition, such as an aging population. As a demographic overachiever, China's aging process will be faster than that of many other countries. In addition, in part because of China's one-child policy, the sex ratio at birth in China has risen and stayed at an abnormal level of 120 boys per 100 girls or even higher in recent years, causing fears that as many as 20 million or more Chinese men will be life-long involuntary bachelors. What most sets China apart from other societies that have experienced the demographic transition, however, is the social cost and risk resulting from numerous families with only one child. A unique component of China's demographic transition has been a government policy that requires the majority of Chinese couples to have only one child. Over the last three decades, in no small part because of the implementation of the one-child policy, China has accumulated nearly 160 million single children aged 0 to 30.[6] Such a number implies that over

TABLE 4 Risk of becoming childless among elderly parents in China with only one child

	Father's age			Mother's age		
	60	70	80	60	70	80
Years of life remaining	13.9	10.8	6.5	20.4	13.3	7.7
Risk that son dies before parent (%)						
Son's age						
35	4			8		
45		6			12	
55			6			17
Risk that daughter dies before parent (%)						
Daughter's age						
35	3			6		
45		4			8	
55			4			11

SOURCE AND NOTES: Calculated from United Nations Model Life Table (Far Eastern Model), with male life expectancy at birth of 71 years and female 75 years. For illustration, a son or daughter is assumed to be 25 years younger than the parent. Percent deceased is calculated for the interval of a child's age and the average life span of the parent.

40 percent of Chinese households have only one child. Taking into account very young only children who may have a sibling in the future, it is safe to assume over a third of all Chinese households may well end up with only one child. Whereas other countries such as Japan will also see a large share of their populations in older age groups, the pace of aging is much faster in China and the resources needed to face the demands of population aging are not as widely available.

Moreover, the large number of families with only one child, often against the will of the parents, presents serious economic and social risks for Chinese families and for society as a whole. The tragic deaths of thousands of only children in the May 2008 earthquake in Sichuan province highlights an extreme misfortune—large numbers of parents who have lost their only children, in many cases too late to replace them. With the current birth control policy in place and low fertility continuing, by the middle of the current century half of Chinese women aged 60 will have only one child.

Even with the country's low mortality level, some Chinese parents still face a future in which their children will predecease them and they will die alone. The numbers shown in Table 4 illustrate the magnitude of such a risk for elderly Chinese parents with only one child. At ages 60, 70, and 80, and assuming the current age-specific mortality schedule, Chinese men and women could still expect to live for a number of years. For men, the likelihood that their sons will predecease them ranges from 3 to 6 percent. For women, given their longer average life span, the likelihood ranges from

6 to 17 percent. For Chinese parents who rely on their children for old-age emotional and instrumental if not financial support, the prospect of dying alone is both poignant and harsh.

Conclusion

For much of world history, China has accounted for roughly one quarter of the human population (Lee and Wang 1999). In the second half of the twentieth century, China completed its demographic transition, joining most other developed and developing countries. China's demographic transition took place at an almost unparalleled pace, with most of its mortality decline accomplished in two decades and its fertility decline in little more than one decade. The significance of China's demographic transition is therefore not only for its magnitude, as the world's largest population, but also for its speed. China is clearly an overachiever in the global demographic transition.

What sets China apart from the rest of the world in the process of demographic transition is not just the role of the Chinese state in facilitating declines in mortality and fertility. The Chinese state clearly has played an extraordinary role, but the apparent success of the state was built on the foundation of the willingness and the acceptance of Chinese families and individuals. A proactive culture of mortality control and reproductive regulation, long a central cultural component in China, provided the impetus for China's mortality and fertility declines. Focusing only on the role of the Chinese state not only overlooks the true engines of China's demographic transition, but also contributes to an under-appreciation of the long-term implications of China's demographic transition.

China's rapidly shrinking young labor force, a result of very low fertility for nearly two decades, will soon end the era of abundant supply of inexpensive labor that enabled China to become the world's largest manufacturing center in the last two decades. This demographic shift in China should have far-reaching ramifications for the global economy as well. Because China's low fertility is largely the outcome of individual choice, constrained as in other parts of the world by the new political economy, a reversal of China's three-decade-long one-child policy is unlikely to result in a substantial increase in fertility. Moreover, rapid population aging will accompany the shrinkage in the size of the young labor force. These simultaneous changes in opposite directions will fundamentally reshape the Chinese economy and society. In addition, and largely because of China's forceful implementation of the one-child policy, Chinese families and especially the elderly will face the prospect of loneliness resulting from the lack of children and kin. Having realized the gains of being an overachiever in the demographic transition, China now must be prepared to pay the attendant costs.

Notes

Figures in this chapter are available in color in the electronic edition of the volume.

The author wishes to thank the MacArthur Foundation for its support that generated some of the findings for this chapter.

1 Per capita income for the United States in 1999 was $21,587 (US Census Bureau).

2 This is according to the United Nations 2008 revised population projection. With a constant-fertility assumption, China's population by 2025 will be 1,443,979, in contrast to India's 1,502,063.

3 Calculating the intrinsic rate of growth requires the calculation of two other measures, the net reproduction rate (NRR) and the mean length of a generation (T). For details of our calculations, see Wang, Guo, and Mao 2008.

4 Calculations based on local fertility policies show that at the end of the 1990s, the fertility level required by policies in China would result in a TFR of 1.47 (Gu et al. 2007)

5 This is a conservative estimate because in our projection of population change for calculating the demographic dividend we assumed a higher fertility level (1.8) than observed recently in China (1.5).

6 China's 2005 National Population Survey counted 2,098,947 only children aged 0 to 30. With a sampling ratio of 0.01325, this number translates into 158,411,094 only children nationwide (SPFPC 2009: 198).

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Achievers and Laggards in Demographic Transition: A Comparison of Indonesia and Nigeria

GEOFFREY MCNICOLL

Over the last 50 years many developing countries have experienced demographic transitions from high to low death and birth rates; others have barely begun that process. What explains that delay? Among broad regions the most striking contrast in this respect, as also in development performance more generally, has been between East Asia and sub-Saharan Africa—regions that many observers in the 1950s and even 1960s would have seen as similarly placed in development level and prospects. Such a comparison, however, is necessarily blurred. A sharper focus can be attained by narrowing its scope, looking at pairs of countries, one from each region, that share some similarities in their initial conditions but diverge in their subsequent paths. Thailand and Ghana are often paired on that basis: starting at comparable levels of real income around 1960, the first showed a six-fold rise by 2000, the second, virtually no improvement; both saw gains in life expectancy but with Thailand maintaining a significant advantage; and from fertility levels of 6 children per woman in the 1960s, Thailand currently averages about 1.8, Ghana still about 4.

Another plausible country pairing is the subject of the present chapter: Indonesia and Nigeria. Both are populous, relatively resource-rich, and culturally diverse; both experienced political turbulence and secessionist struggles in their early years of independence; both have had authoritarian governments over much of their histories as independent states, lately giving way to the forms, and, to differing degrees, the substance, of democracy. In the late 1960s their average incomes were about the same, and both had high levels of fertility and mortality. Their subsequent economic and demographic performance, however, has been radically different. From the 1970s on, Indonesia moved toward an East Asian style of growth, recording strong expansion in agriculture and manufacturing—though with a major setback in

the late 1990s; in Nigeria both those sectors stagnated in an economy increasingly dominated by oil and natural gas revenues. Indonesia made considerable strides in reducing poverty, Nigeria almost none. And while Indonesia currently has a life expectancy close to 70 years and fertility averaging little over 2 births per woman, Nigeria's life expectancy is still below 50 and its fertility is above 5.

In what follows I look more closely at this divergence, both economic and demographic, and consider various explanations for it: differences in governance and policy choice, differences in inherited resources and institutions, and differences in external conditions. Each of these appears to have played some part. However, in the case of trends in fertility (my main focus of attention), I argue that differences in institutional inheritance have been especially important, putting significant obstacles in the way of a Nigerian fertility decline that were not present or could be fairly readily overcome in Indonesia.

Comparative economic–demographic development

Background

Indonesia declared independence from its colonial Dutch rulers in 1945, its economy in shambles from the effects of the Great Depression, which devastated its agricultural export sector, and from four years of wartime occupation by Japan. Several years of revolutionary struggle against the returning Dutch forces followed, with sovereignty finally acknowledged in 1949. Belated Dutch efforts to establish Indonesia as a federal state had been abortive, succeeding only in giving the idea of federalism a colonial taint. The unitary state that in fact emerged was easily able to defeat various local rebellions that broke out in its early years—in the process, overcoming Islamist protest against its secular basis and suppressing regional resentment about the inevitable dominance of Java (with near two-thirds of the population).

Over the 1950s and early 1960s, postwar economic recovery faltered and political instability steadily increased. A fragile constitutional democracy was replaced in 1958 by Sukarno's so-called Guided Democracy, in effect a balancing act over a left-to-right spectrum of communists, nationalists, the politically engaged army, and major Muslim parties. The Communist Party, centered in Java and Bali, sought to mobilize its large if mostly nominal membership in a radical agrarian movement in support of land reform, eliciting intense hostility from landholders, most of them small rice farmers. By the 1960s, decay in the country's physical infrastructure had become acute. The civil service, led by Sukarno's "cabinet of 100 ministers," grew to vast proportions even as administrative capability fell, not least in revenue collection, and high inflation destroyed real incomes.

A coup attempt in 1965 instigated by a group of left-wing army officers with support from Communist Party elements precipitated months of violent reprisals by Muslim groups, with strong army backing, against Communist Party members and sympathizers throughout the country. Probably several hundred thousand were killed, mainly in rural Java and Bali, and thousands more imprisoned. A military regime took power, sidelining Sukarno and his leftist-nationalist supporters but also not conceding much to his Muslim opponents. In 1967 the leading army commander, General Suharto, became president, heading a regime that called itself the New Order. Drawing on technical expertise from University of Indonesia economists—the famed "Berkeley mafia"—the new government rapidly brought inflation under control and, with a renewed influx of foreign aid and investment, set about reconstruction and serious development planning.

Nigeria emerged from a much briefer colonial experience—comparable at least in the familiar story of European trading interests spawning a chartered company, leading in turn to takeover by the metropolitan power, in this case Britain. However, there was no British equivalent to the meticulous intervention in the rural economy and local government that the Dutch pursued in Indonesia. The northern and southern Nigerian protectorates and the colony of Lagos had distinct economic bases and separate political origins; they were brought together administratively in 1914, the combined region becoming the Federation of Nigeria in 1947. Self-governing status was attained in 1954 and full independence in 1960.

The federal structure recognized (and entrenched) the marked cultural and economic differences among the major regions and ethnic groups—Hausa and Fulani in the North, Igbo in the South and Southeast, Yoruba in the Southwest, together making up roughly two-thirds of the population. Each of these three regions was far from economically homogeneous and each contained numerous smaller ethnic groups; tensions among them rooted in inter-regional and inter-ethnic differences remained a fundamental political reality of independent Nigeria. An even simpler faultline that echoed the colonial history, North versus South, also retained major significance, identifying areas of similar demographic weight but with apparently distinct interests and aspirations. A substantial part of the country's subsequent political history can be interpreted in terms of the management of competing regional and ethnic claims on power and resources.

Civilian rule was short-lived. Two military coups in 1966 brought to power the first of a succession of military governments that were to rule the country for most of the next three decades. Widespread anti-Igbo violence in response to the initial coup led to the Biafran civil war of 1967–70, fought over the attempt by the Igbo to carve out an independent state in their region. It was decisively won by the federal government and its predominantly northern-led army. A much expanded military role in Nigeria's economy and public administration was an outcome of the conflict.

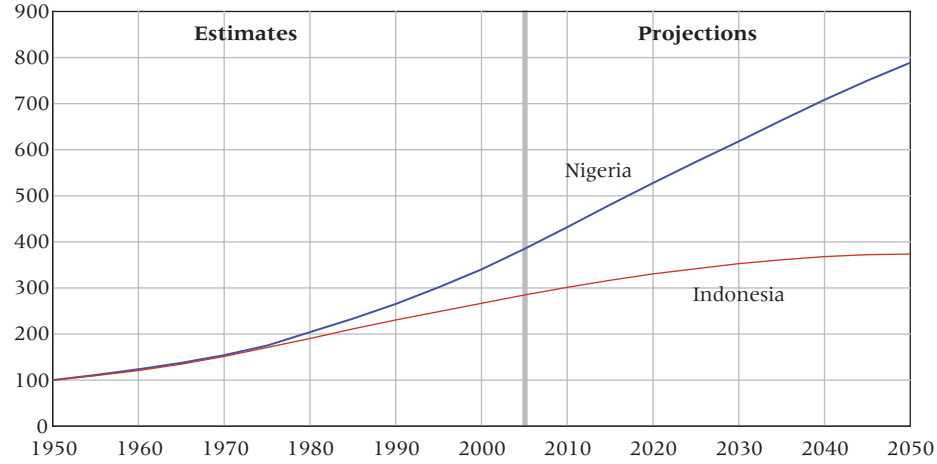
Basic economic and demographic indexes

The bottom-line demographic contrast between Indonesia and Nigeria is seen in the population trajectories in Figure 1. The critical differentiation comes in the two to three decades after 1970. The figure also shows the UN medium projections (usually taken as forecasts) of growth up to 2050. These projections assume the completion or steady progress of demographic transition: Indonesian fertility, already low, leveling out just below replacement; Nigerian fertility halving by 2050.

The population growth rate in Indonesia has already fallen to less than half its peak level (2.4 percent per year, reached in the early 1970s); in Nigeria, a higher peak (3 percent) was reached a decade later and growth is now estimated at 2.3 percent. In 1965 Nigeria had just half the population of Indonesia; it is now about two-thirds the size. By 2050 the two countries' populations are projected to be virtually identical, both around 290 million.[1] But at that time it is likely that Indonesia will have virtually ceased growing whereas Nigeria, even with the assumed near-completion of its demographic transition, would still be adding around 3 million persons annually.

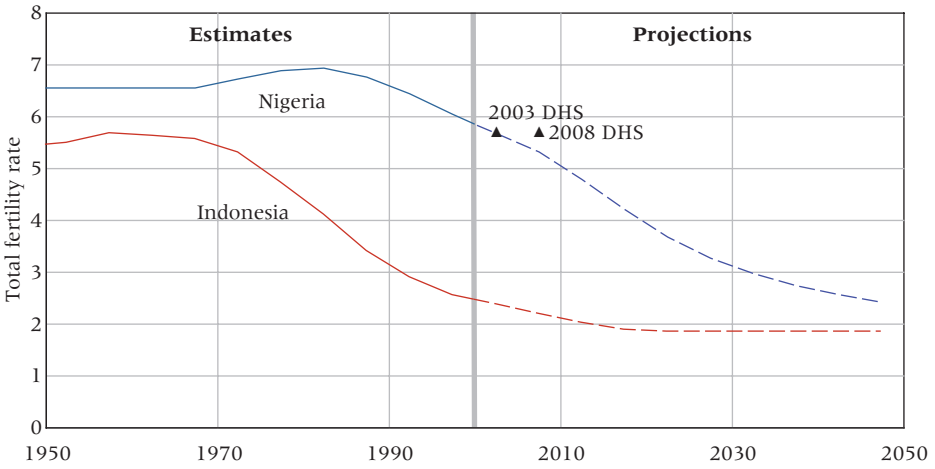
Fertility trends in the two countries, as reconstructed by the UN Population Division, are plotted in Figure 2. Indonesia's fertility transition started in the 1970s and fertility fell by half in about two decades. It is now believed to be not much above the replacement level of 2.1.[2] Nigeria's fertility shows no decrease until the 1990s, and then only a moderate decline. A 10 percent fall in fertility is often taken as marking the onset of the transition; by that measure the Nigerian transition could be said to have started around 2003.

FIGURE 1 Population growth in Indonesia and Nigeria, 1950–2050, estimates and projections (index, 1950 = 100)



SOURCE: United Nations 2009 (2008 Revision, medium variant).

FIGURE 2 Fertility trends in Indonesia and Nigeria, 1950–2050, estimates and projections



SOURCE: United Nations 2009 (2008 Revision, medium variant); Nigeria DHS (2009: 51). Broken lines indicate projections.

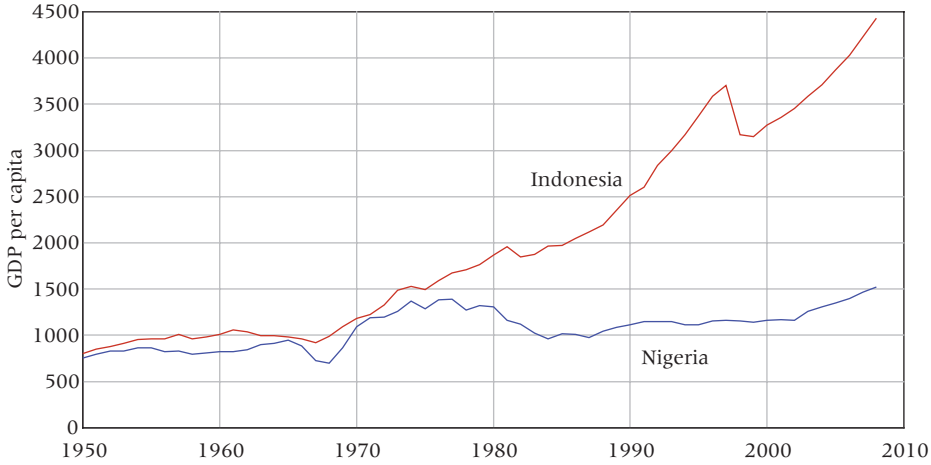
However the 2008 Nigerian Demographic and Health Survey (DHS) recorded no further decline since then.[3]

In life expectancy, Indonesia showed a gain of some 20 years over the four decades since 1970, paralleling achievements in its broader region though at levels well below the region's best performers; Nigeria saw only a small improvement—about 5 years—over the same period.

Economic divergence is most simply captured in terms of per capita GDP in constant dollars. Maddison's estimates are shown in Figure 3. Income levels in the two countries were essentially still equal in 1970; by 2000, even allowing for the dramatic downturn caused by the Asian financial crisis of 1997–98, Indonesia's average income was approaching three times Nigeria's, a differential that has been maintained despite Nigeria's recently improved performance.[4] Poverty figures are even more telling: Indonesia recorded a strong decline in income poverty up to 1996, resumed after the crisis, with the poverty rate (proportion below the country's poverty line) falling from 60 percent in 1970 to well below 20 percent in recent years; an opposite trend was recorded in Nigeria, with poverty rates more than doubling in this period. Around two-thirds of Nigeria's population subsist at or below the $1.25 per day level.[5]

Notwithstanding Indonesia's much faster economic expansion, the structural shift of population toward the cities has proceeded at roughly the same pace in the two countries. Underlying that similarity, however, are very different modes of support for the urban population: Indonesia's growing manufacturing and service economy on the one hand, Nigeria's oil-based rentier economy on the other.

FIGURE 3 Income growth in Indonesia and Nigeria, 1950–2008 (per capita GDP in constant 1990 US dollars[a])



[a]1990 international Geary–Khamis dollars.
SOURCE: Maddison 2010.

A framework for explanation

What underlies these striking differences in outcome—in particular, the differences in progress toward demographic transition? The explanatory framework I draw on can be briefly described as follows.[6]

I start with the simple observation that various combinations of socioeconomic development and cultural change can bring about a society's demographic transition. In a familiar account, the pressures for change have been the aspirations (and vulnerabilities) that come with improving economic conditions; but equally, demographic change even at low economic levels may be traceable to shifting attitudes about authority and women's agency, or to anticipation of new economic threats and opportunities ahead. These would likely describe most historical transitions, often in the face of lackluster public health interventions and official opposition to birth control. The operative forces might be called "natural" drivers of the transition.

Governments may hope to speed up, or perhaps initiate, this "natural" transition through various policy measures. Policies can be explicitly aimed at improving mortality and lowering fertility. Others principally aimed at promoting different aspects of economic and social development may contribute to demographic transition as a welcomed side effect. Together, direct and indirect policies constitute a second set of forces for transition: policy drivers.

How effective policy drivers are, however, depends in many ways on the existing institutional context and other features of the society inherited from the past—what can be called its *legacy*. Particular elements of this legacy may

blunt or distort the outcome that is sought. To the extent that is so, there is potentially a further route for policy efforts to promote demographic transition: by removing or diminishing legacy obstacles.

In addition to the effects of natural and policy drivers and legacy obstacles, transition outcomes for a society are also to varying degrees influenced by trends, conditions, and fortuitous events in the broader economic and political environment—in the society's external circumstances. Any explanation of divergent outcomes needs to recognize contingency.

In the discussion below of the Indonesian–Nigerian divergence I look first at policy differences. In broad terms, Indonesia adopted effective policies; Nigeria did not. This is not the whole story, or even, I will argue, most of it, but it warrants attention. I then turn to legacy factors—looking especially at the contrasting institutional endowments of the two countries as of the 1960s, just prior to the decades of strongest divergence. Finally, I consider differences in the natural drivers of transition and in contingent circumstances. The overall approach to explanation—and in particular, the selection of factors held as likely to have been influential—can always be challenged, but that is the case for any historically grounded argument about social change. Demography's well-known statistical bent here offers no purchase on the problem.

Policy differences: Indonesia vs. Nigeria

Development policy

The contrasting economic performance of Indonesia and Nigeria has been explored at length in two monographic comparative studies: Bevan, Collier, and Gunning (1999)—one of a number of twinned country analyses in a major World Bank project on the political economy of poverty, equity, and growth organized by Deepak Lal and Hla Myint—and Lewis (2007). Both monographs locate the main source of the divergence in policy differences. They are agreed on one major difference: Indonesia did and Nigeria did not change its industrial policy from import substitution to export promotion. From the 1970s, in Lewis's account, Indonesia adopted liberal macroeconomic policies along with strategies to promote nonoil exports, foreign direct investment, and integration into international markets—the cluster of policies usually described (and now often castigated) as the "Washington consensus." Nigeria, in contrast, favored an inward-orientation and political control of trade and investment, insulating the economy from global markets. Its vastly overvalued currency prevented any emergence of internationally competitive industries. Differing elite attitudes toward private capital were another factor. In Indonesia, a system of crony capitalism emerged in which the political elite and the military, in alliance with local entrepreneurs, cornered major sectors of the economy—a corrupt system in many respects, but still operating

within a macroeconomic framework that fostered growth, including growth in manufactured exports. In Nigeria, government support of private capital was much less effective, with pervasive ethno-regional politics encouraging rent-seeking and blocking development of a coherent investment strategy. As in Indonesia, corruption and cronyism were pervasive, but in Nigeria the political uncertainties faced by the elite favored capital flight rather than productive domestic investment.

Indonesia's reform in the post-1967 New Order period was partly forced by the inescapable fact of declining government revenues. Oil production was expected to drop as reserves dwindled, although the revenues it generated rose for a time with the OPEC-led surge in prices. Nigeria's oil reserves were substantially larger, allowing production to expand and making the country increasingly a resource-based economy. Indonesia certainly had other natural resources that partly substituted for falling oil exports—timber, coal, and copper, for example—but found the policy discipline to avoid "Dutch-disease" side effects, discipline that eluded Nigeria.

A policy-centered interpretation of the disparity in growth performance does not solely point to Indonesia's espousal and Nigeria's rejection of liberal economic policies. Major differences in two other policy areas also contributed, both of them emphasized in the Bevan et al. World Bank report. Indonesia devoted substantial resources and energy to enhancing agricultural productivity, particularly by smallholders, and to the goal of attaining self-sufficiency in the main staple crop, rice. Nigeria's agricultural economy was allowed to decline as the overvalued currency turned the domestic terms of trade against it; the country became a major food importer. Finally, Indonesia adopted a number of social policies that benefited the poor, particularly through village public works programs, expansion of primary education, and subsidized prices for rice and cooking fuel. In the manner of the East Asian hyper-growth economies it added equity to growth as a policy objective. Nigeria kept a low domestic price of gasoline but otherwise did little to intervene to halt a rise in income inequality.

Population policy

Interventions aimed at bringing about changes in fertility are the main constituents of population policy. Mortality decline is of course equally a part of demographic transition, but the relevant policy content is better seen as part of a broader public health agenda, closely tied to other elements of social development. It is also an area where, for the most part, service *demand* can be taken for granted; in the case of fertility, demand for birth control services is often weak. Leaving that aside, however, we can examine how Indonesia and Nigeria approached the issue of birth control as public policy.

Neglect or even disavowal of a population problem characterized the Sukarno era in Indonesia. This stance was decisively changed in the late

1960s as one of the first orders of business of the New Order government. The subsequent rapid expansion of a family planning program in Java and Bali, extended, within a few years, to the whole country, is widely viewed as a signal success story in population policy annals.[7] The program gained from Suharto's strong support, effective top-level management, and foreign assistance in supplies and logistics. Arguably, at least as important a contributor to its performance was the program's ability to draw on a mobilized regional administrative hierarchy that had been firmed up in the 1960s chiefly for security reasons. Provincial and local officials were enlisted in promoting the program's ambitious goals—set in terms of target numbers of "acceptors." (The program mainly purveyed oral contraceptives: "acceptance" did not necessarily translate into a change in number of births.)

In Nigeria family planning activism was notably absent. Government denial of the need for birth control (on grounds, mainly, of abundance of natural resources—Sukarno's argument too) and resulting policy inaction persisted longer than in Indonesia, leaving program activity, such as it was, largely up to NGOs. Official statements mildly in support of birth control began to be issued in the 1970s, and a National Population Council was established to formulate and coordinate policy. Desultory official activity largely reflected a lack of urgency about the issue at high levels of government and satisfaction with the private sector taking the lead. Opposition to target-setting in family planning program performance, let alone in fertility outcomes, found broad international support at the 1994 Cairo population conference and may have helped justify this hands-off position in Nigeria. Eventually, however, demographic realities intruded. Some strengthening of goals took place under President Obasanjo in a 2004 policy statement that called, inter alia, for "progress towards demographic transition to reasonable birth rates and low death rates." Full country-wide access to contraceptive services was envisaged and the target set of a decline in total fertility of 0.6 children every five years. (That is roughly the pace anticipated in the UN's current medium projection series.)

Successive DHS surveys record Nigeria's low and barely rising contraceptive prevalence rates. By 2008, just 10 percent of currently married women were using a modern method of contraception (chiefly condoms and injectables), another 5 percent a traditional method (chiefly periodic abstinence). Rural use rates were less than half the urban levels. There were large regional differences: the 15 percent country average use-rate breaks down to about 23–32 percent in the South and 7 percent in the North (Nigeria DHS 2008, pp. 70–71).

What might have been done to jump start Nigeria's program in the 1970s? Survey-based estimates of "unmet need" for birth control are often used to argue for program investments but would not have served that purpose in Nigeria given the country's very high desired fertility.[8] Indonesia's attention to population in the Suharto regime seems to have had origins

in Malthusian thinking—as it had in Dengist China and in India in the mid-1970s, but with less coercive results than in those cases. The Nigerian government's views became nominally in favor of family planning from the 1970s on, but actual program performance languished, any sense of urgency on the demographic front perhaps attenuated by the easily acquired stream of oil revenues. But even in the absence of that excuse, slowness in coming to terms with population growth might have been expected, given a political landscape fractured by ethnic, regional, and religious divisions.

Shaping the policy space

Policy choice in development and population entails both technocratic and political calculation. But that choice, and any resulting achievement, is constrained by the existing institutional and cultural makeup of the society and its endowment of human and natural capital—what I termed earlier its legacy. Elements of this legacy can help or hinder the drivers of economic and demographic change and themselves can be the object of policy action: they therefore belong in any explanatory calculus.

In the Indonesia–Nigeria comparison an emphasis on policy difference, as in the discussion thus far, downplays any legacy effects. Indeed, in the case of the World Bank study the authors flatly dismiss such influence: "As of the mid-1960s there was no basis for a forecast of divergence in either policies or performance; a thesis of historical determinism is therefore unsustainable" (Bevan et al. 1999: 424). This is perhaps an understandable position for the Bank to take since, along with its loans, it is a major purveyor of policy advice. But it goes much too far. No one is defending historical determinism tout court; path-dependence, however, is a real phenomenon. There *was* a basis to forecast an economic divergence between Indonesia and Nigeria, even if not recognized at the time. Discerning such a basis in retrospect—not merely differences in the initial stocks of natural and human capital and in the existing physical infrastructure, but also differences in inherited economic and political institutions—is simply to acknowledge some degree of historical contingency—a routine expectation for any historically grounded account. And Bevan et al. implicitly recognize this in a few cases, for example linking Suharto's pro-poor policies to the expectations on the government built up under Sukarno—a point to which I return. In the demographic case, notably in explaining the divergent fertility paths of the two countries, policy and performance are arguably even more constrained by legacy factors.

Legacy differences: Indonesia vs. Nigeria

There would probably be little disagreement about the kinds of legacy factors likely to bear on demographic transition, leaving aside issues of relative

weight. As already noted, factors promoting or impeding economic development in general make up a major part of these, since sustained economic growth eventually produces a modern demographic regime—not least through the simple process of urbanization. Legacy factors more closely linked to fertility make up a partly overlapping set. Human capital is the major common element. Other elements are features of family and household organization, kinship systems and community structure, belief systems (mainly as they affect agency), and aspects of public administration and local government organization. I discuss these briefly in turn as they manifest themselves in Indonesia and Nigeria.

Human capital

Health conditions and educational levels in the population are the main relevant dimensions of human capital. On health, the murky estimates constructed from subsequent censuses and surveys suggest comparably poor conditions in the 1960s in the two countries, with Nigeria marginally worse off. In both countries, health services, outside the few city hospitals, were rudimentary. On education, Indonesia was ahead, having had more time to overcome colonial neglect: it was advancing toward full coverage at the primary level (compared to just 30 percent enrollment in 1965 in Nigeria), and had an advantage too at secondary and possibly at higher levels. Gender differences in Indonesia were less marked: for instance, male literacy in 1970 was 50 percent higher than female in Indonesia, but more than double the female rate in Nigeria. The statistics in Table 1 signal the comparative human capital situation at the aggregate level. Regional differences were important in both countries, but Indonesia even by the 1960s had done much to lessen them—in particular, moderating the Java vs. "outer islands" gap—while Nigeria's north–south difference, especially in education, remained substantial.

Improvements in health and education, as well as being welfare goals in themselves, are major contributors to development performance more

TABLE 1 Indicators of social development, Indonesia and Nigeria, mid-1960s

	Indonesia	Nigeria
Infant mortality rate (per 1000 live births)	155	166
Life expectancy at birth (years)	44	39
Adult literacy rate (>15 years, %)[a]	54	25
Secondary school enrollment (% of age group)	12	5
Higher education enrollment (% of age group)	1	0.4

[a] 1970
SOURCE: United Nations (1990, 2009); World Bank (1986).

generally and to demographic transition. An early disadvantage in these sectors, however, can be overcome by strong government action, certainly over the space of several decades. Less easily remedied, and hence more telling as legacy elements, are the factors that elevate or downgrade the policy priority of social development at large.

Family systems

Cultural variation within each country undermines most generalizations about Indonesian and Nigerian family systems: nearly every assertion needs to be qualified with ethnic or regional specification and acknowledgment of exceptions. That said, Indonesia's dominant family systems were (and are) broadly nuclear, with relative household economic autonomy—manifested, for example, in individualized land ownership. Kin-based influence on economic and demographic decisions from beyond the nuclear group was fairly weak—indeed, communal landownership and periodic reassignment of use rights, fairly common in colonial times, was village- rather than kin-based. For the increasing proportion of the population with no property stake in agriculture—sharecroppers, wage laborers, small-scale traders, and the like—the pressures of an expanding market economy further promoted individual and household autonomy. Arranged marriage, and for women very early marriage, used to be prevalent, along with high divorce rates, but in the post-independence decades steadily gave way to companionate marriage and a narrowed age difference between spouses. Compared to many other developing countries, social relations in Indonesia display relative sexual equality. Although technically permissible under Islamic family law, and occasionally practiced by prominent individuals (Sukarno famously), polygyny has always been rare in Indonesia.

Nigeria's dominant family systems were and are less easily characterized. Several distinctive features stood out, though with varying regional incidence. Lineage influence on family decisions, mainly from the husband's side, was significant. Fostering of children, especially between relatives, was widely practiced.[9] Polygyny was common, and, partly as an outcome of polygyny, spousal age differences tended to be large.[10] And whether polygynous or not, families would often be "non-pooling" in budgetary terms—the wife or wives and children having (notionally) a separate household budget from that of the father. The overall picture, then, is of a complex organizational setup in which childraising costs and child-labor benefits were not neatly contained within nuclear units, and were likely to be unequally shared between spouses. Both costs and accountability were diffused.

These contrasting family systems plausibly had significant effects on fertility. Indonesian families for the most part were unable to offload childraising costs, hence were responsive to the competitive pressures of the expanding

market economy and its educational requirements by lowering their planned family size. In Nigeria, the analogous effect—the quality–quantity substitution of Beckerian family economics—was obstructed by the mesh of transfers among kin and possibly too by the non-pooling household.[11] The critical question for fertility decline is how quickly that obstruction will erode. (That it is eroding and will eventually disappear, absent a rather dire development scenario for the country, seems certain.)

Kin and community

Rural social organization in Indonesia, colonial and in part pre-colonial in origin, comprised a territorially based hierarchy of provinces, districts, subdistricts, and administrative villages. These units could be and were mobilized in maintaining physical security and carrying out line-ministry extension activities in areas such as public health and agriculture. This top-down administrative system became increasingly ineffective over the Sukarno presidency as political unrest grew. It was reformed under Suharto, becoming sternly authoritarian with ex-military personnel appointed to many regional and local leadership positions. (Village heads were not themselves government officials but, even where elected rather than appointed, had quite limited freedom of action.) Political stability and quiescence were additionally maintained by a regionally deployed military hierarchy that paralleled the civilian one at each administrative level.

Nigeria's social organization reflected a different kind of colonial influence: the policy termed "indirect rule," by which the colonial government superimposed itself above the existing structures of authority—emirates, kingdoms, chieftaincies, and their various subordinate levels. Where these institutions could not be found, they were essentially invented for the purpose. Graf (1988: 7) writes that "indirect rule tended to reinforce the most conservative aspects of traditional political organization while shutting out pre-colonial tendencies towards supra-ethnic group cooperation." It produced "extremely diverse, and to a large extent, developmentally dysfunctional structures" of local government (ibid., p. 180), which persisted after independence. In 1976 nationwide uniformity of a sort was imposed through the establishment of elected local government councils as a third level of government below federal and state.[12]

One of the forms of local social organization that remained important in Nigeria, separate from the village community, was the lineage. As in much of sub-Saharan Africa, lineages had been traditionally influential in land allocation among their members and could exercise some degree of control over members' marriage decisions. That influence steadily weakened with the spread of individualized land titles and widened economic opportunities, but some features persisted—especially the expectations on members to

favor kin.[13] Those practices, widely found in traditional societies but perhaps especially intense in Africa, are what Goran Hyden (1983) has called the "economy of affection." Strong obligational ties of that kind were much less evident in Indonesia, at least as a routine expectation, although nepotism on a fairly spectacular scale characterized Suharto himself.

Belief systems

In Indonesia, census data record some 86 percent of the population as Muslim, 9 percent Christian, and 5 percent other faiths. Fervent Muslims are a much smaller proportion, however: many Javanese, for example, appear to carry the affiliation lightly. Christians are mostly located in the eastern provinces. This degree of Muslim dominance might be expected to relegate religious conflict to the periphery of national politics, but there has long been contention over the role of Islam in government, with Muslim parties decrying the secular state and pressing for greater incorporation of Islamic beliefs and practices.

Nigerian religious divisions, more evenly balanced, are more socially and politically consequential: about half the population, predominantly in the North, are Muslim; 40 percent or so are Christian of various strands (including a burgeoning evangelical component); the rest mainly espousing indigenous beliefs. Religious influence is felt particularly at the state level—even extending to adoption of sharia law in some northern states—and gives added potency to regionalism in national politics.[14]

In both countries Islam and Christianity endeavor to impose their moral beliefs on adherents, and where they have the opportunity on others as well, in matters such as sex roles and marriage. For Muslims, Koranic schools, existing alongside the public education system, are a major vehicle for this purpose. A different, older set of beliefs—in a supernatural world—predates those religions and coexists with them. These primordial beliefs are influential in certain areas of life, notably in the understanding of illness and infertility and thus in choice of health-seeking behavior. In Indonesia they have largely lost force, overtaken by the spread of clinical medicine and modern pharmaceuticals. In Nigeria that is not the case: "indigenous beliefs," standing alone or melded uneasily with a formal religion, constitute for many an intricate and pervasive spiritual reality, one inhabited by ancestral souls and local deities, demanding obeisance or needing placation, benign or sometimes malevolent. (This realm figures daily in the country's lively tabloid press.) In the context of rural society these beliefs would tend to sustain the power of elders and lessen the independence and agency of the younger generation. Over time, that influence is no doubt waning, especially in the transformed social and economic setting of the city.

Governance

Indonesia emerged from colonial rule as a unitary state, federalism firmly rejected and the country's ethnic divisions increasingly seen as a cultural rather than political characteristic. This was no accident. In retrospect, Sukarno, while rightly criticized for incompetent economic management, was singularly skillful in wielding symbols of unity and creating nationalist sentiment (a point stressed by Bevan et al.). Choice of Indonesian (at the time, not widely used) as the single national language in education and government was a major move, lessening the sense of domination of the polity by Java and the Javanese. Nigeria's federal system, in contrast, sought a fair power-sharing balance between North and South rather than suppression of regionalism. This seemingly very reasonable aim, however, entrenched an ethno-religious and regional basis of national politics. In Nigeria, as Kalu (2004) puts it, "ethnicity is a political, rather than a cultural phenomenon." Given the state's institutional weakness, "ethnic identity will continue to be perceived as the most effective strategy for making demands on the state. This in turn, will tend to increase the capacity of the elites to manipulate ethnic differences to achieve their own goals."

A crucial further difference in the two countries' governmental legacies followed from Indonesia's violent suppression of agrarian radicalism in the 1960s, described earlier. Pointing to the supposed communist threat, Indonesia's militarized government forbade nearly all village political activity, allowing space only for a single state-sponsored party. This depoliticization not only precluded any leftist opposition (or expression of views that could be portrayed as leftist) but equally applied to the Muslim parties on the right, giving the government free rein in designing and implementing its programs. In contrast, Nigeria's distributional politics below the federal level continued relatively unabated under military rule.

As legacies, these differences in the character of the national polity and its relationship to regional and local authority arguably had profound consequences for development. They likely mattered too for the course of fertility. In Indonesia, a strong central-government commitment to nationwide programs—in agricultural extension and public works on the economic side, in education, health, and family planning on the social side—brooked no political resistance and faced comparatively little dissipation of effort through local rent-seeking. In Nigeria, national commitments in those program areas, such as they were, tended to lose force in the course of transmission out to the regions and localities in the face of competing political interests and opportunism. Specifically on fertility, a further problem for Nigeria was the perception that birth control would affect the relative population sizes of the regions and thus the (population-weighted) regional claims on power and

resources. The politicization of census-taking, a longstanding problem in Nigeria, was a manifestation of that concern. Both countries experienced decades of strongly authoritarian central government, but only Indonesia found ways to direct that authoritarianism to productive ends in effective regional public administration and extension programs reaching down to local levels. In the United States a dictum of policymakers looking to institutional reform in today's economically turbulent times is "don't let a crisis go to waste"; something similar should perhaps be said of dictatorships.

Decentralization, emerging as a favored theme of development thinking, eventually came to Indonesia, starting, in 2001, with fairly radical devolution of financial and program responsibility to provinces and districts. Democratic accountability no doubt gained; how greatly efficiency may have suffered is not yet fully apparent. McLeod (2004: 368) characterizes the reform in blunt terms: "Indonesia gained democracy but lost effective government." Timmer (2004: 198), more circumspectly, says much the same, describing the change

TABLE 2 Contrasting legacies: institutional inheritances in rural Indonesia and Nigeria, c. 1960s

	Indonesia	Nigeria
Family and household system	Mainly nuclear, minimal kin-group influence	Nuclear and extended (covering co-wives); non-pooling household budgets; residual lineage influence; informal child-fostering common
Gender relations	Substantial gender equity, minimal polygyny	Entrenched role differentiation in household economy and labor force; widespread polygyny; unequal inheritance in *sharia* areas
Community structure	Well-defined administrative villages; pressures for conformity from local community rather than kin	Less formal administrative roles for communities below Local Government Areas (LGAs); kinship competing with territoriality as principle of affiliation
Land rights	Privatized in Java and Bali and becoming so elsewhere, but with social pressures against sales to outsiders; substantial tenancy but absence of large holdings; residual areas of shifting cultivation in outer islands	Communal or lineage-based ownership still common; conflict between grazing and farming systems in North
Legal system	Mixture of customary and statutory systems	Mixture of customary, statutory, and (in some northern states) *sharia* systems
Local government	No district-level financial or program autonomy	Substantial devolution to states and LGAs.

as a shift from "economic policy designed and administered by an insulated group of skilled technocrats, to a politically responsive system with few public institutions in place to protect economic policy from polemicists." In some respects, the country has been creating the conditions for administrative incoherence that Nigeria began with. The hope would be that enough of a modern political and economic dispensation has been created to preclude backsliding. Nonetheless, "it is entirely possible," Timmer writes, "that Indonesia will follow a path that looks more like Africa than East Asia" (ibid., p. 197).[15] The demographic significance of the shift, however, is likely to be minor: by the time it occurred, the country's fertility transition was largely complete.

A rough summary of some of the contrasting institutional legacies of the two countries spelled out above, as of the 1960s, is given in Table 2.

Legacy-based effects on fertility

The likely effects on fertility of these contrasting legacies can be briefly stated.

Human capital deepening. Both countries inherited major weaknesses in health and education. Both had the resources at hand in the 1970s to repair them, which as a byproduct would give a strong impetus to demographic transition. Indonesia invested heavily in these sectors, Nigeria much less. Why? The example of social policy in nearby Asian countries—the original "Asian miracle" economies—must have been influential for Indonesia; West Africa offered no such positive neighborhood effects. But part of the answer, too, plausibly lies in a legacy factor that was operative in Indonesia: the expectations of government created by Sukarno's leftist rhetoric of the 1950s and early 1960s. These expectations the successor regime felt it had to accommodate, even though the events of the 1960s had vitiated any potential political opposition.[16]

Family nuclearization and economic autonomy. Family change is a politically sensitive area, but many governments have little compunction about intruding—and after all, what could be more sensitive than reproductive behavior, altering which is the widely accepted objective of family planning interventions? Indonesian family structure seemed primed for fertility transition. A Nigerian fertility transition, however, would arguably have called for undermining patriarchal and lineage interests and attaining greater agency for women. Land rights are an important entry point here. Post-colonial Indonesia inherited or soon established systems of peasant proprietorship, receptive to productivity-raising interventions: economic accounting lay at the level of the family unit. Nigeria's rural economy, reflecting the complexities of family and lineage and the politics of land titling, was still far from individualized ownership. Changes are undoubtedly underway as the market economy deepens and urbanization proceeds, but on a time scale that remains uncertain.

Community roles. Program management in Indonesia, not only in family planning but also in various other government-led extension activities, was assisted by drawing on community solidarity and social pressures in the context of an authoritarian structure of public administration and a co-opted village leadership. Nigeria's more free-wheeling political life at the local level stood in strong contrast, messier and less beholden to top-down directives—although in that sense less coercive. These different legacies seem to reflect fundamental societal differences between the two countries, perhaps inaccessible to any policy.

Belief systems. Organized religion and occult beliefs are among the most entrenched parts of a society's heritage; both potentially bear on fertility behavior. Indonesia's co-optation of Muslim leaders in support of the government's family planning campaign was a notable policy achievement. Although aided by the imposed political quiescence of the time, it suggests the scope for enlistment of religious backing of such programs elsewhere. In Nigeria, however, that enlistment, had it been contemplated, would no doubt have foundered on Muslim–Christian ethno-religious rivalries. The health domain is less fraught: co-optation of traditional healers as part of a health network has been accomplished in many places, serving both to expand the supply system and to defuse potential resistance to it.

Governance. Rural society in Indonesia in the 1970s would have seemed to observers to be characterized by physical security, social stability, and effective public administration—qualities that anyone who knew the country pre-1965 would not have imagined to lie in its near future. They are qualities too that are still not much found in Nigeria. In Indonesia those conditions immediately derived from the militarization of provincial and local government following the surge of anti-communist communal violence, but the form they took built on existing administrative arrangements, a legacy of former regimes. They undoubtedly benefited the processes of development and fertility transition—not as necessary conditions but certainly as helpful background features in the early stages.

Demographic transition by default?

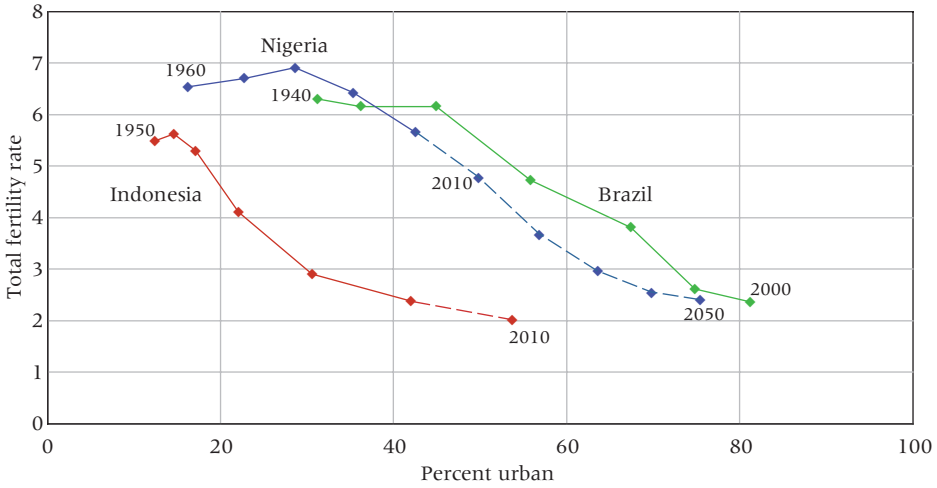
Historical demographic transitions, as remarked earlier, took place with no direct government involvement or in the face of active opposition. Smaller family size was a response by individuals to improving child survivorship and perceptions of a changing opportunity set, actual or anticipated. This was the experience of Western societies in the early twentieth century and of pre–World War II Japan. It was repeated in Brazil in the postwar decades. It points to the possibility of a comparatively policy-free route of demographic transition for Nigeria, one that relies mainly on socioeconomic drivers such

as higher incomes, achievements in health and education, urbanization, and, more elusively, "ideational change"—a transformation in attitudes and values affecting fertility but not necessarily tied directly to present material realities.

Urbanization is the most straightforward of such drivers. Urban fertility decline is probably less impeded than rural fertility by legacy obstacles—city dwellers are less beholden to social traditions and cultural dictates. There is an appreciable urban–rural fertility difference in Nigeria—1–2 children in total fertility according to the 2008 DHS (4.7 versus 6.3)—and that differential could increase fairly quickly: certainly there are well-known African instances of very low urban fertility, such as Addis Ababa. If so, a Brazilian-type fertility decline could be envisaged for Nigeria. The UN medium projections for Nigeria seem to foresee that scenario: they show fertility dropping to 2.4 (near 2050) at an urban share of 76 percent. Brazil reached that fertility level with about the same urban fraction. Indonesia's fertility transition, in contrast, has been much less urban-centered. (See Figure 4.)

Ideational change by its nature is harder, perhaps impossible, to predict. The dynamics of values are mysterious. Ideational change, many believe, underlies simultaneities in fertility declines between distant regions and under widely differing material circumstances. Some see it in the substantial fall in fertility in Bangladesh in the 1980s and 1990s that occurred despite lackluster economic progress. Soap operas in Latin America are often pointed to as agents of influence in changing attitudes toward family size in that re-

FIGURE 4 Fertility and urbanization transitions in Indonesia and Nigeria compared to Brazil's transitions



NOTE: Data points are at ten-year intervals: 1940–2000 for Brazil, 1950–2010 for Indonesia, 1960–2050 for Nigeria (UN estimates and medium variant projections). Broken lines indicate projections.
SOURCE: United Nations 2008, 2009; Merrick and Graham 1979 (Brazil 1940 data).

gion, though their effect is hard to separate from that of a vibrant consumer economy. And in Africa, the very rapid spread of cell phones and their ramifying applications is a wholly new phenomenon with the potential to generate ideational change in numerous spheres of life.[17]

A note on contingency

The onset and pace of demographic transition in a country, like development more generally, reflect not only that country's unique legacies and array of policy interventions but also the effects of external economic and political conditions.[18] Indonesian economic performance under the Suharto government gained greatly from spillover effects of the progress of its dynamic neighbors, from America's political and military involvement in Southeast Asia, and from a favorable international trade regime. Indonesia was able to construct a labor-absorbing manufacturing export economy during the "window" of the 1980s and early 1990s when Western demand was surging and protective barriers were low, as its oil exports dwindled. Nigeria's regional neighbors have mostly offered object lessons in policy failure—with the exception, in recent years, of Ghana. Foreign investment in the country has been largely confined to the resources sector, though China's entry as investor may broaden that focus in the future. Awash with oil revenues, Nigeria developed no manufacturing sector of any significance and efforts to do so now face daunting competition from the manufacturing powerhouses of Asia. Indeed, the benefits of globalization for Nigeria are unclear: Collier (2007) argues that globalization tends to reinforce the bad governance of poor, resource-rich countries.

For fertility decline, a particular circumstance, already mentioned, has been the shift of international attention away from population problems as the large falls in Asian birth rates became apparent. Those falls, along with the sentiments opposed to target-driven family planning programs, Asian-style, that found expression in the 1994 Cairo Agenda, eroded both interest in and foreign assistance for birth control—despite Africa's still high fertility. Evidence of the situation is seen in the almost total neglect of population issues in recent accounts of Africa's development problems and priorities—for example, in the widely publicized 2005 report of the Commission for Africa—or in the agenda and activities of the African Union.

Final remarks

Each component of demographic modernity—low mortality, low fertility, and low natural increase—offers major benefits for well-being and for the development effort, at least until serious population aging sets in. Yet in a significant number of countries, many of them in Africa, the pace of demo-

graphic transition has been sluggish. The comparison between Indonesia and Nigeria set out in this chapter has asked why. (The details would differ in other country pairings, but the main thrust of the argument would I believe be preserved.) Policy differences are part of the explanation. On the mortality front the ingredients of effective policies and program designs, appropriately tailored to social and economic conditions, are well-known, attested from many decades of experience. The fertility side is less clear-cut. Ultimately, fertility decline can be seen as a necessary accompaniment of attaining a modern mortality regime. But it is not an immediate accompaniment, and often the delay stretches into decades, all the while with rapid population increase. The most straightforward policies to favor it—through family planning programs—have at best a mixed record of achievement. The main obstacles in the way of fertility transition, I have argued, are found in the institutional legacies of the past: social realities of the kind that Chinua Achebe referred to (in his essay *The Trouble with Nigeria*) in writing of his country as being held in "the dead grip of the patriarchs of an obsolescent dispensation" (1983: 61). But while some legacies are indeed all but immutable, many are not, and the broader policy task is to discern how to nudge into being a new dispensation, one within which fertility levels can be reached that are in accord with the needs of a modern society and the emerging desires of its citizens.

Notes

Figures in this chapter are available in color in the electronic edition of the volume.

This is a revised version of a paper presented at the XXVI International Population Conference, Marrakech, September–October 2009. Comments from Terry Hull and Daniel Sala-Diakanda are appreciated.

1 Although earlier Nigerian censuses have often yielded data of dubious quality, the 2006 census population total, 140.0 million, is believed to be roughly accurate. The UN medium projection estimates for 2010 are Indonesia 233 million, Nigeria 158 million. For 2050, the equivalent estimates are Indonesia 288 million, Nigeria 289 million (United Nations 2009).

2 The 2007 DHS estimate for 2005–7 is 2.6, an apparent stalling over the previous decade (see *Indonesia Demographic and Health Survey 2007*, p. 48). Hull and Hartanto (2009) argue persuasively that this figure is inflated as a result of the DHS's undersampling single women not in their parents' household; they arrive at an adjusted total fertility rate of 2.3.

3 *Nigeria Demographic and Health Survey 2008*, p. 54. Regional differences are marked and persistent: the 2008 survey has total fertility averaging near 7 in the northern states, around the national average (5.7) in the central region, and in the range 4.5–4.8 in the south.

4 World Bank purchasing power parity estimates of per capita gross national income are roughly parallel, though the differential is narrower. The 2007 estimate for Nigeria, after several years of strong oil-sector performance, is $1770; the equivalent figure for Indonesia is $3580 (*World Development Indicators* 2009).

5 Lewis 2007: 198–199; World Bank 2010: 381.

6 This framework is described more fully, and applied to fertility transition, in McNicoll (2009).

7 For details see McNicoll and Singarimbun (1983) and Hull and Hull (1997).

8 According to the 2008 DHS, the average ideal number of children was 6.1 for Nigerian women at reproductive ages and 6.7 for currently married women. For men, the corresponding averages were 7.5 and 8.8 (Nigeria DHS 2008, p. 114).

9 Caldwell and Caldwell (1987) estimated that one-third to one-half of West African children were fostered-out for some period during their upbringing. For example, data for Ibadan around 1980 collected by Isiugo-Abanihe (1985: 61) showed 37 percent of males and 33 percent of females at the time currently fostering-in one or more children under age 15.

10 They still are: countrywide, according to the 2008 DHS, 33 percent of married reproductive-age women (over 40 percent in the northern states) and 19 percent of men were reported to be in polygynous unions, mostly involving a single co-wife (Nigeria DHS 2008, pp. 92–93). The proportions have been decreasing: they were appreciably higher in the 1990 DHS.

11 Fapohunda and Todaro (1988: 578–579), referring to Yoruba society in particular, summarize the pronatalist inclinations built into family arrangements:

> [C]hildren generate net positive income flows to extended families by providing labor, guaranteeing financial security, and enhancing family power through enlarged social networks. The elders, in turn, encourage the birth of many children by arranging early marriages, by exerting pressure on young parents to observe postnatal abstinence practices that maximize the number of surviving children, and by easing parental budget constraints through intrafamily transfers.

How economic change affects the fertility of non-pooling households is unclear.

12 Rising civil disorder and ineffective policing in the 1990s led to emergence of vigilante groups—the Bakassi Boys in the southeast, most notoriously, but also similar groups in other regions. Meagher (2007) suggests that this shows the resilience of Nigeria's civil society.

13 Writing of Nigeria, Smith (2007: 163) describes "the contradictory pressures of increasing individual ambition and continuing obligations to kin and community, all in a context of economic insecurity." There is, of course, a complementary benefit to the recipient of support. Secondary education is a chokepoint where that assistance comes into play: the "fierce competition" to get into favored secondary schools in Nigeria calls for mobilizing the efforts and resources of "families, kin groups, and communities" (ibid., p. 69).

14 As alluded to earlier, Indonesia experienced several regionally confined Islamist rebellions in its early years of independence, and one, in Aceh, that persisted for decades. Both countries have seen recurrent episodes of Muslim–Christian communal violence in areas where local proportions of each faith are comparable: murderous clashes in the eastern Indonesian provinces of Sulawesi Selatan and Maluku, and in Plateau and Kano states in the central region of Nigeria.

15 An altogether rosier anticipatory view of (financial) decentralization is presented in an account from the World Bank (2004: 92–93) of Indonesia's Kecamatan [Subdistrict] Development Program, entailing block grants to local governments.

16 This argument is made persuasively by Bevan et al. (1999); Timmer (2004: 197), however, sees Suharto's embracing of pro-poor policies as somewhat of a mystery.

17 One major telecommunications company in Africa, the MTN Group, records in its 2008 annual report that it had 23 million subscribers in Nigeria, which it estimated amounted to 55 percent of the market.

18 This is the category "circumstance" in the framework referred to in note 6 above.

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PAST AND FUTURE IN THE LONG PERSPECTIVE

Who's Afraid of Population Decline? A Critical Examination of Its Consequences

David Coleman
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

Fear of population decline, censuses to warn of it, and pronatalist and other policies to avert it are almost as old as states themselves. 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 land is relatively abundant and productivity static, population numbers are the limiting factor of production, their increase to be encouraged by any means including conquest, the prohibition of emigration, and enslavement; their 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 component, to be increased irrespective of the effect on individual standards of living.

Between the two World Wars, birth rates in many Western European countries and in the United States fell to below the level of replacement (Van Bavel 2010). The prospect of population decline implicit in those rates, formalized into alarming population projections (e.g., Charles 1938), prompted several governments to adopt pronatalist policies to avert the "twilight of parenthood" and "race suicide" (Glass 1940). The recovery of the birth rate and the "baby boom" dispelled those fears in most Western countries, at least for a while. Instead the world concerned itself with over-population. But since the end of the twentieth century, the demographic, political, and business worlds have rediscovered population decline. For the last of these, at least, this prospect is unappealing (see Longman 2004). It is seen as incompatible with the American Dream and, probably, with the dreams of businesspeople everywhere. Decline in European populations is regarded with pity, with blame and an element of *schadenfreude* (Wattenberg 2004; Steyn 2006; Laqueur 2007) especially from across the Atlantic, as well as with sober analysis (Eberstadt and Groth 2007; Jackson and Howe 2008). The notion of global

decline first edged into 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. Until the 1980s, demographic transition theory took for granted that populations emerging from the transition would resume the previous pattern of maintenance of numbers sustained by approximately replacement-level fertility. That assumption was convenient, reasonable, but evidence-free (United Nations 2002; Demeny 1997). Fertility in most of the developed world remained resolutely below replacement level from the 1970s onward, emulated by a growing number of developing countries, provoking renewed concern (Chesnais 1996) and some interesting long-term speculations (Bourgeois-Pichat 1988). It must be said, however, that in some densely populated countries such as the Netherlands, public opinion has for some time been notably relaxed about the prospect of population decline (Rozendal and Moors 1983). The numerous Dutch citizens emigrating from the Netherlands cite overcrowding among other factors that have driven them from their homeland (Van Dalen and Henkens 2007).

The era of rapid and sustained population increase was a short one in the broad sweep of human history, as Reher (2007) has pointed out in a seminal article. It dates back little more than two centuries and is now drawing to a close in the West, with profound political and strategic implications (Rostow 1998). Before that "great population spike," population decline was a constant preoccupation and a not infrequent experience (Glass 1973; Biraben 2004). The high water mark of human population is likely to be under 10 billion (UN 2009); other projections expect global decline before the end of the century (Lutz, Sanderson, and Scherbov 2001).

This chapter examines the prospect of population decline in the modern world and its relationship with population aging. It evaluates the likely consequences for economy, society, and environment 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 systematic treatment of past population declines (see Dumond 1975; Charbonneau and Larose 1980; Galloway 1986; Tainter 1988; Kennedy and Clarkson 1993; Chu and Lee 1994; Hatcher 1996; Friedrichs 1997; Russell and Russell 1999; Dyson and Ó Gráda 2002; Biraben 2004; Chavas and Bromley 2005; Diamond 2006) and other important topics. Furthermore, the important topic of urban and regional population decline within countries has also been omitted for want of space.

We defend this omission. Regional and urban decline, relative or absolute, has always accompanied regional and urban growth in other parts of the same country. Unlike national population decline, it is not a novelty in the context of the last two centuries. Furthermore, those who migrate away from declining local centers can move elsewhere relatively easily within the same

national economic, legal, linguistic, and cultural space. Unless accompanied by concomitant decline at the national level, the internal shifting balance is devoid of strategic or major political consequences and should generally be regarded as a natural and desirable consequence of adjustment to changed realities of comparative regional advantage. That is not to say that abrupt regional and urban declines cannot be problematic, as for example when the long-delayed end of subsidy to rust-belt industries becomes imperative, or antiquated agricultural practices, protected by political isolation, are suddenly exposed to international competition or their populations to the temptations of broader horizons, as in Eastern Europe post-1989. (These topics are considered in a longer version of this chapter at «http: //www.spsw.ox.ac.uk/research/groups/oxpop/papers.html».) The difference between the process of population decline over time and the fact of having attained a smaller population is emphasized. Whether population decline itself should always be regarded as a problem is a controversial matter. We conclude that it should not be.

Population decline—The current reality

Population decline can arise from any combination of low birth rates, high death rates, and net emigration. In the modern world, low birth rates are the key. Seventy years ago birth rates in most countries of the developed world fell to an average of two children per woman or below (Van Bavel 2010). Today, after the unlooked-for irruption of the baby boom, all its birth rates, with the exception of the United States, New Zealand, and Iceland, have returned to below the level required to maintain the population. Without migration, the Western world faces population decline in the short or medium term given current levels of fertility. Many developing countries are likely to follow that example within a few decades. Natural increase remains positive in parts of North-West Europe. Immigration allied to comparatively high fertility is projected to generate considerable population growth in Scandinavia, France, and the United Kingdom, and in Australia and the United States to even higher levels. Elsewhere, deaths exceed births especially where chronic low birth rates have exhausted positive demographic momentum and turned it negative (Japan: Ogawa et al. 2005; Germany: Schwartz 1998, Birg 2002). The last generations completely to replace themselves in Western Europe were born in the 1950s (Sobotka 2008).

Countries with "natural decline" in 2008 included Italy, Germany, and 12 countries in Eastern Europe and the Russian Federation (Table 1), and Japan. Germany's population fell after 1974 (Federal Republic) and then again from 2005 after a period of immigration-fueled growth. There, official projections gloomily assume a stagnant total fertility of 1.4 and a decline to

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

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

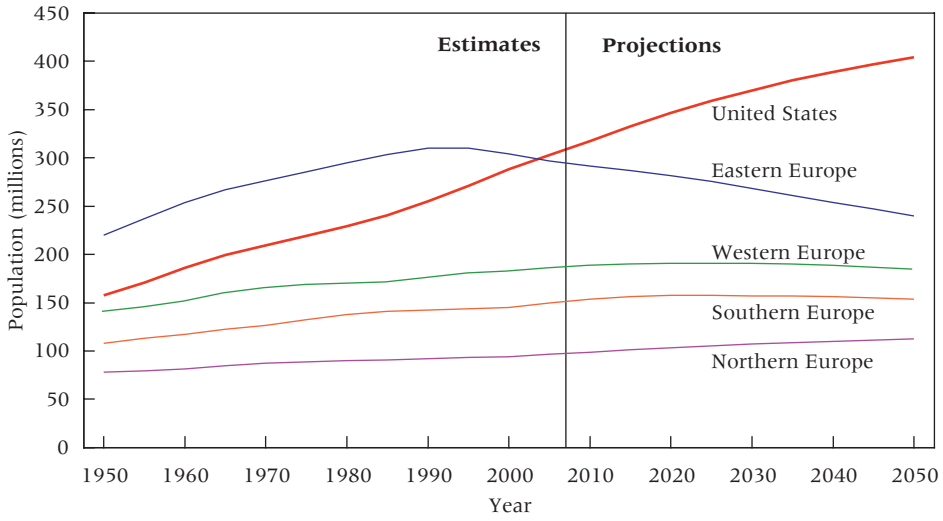
NOTE: States below 1 million population excluded. Total change unknown for Serbia.
SOURCE: Eurostat *Data in Focus* 31/2009, Table 1.

68.7 million by 2050 with 100,000 net immigrants (Statistisches Bundesamt 2006). Japan's population reversed course 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 percent per year (Government of Japan 2009: Tables 1.4, 1.6). In China, Hong Kong, South Korea, Taiwan, and Singapore, despite very low total fertility, demographic momentum still keeps births ahead of deaths.

Aging and depopulation through emigration can become institutionalized if movement to attractive destinations is easy (e.g., Breton et al. 2009). In Ireland emigration became embedded in the culture in the nineteenth and the first half of the twentieth centuries (Kennedy and Clarkson 1993; Daly 2006). East of the Elbe, population decline is accelerated not only by emigration (Haug 2005) and by very low fertility, but also, in some republics of the former Soviet Union, notably Russia, Belarus, and Ukraine, by high levels of mortality (DaVanzo and Grammich 2001; Chawla et al. 2007; Vladov 2007). In 2008, deaths exceeded births in 14 countries in Europe, and in 13 total population was declining after taking migration into account (Table 1).

The anticipated 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

FIGURE 1 Population estimates and projections, United States and major European regions, 1950–2050



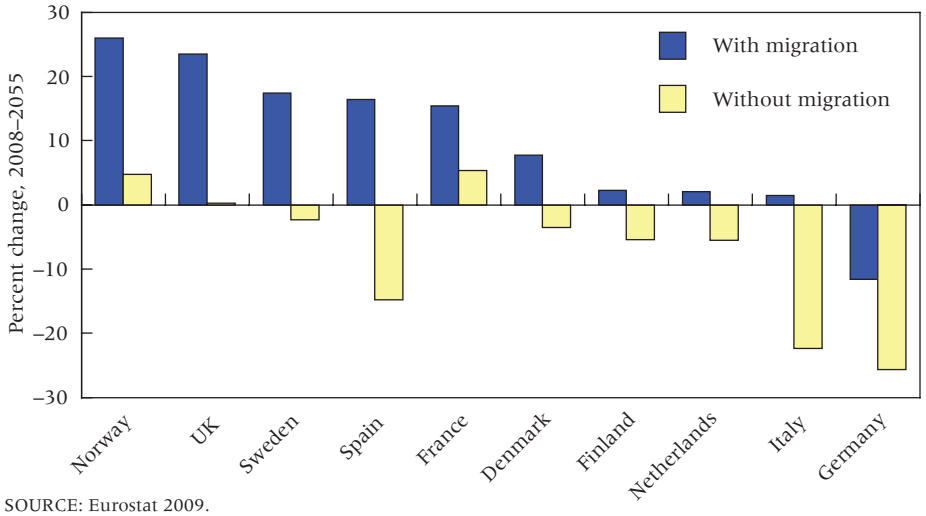
SOURCE: UN 2008-based medium variant projections.

all other regions of Europe (Figure 1). Taking all of the regions of Europe together, as well as the United States, the expectation for the future of the developed world is a picture of expanding diversity, not a collective descent into oblivion.

The paths of future fertility shown in Figure 1 are only projections. Viewed as forecasts, projections are almost always wrong. What matters is how wrong. For 30 years, birth rates in Western Europe have been relatively stable. According to the Eurobarometer survey of 2006, women in all European countries except Austria want at least two children (Testa and Grilli 2006). Postponement or delay in childbearing, universal since the 1970s, deflates annual births and period indexes of fertility. Its continuation until 2020 would account for 45 percent of projected decline in Europe. It also has a minor, contrary effect in slowing the rate of population decline by increasing generation length (Goldstein et al. 2003).

Period birth rates recover when postponement ends. Partly for this reason, birth rates have risen recently in European countries, as in the United States and Australia (Sobotka 2008; Myrskylä et al. 2009). While in some it is now close to replacement (France 2.02, UK 1.96 in 2008), few demographers believe that fertility will generally return to replacement level (e.g., Lesthaeghe and Willems 1999; Frejka and Sardon 2004). Persistence of very low fertility over a long period may socialize new generations into very low expectations for family size: a low-fertility "trap" (Lutz et al. 2006), to be reversed only with

FIGURE 2 Population change in selected European countries 2008–2055, with and without migration (percent)



SOURCE: Eurostat 2009.

the greatest difficulty (Dalla Zuanna and Micheli 2004). UN projections (medium variant) assume that all countries will eventually converge 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 percent per annum. However, there is no scientific evidence for choosing that number (or, with present knowledge, any other) as a final equilibrium figure.

Migration, now the most important factor in Western population dynamics, is the most volatile and the most difficult to project (Teitelbaum 2001). The potential importance of future migration in Western Europe, assuming the continuation of current trends, can be gleaned from Figure 2. Those outcomes powerfully depend upon the often unpredictable factors behind the diverse components of migration flows.

Population decline and population aging—Divergent sisters

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

Population decline is often treated as an almost incidental byproduct of population aging, which has received the greater attention. In some aspects those processes proceed in parallel, in others they diverge. Decline and aging may share a common cause in low birth rates, but one does not cause the other. Any reduction in birth rates promotes population aging, even in youthful societies. Decline only follows (excepting the effects of migration) when the birth rate falls below the death rate. Inward migration (in the youthful pattern usually experienced in developed countries) acts similarly upon both, tending to reduce population aging and decline, and preventing or reversing decline altogether if it is on a large enough scale. A reduction in mortality has opposite effects—tending to increase population, or at least to moderate decline, while (in modern societies) also exacerbating population aging.

Sub-replacement fertility, continued for many years in the absence of migration, has divergent effects upon age structure and population size. Ignoring migration and mortality, it makes the population older for about two generations before the structure comes to rest upon a new, older but stable age-distribution. Population size follows a different path, continuing downward 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 toward extinction.

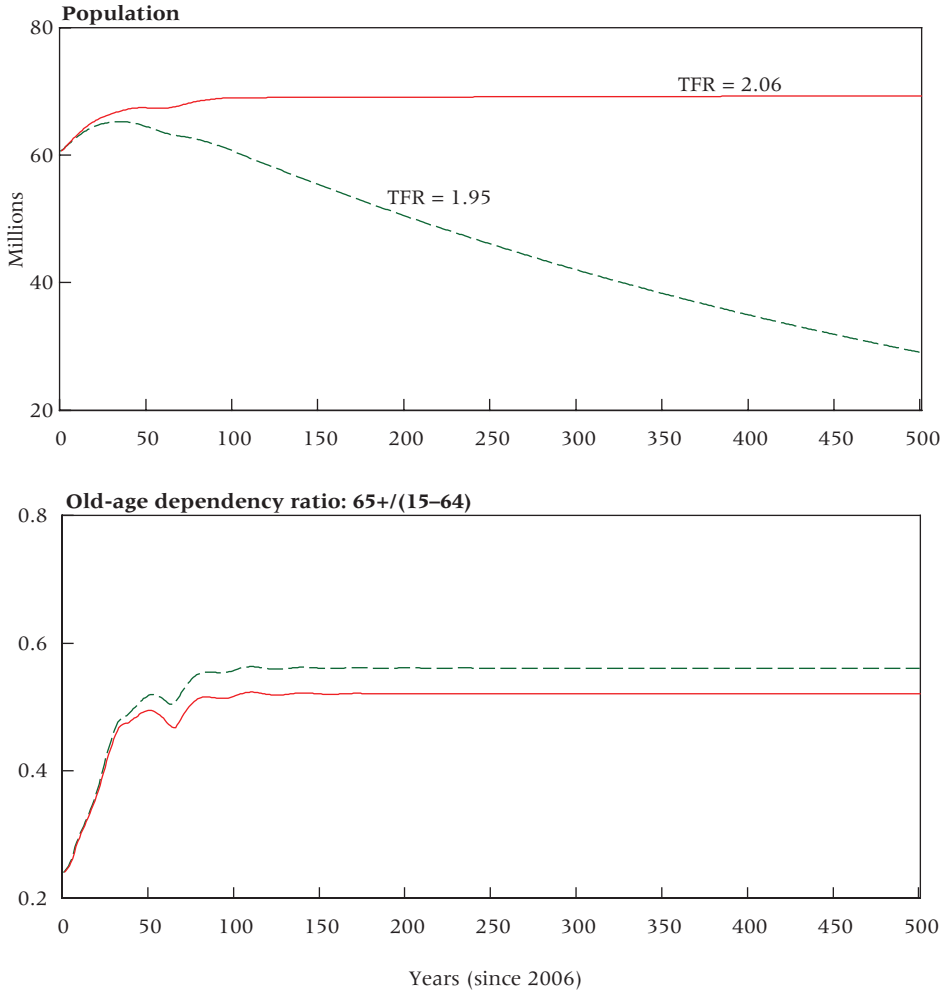
Projections can best illustrate these points, here for the United Kingdom (Figure 3a). For simplicity they assume no migration. Age-specific mortality rates are those used in the Government Actuary's Department (2008) 2006-based Principal Projection up to 2081 and constant thereafter. Age-specific birth rates are raised uniformly to produce a replacement-level fertility of 2.06 and a marginally sub-replacement rate of 1.95 (the actual UK rate for 2008 was 1.96).

At both levels of fertility, the dependency ratio rises to about 0.5 after two generations and then remains constant. The higher fertility projection gives slightly lower dependency. However, the modest difference in fertility generates a great divergence in population size, which in the long run tends to extinction in the case of the lower fertility population.

Figure 3b repeats the same exercise assuming that mortality will continue to fall at 1.0 percent per year after 2081 rather than remain constant. As before, a modest reduction in fertility has a strong impact on population but a modest impact on age structure.

Can longer life moderate or stop population decline? Longer life can offset the population decline inherent in low birth rates, albeit only over the long term and by assuming extreme maximum lengths of life. With a sub-replacement TFR of 1.84, no migration (as in the GAD 2006 Principal Projection), and constant mortality after 2081, the UK population falls to 12 million after 500 years and continues falling. But if mortality continues to decline at 1 percent per year with no limit on life span, population falls

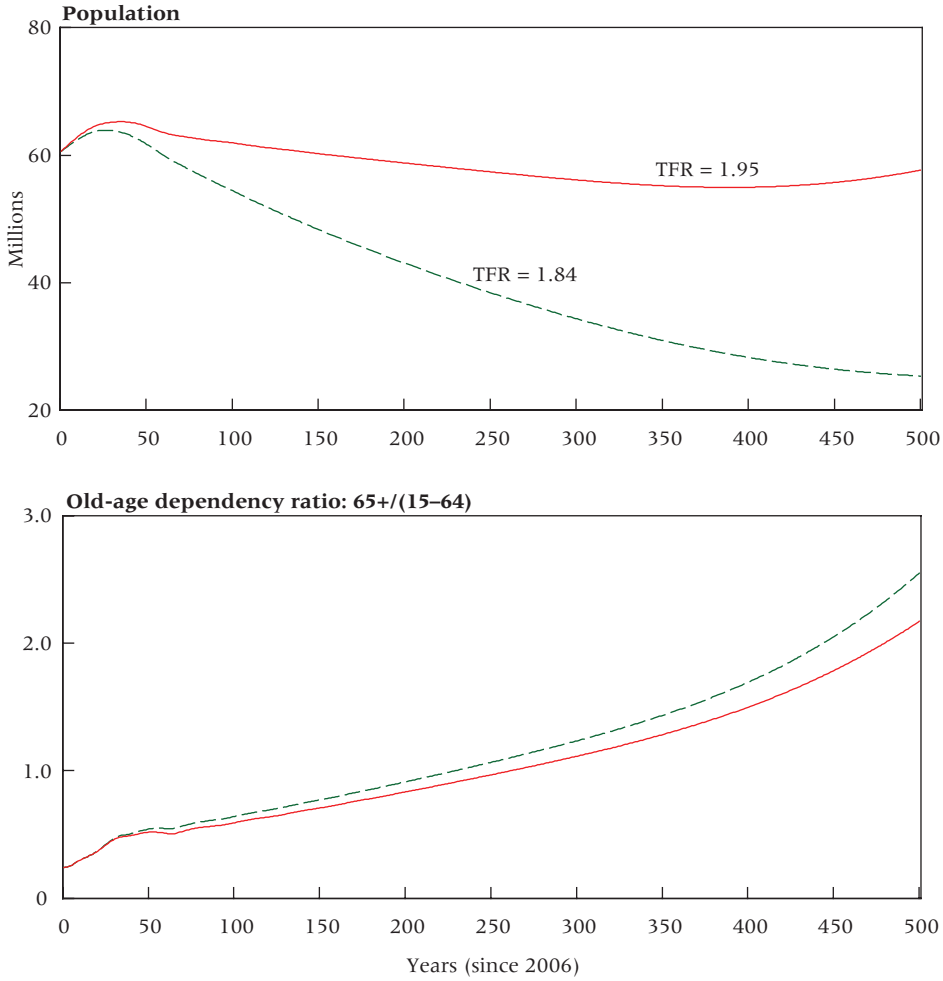
FIGURE 3a Projections of population and old-age dependency for the UK, with mortality rates constant after 2081



SOURCE: Authors' calculations (see text).

more slowly to 25 million after 500 years and finally recovers to level out at 37 million in the very long run. With a more modest reduction of mortality of 0.5 percent a year after 2081, with no limit on life span, population falls to 16 million after 500 years and eventually levels out at 4 million. Thus, increasing longevity may eventually stabilize population by offsetting the declining number of births. But this takes us to the realm of science fiction (Borges 2004): life spans of 1,000 years and over eventually become very common.

FIGURE 3b Projections of population and old-age dependency for the UK, with mortality rates declining by 1 percent per year after 2081



SOURCE: Authors' calculations (see text).

Reasons for fearing population decline

Compared with the problems associated with population aging, population decline has received less attention in contemporary debate by economists and others (McMorrow and Roeger 2004; Nyce and Schrieber 2005; Prskawetz, Bloom, and Lutz 2008). At official levels and among business interests, it is assumed axiomatically to be bad, despite environmental concern about continued growth (Guzman et al. 2009). Concern at the government level is reflected by the increasing use of policies to stem the fall in numbers and the

aging of population (Heleniak 2003; Chapple 2004; Coulmas 2007; Vladov 2007; Jones et al. 2009).

When considering the objections to population decline, and its possible benefits, it is important to distinguish 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 cause for concern if population falls behind 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

Because labor (equivalent to population) is one of the key inputs to production, it is axiomatic that population growth increases total output (GDP) as long as additional workers can be employed. This is illustrated by the American experience. During the twentieth century GDP per capita grew at virtually the same rate in the United States as in Western Europe (2.0 percent p.a. and 1.9 percent p.a. respectively).[1] However, the United States experienced much faster population growth (1.3 percent as compared to 0.5 percent) with the result that total GDP also increased much faster. In 1900, the total output of the US economy was 46 percent of that of Western Europe as a whole. By 2000 the figure was 106 percent. Conversely, declining population implies slower output growth, unless it is compensated by acceleration in productivity. Confidence in growth 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 labor force can match demand with the required output. In theory, a larger population size permits greater economies of scale and division of labor, thus improving productivity. Manufactured products with high development costs come within the reach of growing capital markets.

The key argument may be stated as follows: in a closed economy, population decline, or even the end of population growth, pulls the rug from under these advantages and reverses them. It is accompanied by a greater degree of population aging with all its costs. With given productivity, GDP declines *pro rata* with numbers of people. Economies of scale may diminish. Shrinking markets and a diminished workforce could squeeze profitability—with declining domestic demand accompanied later, as the workforce contracts, by rising wage pressures from an increasingly scarce labor supply. Weaker investment, prompted by the prospect of declining markets, would mean that plant ages and is less competitive. If cheaper imports replace domestic supply, domestic manufacturing capacity gets hollowed out.

A falling population base implies higher taxes to maintain existing infrastructure or to fund indivisible new projects. Eventually, the state may have to abandon some of the infrastructure—amalgamating schools and hospitals and restricting repairs. A contracting housing market and falling public investment in infrastructure reduce demand for building materials and construction work. If decline occurred across the board, smaller communities could become unviable (Richard Cragg, pers comm; 8 July 2009).

In a closed economy, declining population thus puts the spotlight on increasing standards of individual productivity and consumption to maintain the desired level of investment and confidence. Vulnerability to slumps may be higher without the prospect of long-term growth in demand to buoy up confidence. Products with high research and development costs can no longer be contemplated 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 limited domestic market, the discouragement of risk-taking, and the lack of optimism about prospects. Excess space, freedom of movement, and flexibility in land use "[induce] in the minds of many people an attitude of helplessness and hopelessness," and lack of pressure of increasing population failed to force the pace of development (Walsh 1974: 8, 16, 17).

Military security

Other things being equal, big countries have more political and military power than small ones (McNicoll 1999; Kennedy 1988; Kagan 2003). Population decline *ipso facto* reduces the potential size of armed forces. GDP, smaller than hitherto, can no longer support the domestic development of expensive equipment, which must then be imported at a cost to the balance of payments or forgone. The mechanization of warfare and the advent of nuclear weapons have not eliminated the importance of the balance of numbers between powers at similar levels of development. A classic example is the failure of the French population to grow in the nineteenth century, following its very early fertility transition. France began the nineteenth 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 World War I reinforced fears of population decline (see Teitelbaum and Winter 1985), confirmed by the final catastrophe of 1940 among other reverses (Sauvy 1987: Ch. 8). More recently, the power residing in the Kremlin has diminished with the diminution 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 break-up of the Soviet Union itself in 1991, Russia will face an even further loss of capacity if its population declines as projected from 148

million in 1990 to 116 million by mid-century (Balzer 2005; UN 2009). Many also argue that the relative decline of the Western powers projected for the twenty-first century, compared with the population increases of developing countries and magnified by the latter's economic growth, promises a radical shift in the strategic balance (e.g., Jackson and Howe 2008).

Civil political power

Numbers also matter in the peaceful exercise of power. Population determines representation in many international bodies (although not the United Nations) and is correlated with economic power. Representation in the European Commission and the European Parliament is directly related to population, although with a favorable 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 the rank-order of size in the EU. 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. Smaller countries such as Bulgaria (Sugareva et al. 2006) and Hungary fear damaging depopulation. More broadly, the relative and eventual absolute decline of the population of Europe invites an unfavorable strategic outlook compared with the continued rapid growth of the United States (Kagan 2003), diminishing Europe's importance to the United States as an ally in competition with other, growing global centers of power and wealth.

Productivity

Finally, population aging is held to reduce productive capacity as the older workforce falls not only in number but also in its capacity for output and innovation (Skirbekk 2005; Lindh 2005)—for example, in the rapid growth of new service industries requiring new skills, especially information technology, to which older people are allegedly refractory. Some intriguing work points to quite the opposite conclusion, showing that older, more experienced workforces can be more, not less productive (Malmberg et al. 2008). Productivity analysis in Japan also suggests no cause for concern from an aging workforce accustomed to working late into life (Clark et al. 2008). Furthermore, workforce aging shifts the age distribution of workforces closer to the optimal, even generating a productivity dividend, according to an international analysis (Prskawetz, Fent, and Guest 2008). Without population pressure, technical capacity is claimed to fall to a more extensive, less specialized level (Boserup 2003). That analysis, however, seems appropriate for traditional agricultural

regimes, rather than modern technical ones where manpower shortages should provoke substitution by capital. For the enthusiast such as Julian Simon (1981) population is the "ultimate resource," and 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 houses pondering old ideas" (cited in Chesnais 2001). Insofar as it can be measured, however, scientific productivity appears to continue at a high (although not peak) level into old age, among the Fellows of the Royal Society and the members of other scientific groups (Edwards 2008: 106–111).

Is population decline really such a problem?

Population decline, therefore, is seen as bringing some disadvantages to any society. Rapid decline in countries such as Bulgaria has pathological social and economic causes provoking emigration and low rates of birth and survival in a vicious circle. The population declines currently in progress and projected for other countries in Europe are more gentle, buffered by immigration and greater longevity and, recently, some recovery in birth rates. Germany's decline, projected to mid-century, would take population size back to the level of 1955, in Poland to the level of 1967, in Italy to 1977. None of the dire effects foreseen above was apparent in those populations in their earlier, smaller size.

The rapid decline and aging in the rural areas of South-Eastern Europe is an extreme acceleration of a normal process. Over more than a century in all developed societies, efficient agriculture has produced more and cheaper food and occupied a much smaller proportion of the workforce (Saville 1957; Feser and Sweeney 2003). As rural populations decline, their numbers may sometimes fall below the critical minimum threshold for maintaining local services (Sutter and Tabah 1951). But this out-migration liberates a workforce for urban industry, services, and specialization. Not all grieved to leave the often impoverished countryside, or the "idiocy of rural life." And in some countries, counter-urbanization has partly reversed the trend, although not to the agricultural sector (Champion 1989, 2000).

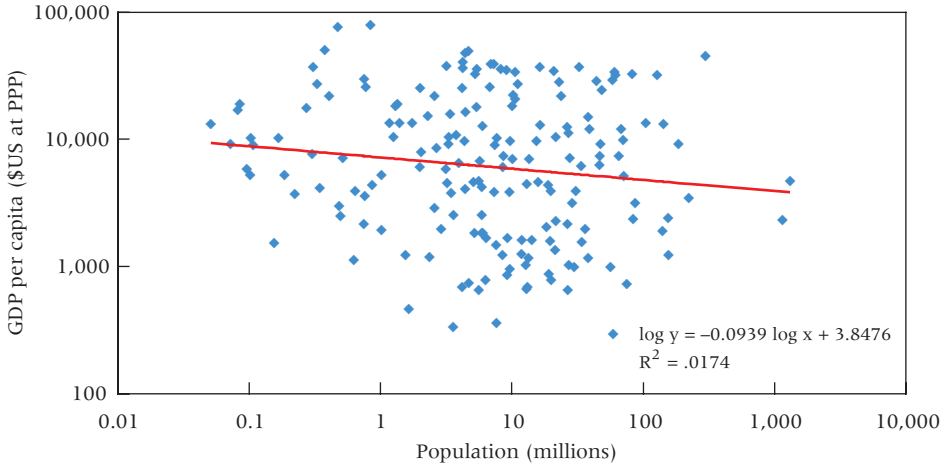
So far we lack much empirical evidence that modern population decline will depress innovation, investment, or individual wealth—the depression has scarcely begun. Population in all the major West European countries, including the UK, had almost ceased to grow from the 1970s until the 1980s, until the revival of immigration from the mid-1980s. In Germany (Federal Republic) numbers fell slightly from 1973 to 1985. Despite that, German GDP continued to grow substantially, by 26 percent over the period compared with 29 percent for 13 countries of Western Europe (UNECE Economic Survey of Europe 1989–90, table A.1). No crisis of business confidence ensued, or was

even discussed; nor is it being discussed now. The mood in Japan is more despondent (Chapple 2004; Matsutani 2006; Coulmas 2007), but even there economic pessimism is not universal. Over the decade 1995–2005 Japanese GDP rose by 11.9 percent and population by 1.8 percent. The IMF forecasts that in the following decade, 2005–15, population will fall slightly by 1.2 percent, but GDP will rise by a further 10.6 percent (IMF WEO database).

On closer scrutiny, some of the problems listed above lack substance, or may in fact be advantages. Current recession apart, the practical concern most often voiced is not unemployed resources and unemployment, as feared by Keynes (1936), but a shortage of labor hampering output, and inflationary wage pressures. Concern about GDP can only be justified if national power, defense, 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 (1969: 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 optimizes individual welfare. The interest of the poor might be quite other. Those who sell their labor do better by making themselves scarce, not abundant.

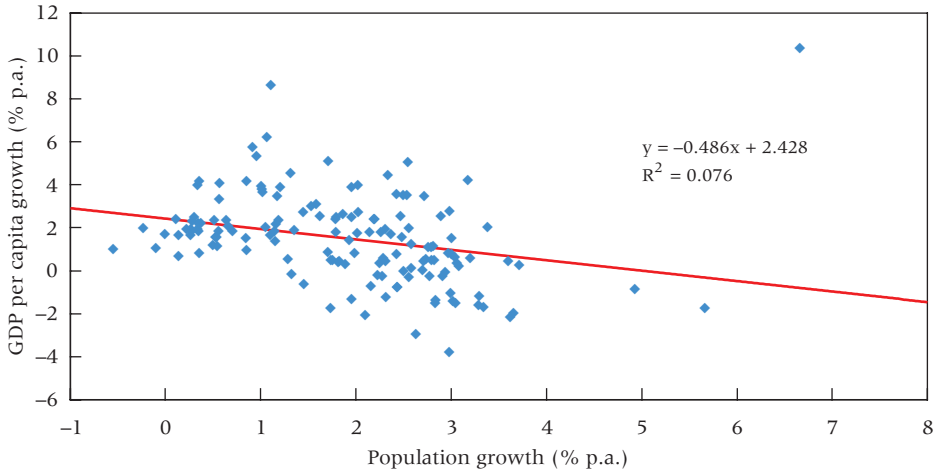
On a global scale, there is no evidence of a positive relationship between population size and GDP per head, or between the growth rates of these variables (Figures 4a, b). The same is true among the industrial countries (not shown separately) and also over a much longer time period. Using data from Maddison (see endnote 1) we computed growth rates over the twenti-

FIGURE 4a GDP per capita and population, 180 countries, 2006 (log scale)



SOURCE: IMF, WEO databases. All countries for which data are available are shown.

FIGURE 4b Growth rates of GDP per capita and population, 147 countries, 1980–2006



SOURCE: IMF, WEO databases. All countries for which data are available are shown.

eth century as a whole for a sample of 12 major West European economies, together with Canada, the United States, Australia, New Zealand, and Japan. A regression of growth in GDP per head on population growth yielded a correlation coefficient equal to –0.12. With Japan excluded the correlation was –0.25. Moreover, small industrial countries are just as rich as large ones (Barlow 1994; Kelley and Schmidt 1995; Sheehey 1996; Barro and Sala-i-Martin 2003).

Economic growth measured simply as GDP growth, as opposed to increase in GDP per head, has no bearing on individual welfare, as the UK House of Lords (2008) emphasized in its recent report. A number of European countries have lost territory and (in most cases) the corresponding population over the last century (Austria, the United Kingdom, Germany, Sweden), without adverse consequences for individual standards of living. While a large domestic market is obviously an advantage, as the US example shows, equivalent advantage may also arise from the adoption of free trade or membership in a trading bloc such as the European single market. The same principle applies to military and political affairs, where countries too small to have much influence on their own can increase their leverage by joining alliances. However, as the EU and NATO illustrate, alliances can be fraught with problems and can rarely mobilize their combined diplomatic or military resources as effectively as a large centralized state.

Small countries within a peaceful 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 impo-

tence makes them convenient as neutrals. Some smaller states, whether densely protected by mountains and guns as Switzerland, or devoid of both as Luxemburg, earn part of their living as uncontroversial hosts to international bodies. Small nations, with the same vote as the biggest, are thereby disproportionately influential in the UN General Assembly and are over-represented among EU institutions. For the most part, it would be vain for countries locked into modern low-fertility demographic regimes to seek radically to change their position in the international league table of population size. And to try to do so through mass immigration would risk a serious breakdown of cohesion.

Can we quantify the likely economic consequences of population decline, specifically its effects upon personal tax rates? Table 2 illustrates a hypothetical population of 80 million under various assumptions about future fertility and net migration, together with the tax rates required for long-run government solvency. Table 2a assumes that the population is initially stationary with a zero government deficit. Table 2b is a more realistic representation of a modern low-fertility economy, with an initially unbalanced age structure and a fiscal deficit in the base year.

In these examples, population decline is associated with aging, which has a harmful impact on government finances. In the short term, the government spends less on children, but this is outweighed by the medium-term loss of tax revenue as the tax base shrinks as a result of a declining labor force. To preserve fiscal solvency taxes must be raised or expenditure cut. The former option is assumed here throughout. All of these conclusions assume that retirement age and workforce participation rates remain constant—an assumption now looking distinctly conservative. The required tax increase depends on who pays the extra taxes and when. Two cases are shown: (1) an immediate across-the-board tax increase affecting all generations, and (2) no tax increase for the generations alive in the base year, with the increase borne entirely by future generations. The key points are:

If taxes are raised immediately, the increase required for long-run government solvency is comparatively small. Faster population decline means somewhat higher taxes, but the effect is not dramatic.

If only future generations pay higher taxes, the effects are more severe and in some cases the required tax increase may be very large.

For any given rate of population change, the sustainable tax rate depends on the relative contribution of native births and immigration to future population. In these examples, immigration is more tax efficient than a higher birth rate, but the difference is not very large.

The conclusion that immigration is a more efficient means of generating tax revenue than raising the birth rate is particularly uncertain. It is derived on the assumption that immigrants and natives of the same age are identical in every way. They have the same earnings, employment rate, and

TABLE 2a Sustainable tax rates under alternative scenarios of future total fertility and migration

Migration scenario/ future TFR	Population after 100 years (millions)	All generations pay extra taxes	Only future generations pay extra taxes	
		Common tax rate (%)	Tax rate for present generations (%)	Tax rate for future generations (%)
No migration				
2.1	80.0	46.8	46.8	46.8
1.8	55.1	47.6	46.8	48.5
1.5	36.3	48.3	46.8	50.8
With migration (200,000 p.a.)				
1.80	80.0	46.6	46.6	46.5
1.39	55.1	47.2	46.6	47.7
0.86	36.3	47.8	46.6	49.6

NOTE: Initial conditions: population = 80.0 million, age structure = balanced, tax rate = 46.8%, government fiscal balance = 0. Assumptions: population initially stationary; constant mortality; taxes levied only on income from wages and profits. The sustainable tax rate satisfies the inter-temporal budget constraint, summation over an "infinite" time horizon (500 years). The discount rate is 3.0 percent, incomes and expenditures grow at 1.5 percent p.a.
SOURCE: Rowthorn 2008.

TABLE 2b Sustainable tax rates under alternative scenarios of future total fertility and migration

Migration scenario/ future TFR	Population after 100 years (millions)	All generations pay extra taxes	Only future generations pay extra taxes	
		Common tax rate (%)	Tax rate for present generations (%)	Tax rate for future generations (%)
No migration				
2.20	80.0	47.2	43.0	50.4
1.89	55.1	48.1	43.0	54.0
1.58	36.3	49.0	43.0	58.9
With migration (200,000 p.a.)				
1.89	80.0	47.1	43.0	50.4
1.46	55.1	47.8	43.0	53.2
0.96	36.3	48.5	43.0	57.2

NOTES: Initial conditions: population = 80.0 million, age structure = unbalanced, tax rate = 43.0%, government fiscal balance = –1.5% GDP. Assumptions: As in Table 2a except for the initial conditions. The initial age structure is unbalanced because of recent fertility decline. There is also an initial government deficit because of the low initial tax rate.
SOURCE: Rowthorn 2008.

productivity, and pay the same taxes; moreover, the absorption of immigrants imposes no fiscal costs, and immigrants do not displace native workers. These assumptions may not hold in practice. US estimates show that while the fiscal impact of younger immigrants is generally positive, it varies greatly according

to educational level and is often lower than that of an equivalent native child. Whatever the educational level of its parents, an additional native birth on average yields a greater fiscal benefit than an additional immigrant who has no more than high school education (Lee and Edwards 2001).

Finally it is important to remember that these effects arise from the aging of the population that accompanies population decline, not from having a smaller population as such. Similar increases in population aging, and consequent fiscal inconvenience, would accompany a transition from moderate population growth to zero growth.

On the question of economies of scale, the significance of this factor depends on the extent to which overseas markets can compensate for the diminution of domestic ones. Free trade makes national-level population decline less important because it increases the proportion of output that is exported. Countries with a small population typically export far more per capita than large countries at the same stage of development. For example, in 2008, total US exports of goods and services were equal to $5,900 per capita. The corresponding figures for Finland and the Netherlands were $24,100 and $44,300 respectively (WTO database). Smaller economies, however, may lack the resources to invest in new highly competitive products requiring expensive research and development. But that situation can also apply to very large countries—there may only be room in the world for two major manufacturers of civil aircraft, and two or three of aero-engines, and a diminishing number of volume car manufacturers, for example. And increasingly these manufacturers are multinational.

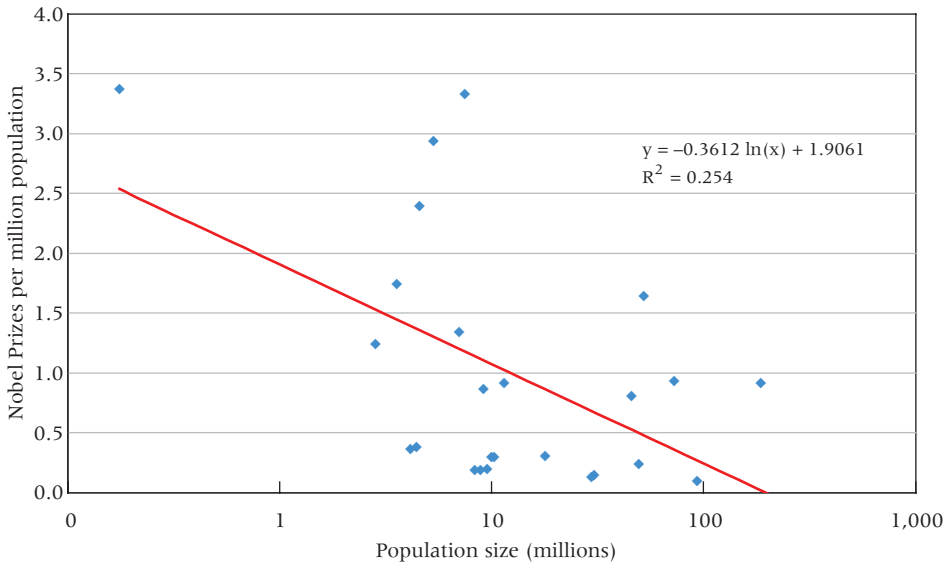
As regards demand, some earlier worries have lost impact. Consumer demand for ever-cheaper goods appears to be insatiable—contrary to what Keynes (1936) and Reddaway (1939, 1977) (and before them Malthus) had feared. Reddaway's concerns were primarily directed to the economy of a manufacturing nation, not one where services predominated, and seem to have been wrong even then. Superior macro- and micro-economic policies have developed in the years since World War II, with floating exchange rates, more open international trade, better management of inflation, and (in many countries) a less regulated labor market and price mechanism. Consumer demand has been fueled by the accelerating inventiveness of (ever-cheaper) consumer products promoted by advertising in ways unheard of in earlier times, the outsourcing of manufacturing, and borrowing. The recent economic crisis had nothing to do with population decline but was provoked by high consumption fueled by excessive debt and failings in the financial sector.

Some claim that declining numbers or small size deprives countries of critical mass for research and development, driving specialists abroad. But among the prosperous countries of Western Europe there is no brain drain from small to larger populations. Scholarship has always been mobile and international, and technical innovations in small countries (e.g., Nokia,

and nuclear power in Finland; advanced jet fighters and other weapons in Sweden) do not support such fears. The related notion advanced by Simon (1981), that population size and growth are essential because they produce more geniuses, to the general good, seems a priori absurd. The briefest refection upon the intellectual output of fifth-century BC Greece and of Renaissance Florence, with the stagnation that followed, or the relative intellectual sterility of much larger populations then and today, allows us to dismiss that notion. There is no significant association between population size and the number of Nobel Prizes awarded per million of population (Figure 5). The smaller populations do better—first in rank is Iceland, and the first eight (mostly Nordic) all have populations under 10 million except for the United Kingdom.

Downturns in house-building are often regarded as a herald of economic decline, depressing demand for other products and leading to layoffs among building workers (although effects on the domestic economy could be mitigated if many are immigrants without permanent residency). Falling house prices erode the asset value for the aged population, on which some in property-owning countries rely for their pensions through equity release. Would population decline thereby trigger a perpetual slump? In fact, large and damaging fluctuations in house prices and demand have so far had little

FIGURE 5 Relationship between Nobel Prizes 1901–2002 per head of population and population size in 1960 (log scale)



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

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 buried in unproductive brickwork.

Furthermore, in most countries growth in numbers of households is far ahead of population growth and will continue long after the latter ends, being driven by independent trends that have substantially reduced household size over the last century: divorce, longer survival, a more independent young population. The trend toward smaller household size, however, has already slowed in the United States and UK. In the UK, the land element in house prices is very high (40 percent of the price or more). Some claim that this is driven by planning constraints on land (Evans 2004: 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 apartments. In the UK and elsewhere there has been an irrational tendency for the co-existence of two inflation systems (national inflation bad, house-price inflation good) leading to inflationary bouts of equity withdrawal. Deflating the house-price bubble, even if painful to the building industry, would eventually benefit national economies. Population stabilization, and decline, would provide one of the pins to prick that bubble once household growth had run its course. Economic stimulus cannot depend upon continued—and ultimately unsustainable—population growth.

The other side of the argument: The merits of population stabilization and decline

Regarding the economy as a whole, long ago the end of population growth was seen by Britain's Royal Commission on Population (1949) as a relief from the balance-of-payments problems that have plagued the UK and other countries for most of the twentieth century, as competitive advantage in manufacturing was lost. Some imports of food, fuel, and raw materials (in Japan all fossil fuel and most raw materials) are unavoidable. With fixed land area there are limits to sustainable food output; with fewer people self-sufficiency is easier and is accompanied by 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 situation worsened by global climate change and population increase.

As population diminishes and the stock of capital goods does not, the ratio of capital to population improves and the average person should be wealthier. Resources can be directed to improve living standards, not to make wider provision for a growing population (Reddaway 1939). However, the

capital stock eventually needs to be renewed and the annual cost of maintaining the complete transport network and other infrastructure may be unchanged, so that with a much smaller population the cost per head would be greater. Once these factors are taken into account, it is less obvious that, over the long run, a much smaller population benefits from inheriting a capital stock designed for its more numerous ancestors. But in the shorter term, a modest reduction in size would take population back to a more comfortable stage when congestion on the same transport networks was less. In many countries, certainly the UK, infrastructure provision—notably in transport—has lagged badly behind population growth and other factors of demand. London is already under serious water stress partly as a consequence of rapid population growth (Environment Agency 2010). To avert temporary crises, a large desalination plant will operate in London from 2010—an extraordinary expedient seemingly more appropriate to the Gulf States or to Australia.

The scarcity of labor in a declining population will inconvenience employers. But there are two important compensations. Employers will be obliged to review the efficiency of their operations and introduce equipment and techniques to increase productivity, substituting capital for labor and creating demand for higher-technology products in a more knowledge-based economy (*Economist* 2006; *Financial Times* 2006). Governments would be obliged to accelerate overdue reforms of retirement age. Much greater efforts would have to be made to mobilize the substantial population of unemployed youth and the "underclass" into the workforce. With abundant labor, immigrant or otherwise, this part of the population, unattractive to employers, can be ignored, remaining in its marginalized and often criminalized state. Mobilizing this population would improve average income, cut crime, and reduce inequality. But generations have now been socialized without work. Investment in training must be substantial, and welfare arrangements more discriminating and less dysfunctional.

Costs of congestion and crowding should decline with smaller population, and journey to work times fall. Traffic could decline *pro rata* with population. With a much smaller population, lower density could increase some journey times, but lower density might have the paradoxical effect of making population more geographically concentrated, as some areas become effectively depopulated. With fewer people, fewer resources need to be devoted to new dwellings and their associated infrastructure once household formation had also ceased to grow. Housing, much criticized recently in the UK for its cramped plots, could be built at a lower density as in the earlier twentieth century, with gardens free from the threat or the temptation of "infill." Unsatisfactory housing, especially in social housing estates on the urban periphery requiring apparently perpetual refurbishment, would be demolished and returned to open land. Costs of housing and of land would eventually fall with a stable or declining population. That outcome might encourage family formation, as discussed later.

The pace of decline: Innovation and investment

Some economic arguments against population decline relate to shrinking markets and their supposedly depressing effect on investment and innovation.

The investment argument is concerned mainly with items such as infrastructure, where capital stock has a long life span and is inflexible. If population is growing rapidly, firms may build ahead of demand, so that capacity is initially underutilized but fills up later as population increases. The prospect of future growth makes investors more adventurous, because over-supply can be eliminated without scrapping. It is sufficient simply to wait for population to catch up. With a rapidly falling population the time profile may be just the opposite, with capacity utilization falling as the number of users declines. Investors will be reluctant to install enough capacity for the current population because they will be worried about future over-capacity. They will err on the side of caution because they cannot rely on growth in demand to eliminate over-supply. The strength of these arguments depends on the time horizon for the product in question and the pace of population decline. For products with a very short life cycle, say five years, there is little difference between a market that is expanding at 0.5 percent a year and one that is shrinking at this rate. After five years, the expanding market is 5 percent larger than the shrinking market. Such a difference would not have much effect on the incentive to invest. Over a 50-year period, however, the horizon that applies to housing and many infrastructural projects, the divergence between the fast- and slow-growing markets would be substantial. After 50 years, the expanding market would be 64 percent larger than the shrinking market.

A rate of decline of 0.5 percent per year seems quite rapid in the context of historical and current experience. The relatively short period of decline in English population totals in the second half of the seventeenth century amounted only to –0.023 percent p.a. (Wrigley 2004). As Table 1 showed, only Latvia, Bulgaria, Serbia, and Ukraine are currently experiencing annual population decline approaching 0.5 percent. All suffer from unusually severe combinations of low fertility, high death rates, and emigration inherited from recent history. In the remaining countries in the table, including Germany, population change is currently around –0.2 percent per year or less. The pace of change in Japan is also –0.2 percent per year at present. If continued, these rates would imply a 10 percent reduction in population every 50 years. However, cumulative alterations in the age structure are projected to accelerate the pace of population change to around –0.6 percent per year in Germany and –0.8 percent in Japan by mid-century (UN Population Division, 2008 Revision, medium variant). Such rates imply a reduction in population equal to 26 percent and 33 percent respectively over a 50-year period. Under these conditions the share of investment in GDP would almost certainly be lower because less productive capacity would be required to meet future demand.

This would be an advantage to the extent that the resources thereby released could be devoted to consumption (see below).

The effect of population decline on innovation is uncertain. One potential channel is through its impact on output growth. Kaldor (1966) famously argued that productivity growth is a positive function of output growth, especially in the manufacturing sector. In a fast-growing economy firms innovate and improve efficiency at a faster pace because they must constantly overcome new challenges. If population decline leads to slower output growth, this should result in less innovation and slower productivity growth. It is difficult to test this claim directly since there is so far little experience of population decline. But we can get some indication by looking at the historical relationship between population growth and economic performance. As we have seen above, there is no evidence that faster growth of population leads to faster growth of GDP per head. To the extent that the latter variable is a suitable proxy for innovation, these results do not support the claim that population growth stimulates innovation. Indeed, the opposite claim is equally plausible. It is conceivable that the existence of a declining population would create new kinds of demand and might actually encourage innovation. For example, the fact that fewer people were using infrastructure each year might create an incentive to design more flexible or less durable forms of capacity that could be cheaply replaced or adapted to alternative uses. Multipurpose buildings are an obvious example.

Transition

The preceding discussion concerns the implications of a given constant rate of population growth. There is also the issue of transition from one growth regime to another. As Matsutani (2006) points out, a decline in the rate of population growth will have an impact on the productive structure of the national economy. The domestic demand for investment goods, such as energy and transport infrastructure, buildings, and machinery, depends on the expected rate of output growth. The share of expenditure devoted to domestic investment will normally be higher in a fast-growing economy than in a slow-growing one. Thus, if population decline leads to slower output growth, the result is likely to be a shift in the composition of domestic demand away from investment goods toward other items such as public services and consumer goods and services. The implications for the producers of investment goods will depend on the speed at which the transition from high to low domestic investment occurs and on the prominence of exports in the economy. If the transition is gradual, then firms that produce investment goods may be able to expand their exports to compensate for their loss of home markets. Alternatively, they may shrink their production of investment goods in an orderly fashion so that other types of producer can take up the slack. However, if the transition is abrupt there may be significant dislocation in the investment

goods sector, and workers displaced from this sector may fail to get alternative employment. Having been geared up to population growth, the economy may find it hard to adjust to a sudden transition to falling population.

Environmental aspects of decline

The environmental consequences of lower population density could be considerable and mostly favorable. Human population growth has been the biggest threat to wildlife (Hambler 2004: Ch. 2). Most encroachment on countryside would cease. With a relaxation of pressures, the intensification of agriculture, which makes much of the countryside a wildlife desert, would be relaxed. Some marginal land could revert to wilderness, as in previous eras of population decline (e.g., sixth-century and late-fourteenth-century Europe). Expensive sea defenses protecting low-lying coastal land no longer needed for agriculture could be abandoned, leaving land to be reclaimed by sea and saltmarsh. In Western Europe, especially the UK, most "nature" is man-made. The climatic climax vegetation (the stable natural state without human interference) over most of Europe is forest, to which untended land would revert within a century or so, after an unaesthetic interval of scrub. Succession from agriculture back to forest brings a greater richness of species (Hambler 2004: Ch 7), and trees are effective carbon sinks.

Emissions and pollution of all kinds would fall, roughly *pro rata* with population size, with benefits for human health (Costello et al. 2009). Households are a most important source. In the UK, for example, in 2007 the domestic sector consumed 28 percent of all energy generated and was responsible for 26 percent of CO_2 emissions—the single most important source except for transport. Energy consumption in the domestic sector grew 20 percent from 1970 to 2007, mostly due to growth in the number of households. Projected population growth will prevent the UK from meeting its self-imposed target to reduce emissions by 20 percent from 1990 levels by 2010 (Boardman 2005), even if nothing else does. The environmental effects of the faster population growth in the United States, Canada, and Australia (O'Connor and Lines 2008) are correspondingly more potent, with US oil use projected to increase by 43 percent by 2025 (Markham and Steinzor 2006). The projected diminution of Japanese, Russian, and eventually Chinese populations must be welcomed for its effect on emissions, the consumption of hardwood forest products, and many other causes of environmental degradation, although the demographic effect is probably minor compared with the increase in purchasing power.

The inevitable end of growth

Most of the world's population has already turned (neo)Malthusian, deciding that its own private population—its family size—has no further need of in-

crease and would be better smaller. Many poor countries now have birth rates below or near replacement level (China, Iran, Thailand, Brazil, Sri Lanka, Vietnam, some Southern states of India). There is no reason why this decline should stop at the replacement level. UN population projections since 2002 have included a low variant indicating global population decline beginning before 2050; demographers at IIASA believe that global decline by 2070 is an odds-on favorite (Lutz, Sanderson, and Scherbov 2001).

The final argument is that population growth, and economic growth measured as GDP, must come to an end. Evidence for unavoidable shortage of fresh water in many parts of the world, even more than projections of food shortage, is mounting. Growth in population and economy together are bringing about their own limitation, if forecasts of the climate change that they provoke have any validity (Dyson 2005). The demographic consequences of climate change are even more difficult to project than climate change itself: uncertainty piled upon uncertainty. The higher latitudes of the Northern Hemisphere may be able to support more population than at present. The prospect for some other areas is less rosy, including many with high population growth in fragile arid lands in the tropics (e.g., Boko et al. 2007). Projections of climate change, although controversial and uncertain, once remote in time, have now started to overlap with the range of conventional population projections, although for the most part are not incorporated into them. If the populations of the world do not reverse their growth through voluntary action, then negative feedback from our previous activities may force such a reversal, in disagreeable ways. But prognoses must be cautious. The sharp declines in population forecast by limits-to-growthers (Meadows et al. 1972, 1992) devalued later warnings based on better evidence.

Conclusions

Widespread sub-replacement fertility has focused attention on population decline. Decline is already underway in a number of countries: in Germany, on the eastern edges of Europe, and in Japan. Some think it will become universal. Population decline and population aging in modern societies share a common cause in low fertility. But one does not cause the other. Much more attention has been given to aging than to decline, in contrast to the position in the 1930s (Glass 1936; Charles 1938).

The dynamics and effects of aging and decline are divergent. Sub-replacement fertility ages the population until a new stable age-structure is reached. Decline continues indefinitely and would in the long run be very substantial. In modern societies, reductions in death rates exacerbate population aging but moderate decline. Small reductions in fertility have an increasingly large effect on population size, but little effect the age structure. Over the very long term, reductions in mortality could have a big effect on both population size and age structure.

The process of population decline inevitably brings problems, although rates of decline might hardly be perceptible to contemporary observers. A smaller stationary population, once achieved, could have advantages. Smaller population size might of itself arrest further decline and permit the resumption of growth. The notion of homeostatic feedback between population size and family building was the foundation of Malthusian population theory (Malthus 1803), and its existence is well documented for earlier centuries (e.g., Wrigley and Schofield 1981; Lee 1985; Wilson and Airey 1999; Clark 2007). Those processes have been neglected in much recent population thinking. Lee (1987: 459) concludes: "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." The advent of population decline suggests that a reconsideration is overdue.

Negative feedback in modern societies may have been underestimated. Populations may have overshot their sustainable or comfortable limits. Inevitably there are lags, protracted by the inertia of culture and tradition, between the beginning of negative effects upon family welfare of larger surviving family size and larger population, and the responses of individuals to it (Ehrlich and Kim 2005). Demographic momentum exacerbates the delay. Fertility at or below replacement level was reached in most Western European countries by the 1930s. But their populations have since increased by between 20 and 80 percent, partly thanks to the transient baby boom but mostly as a consequence of demographic momentum. Density-dependent responses may still be discernible in modern human populations at the provincial level. Recent studies in European countries have shown a negative relationship between population density and fertility, controlling for the effects of other variables (Lutz and Ren 2002; Kulu et al. 2009). Negative feedback can be important at the national policy level as well, in attempts to avert the dire consequences implicit in the persistence of unhelpful demographic trends, and thereby to falsify the population projections that herald the bad news. In many poor countries, family planning policies have already successfully moderated population growth. In some countries of the rich world political pressure is growing for an explicit recognition of the need for measures to increase the birth rate, however ideologically unacceptable pronatalist policies may have been regarded in even the recent past. So far, most direct pronatalist measures have been ill-conceived and ineffectual except in the short run. But broader-based family policies allied to labor market reform are a different matter (McDonald 2006).

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 relevant 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.

Notes

Figures in this chapter are available in color in the electronic edition of the volume.

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1 These data were compiled by Angus Maddison and are available at «www.ggdc.net/maddison/Historical.../horizontal-file_03-2007.xls».

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Population Policy and the Demographic Transition: Performance, Prospects, and Options

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In countries that comprise the majority of the world's population, the demographic transition has now reached its putative endpoint: a state marked by low fertility and low mortality. It is expected that the rest of the world's countries are headed in the same direction, prompted by modernizing social change and nudged by looming physical constraints.[1] What were the roles of deliberate policies, and in particular of policies aimed at affecting fertility, in prompting this momentous transformation? What lessons might that experience hold for shaping population policies in the contemporary world, and shaping them in the future, after transitions have been completed? The discussion below seeks to give some partial answers to these questions.

Before the transition: Population change without policy as a driver

In traditional societies, fertility and mortality are high. In modern societies, fertility and mortality are low. In between, there is demographic transition. Few demographers would be satisfied with this lapidary definition of the transition, yet it states the key determining parameters of that process. But it does not explain its driving forces and does not inform about the particular demographic characteristics of the post-transition state.

The pre-transition era's essential demographic characteristics are reasonably well known. Although estimates of population numbers before about 1700 lack accuracy, it is certain that for large population aggregates over long periods of time—such as the preceding one or two millennia—the average rate of growth was extremely low: positive yet barely distinguishable from zero (McEvedy and Jones 1978). It is thus difficult not to attribute an underlying collective rationality to the behavioral patterns that yielded fertility levels

that generated such long-run near-stationary equilibrium. Lower fertility would have led to population decline. To the extent that higher fertility would have been possible, the control mechanism keeping growth rates in check described by Malthus—an upward adjustment of mortality—would have been triggered. This mechanism is self-regulated: to talk about population policy in the sense in which the notion is understood today—conscious government efforts to influence the determinants of population change—would be plainly anachronistic.

Rulers of any political unit always had, however, an obvious stake in the size and composition of the population over which they had authority, hence an incentive to try to steer demographic change in a desired direction. Greater numbers tended to connote greater wealth and power, at least for those at the apex of the social pyramid. Populationist sentiment prevailed among rulers throughout most of history, evidenced by territorial expansion and conquest and often also by openness to and encouragement in admitting people from the outside to territories controlled by the rulers. But in traditional societies the leverage of the weak pre-modern state over natural growth, and especially over the crucial variable of fertility, was necessarily limited. The dominant influence setting the patterns of reproduction was located, instead, in a deeper layer of social interaction. Births, the key element affecting population change, are produced by individual couples—seemingly an intensely private affair, yet one in which the immediate kin group and the surrounding local society have a material stake. All societies, if in varying degrees, grant a measure of self-sovereignty to their members. An individual has certain rights over his or her direction in life. But this is always subject to constraints, not only biological but also social. Well before rights and obligations are formally codified in legal terms, they are established through spontaneous social interaction—a self-organizing process. Restrictions on freedom to act take the form of social expectations and pressures that individuals can ignore only at considerable personal costs. Typically, there was a strong expectation that men and women should marry and have children. Parental and kin obligations in the matter of bringing up children were well understood by all adults and informally enforced by the community. In most traditional societies there was an expectation that children are to be born to married couples only; that a husband is obligated to support his wife and his children; and that he can expect reciprocal services from them. And informal rules shaped by community interest tended effectively to regulate the entry of foreigners.

The fabric of such demographically relevant behavioral expectations, supported by internalized personal norms and buttressed by religious injunctions, was a product of social evolution; how effective such institutions were became an important determinant of societal success. As a classic statement of Alexander Carr-Saunders, a prominent British demographer of the inter-

war years, asserted, in the constant struggle between adjacent groups, those practicing the most advantageous customs would have an advantage over those that practiced less advantageous customs (Carr-Saunders 1922). Few customs can be more advantageous than those that result in a number of persons the members of the group consider to serve their best interest. Thus in traditional society the idea became established that it was the right thing to bring up a certain number of children, and social behavior yielding that number on average would be enforced by a web of informal but effective expectations and pressures.

Given the harsh biological and economic constraints pre-modern societies invariably experienced, that "desirable number" presupposed fairly high fertility: high enough to provide a sufficient margin of safety over mortality. Successful societies—those that survived to the dawn of the modern era—thus obeyed the biblical injunction to be fruitful and multiply, even though such multiplication as a matter of necessity was very slow. But traditional demographic regimes resulting from spontaneous social interaction achieved their modest population growth rates at varying levels of fertility and mortality. Early modern Western Europe succeeded in maintaining a relatively low average level of mortality by keeping birth rates low, primarily by means of a fairly high average age of marriage and substantial proportions who remained permanently single. A contrasting pattern, prevailing in much of the rest of the world, combined early and universal marriage and a consequent higher level of fertility with death rates that were also higher. With respect to the rate of population growth, these different combinations of birth and death rates in traditional societies were quite similar. The potential for rapid population growth that might be triggered by a fall of mortality was, however, much higher when the pre-modern equilibrium was the result of a combination of high mortality and high fertility.

Rationale for population policy

The rise of effective state formations in the West brought about the credible promise of realizing a better material life for large masses of people. The state increasingly came to be seen as an institution created by the voluntary association of the individual members of a given society to further their interests. The central function of the state was to produce public goods—goods that individuals cannot secure for themselves. The US Constitution, promulgated in 1789, articulated the key items among such goods concisely and with the ambition of conveying universal validity. The aim of the Union formed by the People was, in the words of the Constitution's Preamble, to "establish Justice, insure domestic Tranquility, provide for the common defence, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity." In pursuing such goals, regulation of immigration into a state's ter-

ritory is clearly defined as a public good, thus delineating a particular role for population policy. Aggregate fertility may also be construed as a public good, if its level as determined by spontaneous social interaction is considered too high or too low with reference to the collective interest.

The potential role of the state in regulating immigration is straightforward: individuals wishing to restrict or promote it cannot set up their own border patrols or issue entry visas. Individual preferences in the matter, however, are likely to differ. It is the task of the government to weigh and reconcile conflicting individual desires and come up with a policy deemed the best under the accepted rules of the political decisionmaking process.

To claim a role for the state in the matter of fertility is far more problematic. Additions to the population are the result of a multitude of individual decisions concerning childbearing. Within the constraints of their social milieu, these decisions reflect an implicit calculus by parents about the private costs and benefits of children to them, including consideration of the interests of the children themselves. But neither costs nor benefits of fertility are likely to be fully internal to the family: they can also impose burdens and advantages on others in the society. Such externalities, negative and positive, represent a legitimate concern for all those affected. An individual's influence on the fertility of other families, however, is limited: there are no private markets offering preferred patterns of aggregate demographic processes to individual buyers. Remedying such market failure may then be attempted through intervention by the state so as to affect individual behavior in order to best serve the common good.

The earliest clear formulation of the population problem as one of coordination among individual preferences, hence establishment of the rationale for potential state intervention in the matter of fertility, was given by William Foster Lloyd, an Oxford mathematician and economist, in an essay published in 1833 (Lloyd 1968). In the spirit of the Malthusian concerns of his time, Lloyd noted the possibility of overpopulation even under conditions when all families have only the children they actually want, and he suggested the direction in which remedy ought to be sought. The simple fact of a country being overly populous, he pointed out, is not sufficient evidence that the fault lies in the people themselves, or a proof of the absence of a prudential disposition. The fault may rest, not with them as individuals, but with the constitution of the society of which they form part. Population policy should therefore strive toward institutions and incentive systems that provide signals to individuals guiding them to behave in harmony with the collective interest.

The onset of demand-driven fertility transition

The dawn of modernity was signaled by increases in agricultural productivity, permitting gradually diminishing death rates, hence accelerating population

growth. But that growth could limit the gains improved productivity would have permitted in terms of average standards of living. In his famous *Essay,* written one-third into the eighteenth century, Richard Cantillon, one of the founding fathers of modern economics, devoted a chapter to this race between numbers and products. Is it "better to have a great multitude of Inhabitants, poor and badly provided, than a smaller number, much more at their ease?" he asked. Cantillon did not answer that normative question, but he supplied a positive theory of population growth, highlighted in the elaborate title of his Chapter XV: "The Increase and Decrease of the Number of People in a State chiefly depends on the Taste, the Fashions, and Ways of Life of the Property Owners" (Cantillon 2010). Thus was born the demand theory of fertility, formulated for the dominantly agrarian society of his age, but with a bright future of general applicability. The size and growth of the population, Cantillon held, reflect how people wish to spend their resources and what levels of living they consider acceptable for themselves and their families. He concluded that "the Increase of Population can be carried furthest in the Countries where the people are content to live the most poorly and to consume the least produce of the soil."

Classic Malthusian theory considered the outcome of this race between growth in productivity and growth in population foreordained. As was posited in the Bible, "When goods increase, they are increased that eat them" (*Ecclesiastes* 5:11). Malthus agreed. He held that population has an inevitable tendency to grow exponentially and such growth eventually must nullify any economic gains. Rising mortality cuts population growth back to zero. The initial improvement is doomed to be temporary: for the great masses of people, equilibrium is re-established at subsistence levels of living.

Whatever the validity of this grim model of economic–demographic interaction in interpreting pre-modern population history, it was shown to be invalid for the two centuries that followed its formulation. The industrial revolution, set on its course in Western Europe by the harnessing of new energy sources and by an outburst of technological improvements in industrial production and transportation, brought rising standards of living, hence better health and falling mortality. Demographic transition, though destined to proceed with significant differences from country to country as to its timing, speed, and growth implications, was set into motion on its world-transforming trajectory. In its long initial phase, birth rates remained high or decreased only slowly, hence lower death rates spawned historically unprecedented rates of population growth. But the economy could grow even faster, accommodating the ever higher human numbers. On the global level, population during the nineteenth century multiplied by a factor of 1.8, from about 900 million to slightly over 1.6 billion. In the twentieth century, with world population by 2000 passing the 6 billion mark, the global multiplier was 3.8. The expansion of the supply of food, the ultimate limiting factor in

Malthusian theory, kept pace with, indeed well surpassed, the expansion of population, however rapid the latter turned out to be.

But could such expansion on a finite planet continue to keep up with Malthusian dynamics? Replicating twentieth-century growth in the twenty-first would have produced a global population exceeding 23 billion. Wouldn't that be Malthus redux? That is a question history will not put to the test. Albeit with a time lag, the fall of mortality elicited decreasing birth rates. By the third decade of the nineteenth century Malthus's own thinking had also evolved, leading him to a terse but lucid and profoundly significant formulation of a demand theory of fertility of his own. Improvements in the standard of living need not be followed, as if by an iron law, by fertility-generated slipping-back to mass misery and rising mortality. He wrote: "From high real wages, or the power of commanding a large portion of the necessaries of life, two very different results may follow; one, that of a rapid increase in population, in which case the high wages are chiefly spent in the maintenance of large and frequent families; and the other, that of a decided improvement in the modes of subsistence, and the conveniences and comforts enjoyed, without a proportionate acceleration in the rate of increase" (Malthus 1820: 250–251).

The possibility of such diametrically different responses to the stimulus of higher wages suggests a large element of indeterminacy in fertility behavior. To Malthus, the causes of these divergent responses were to be found in the circumstances, social and political, in which people lived—in particular, whether those circumstances hindered or rewarded planning for the future. From his analysis he derived a prescription for a population policy that would yield the hoped-for demographic outcome: "Of all the causes which tend to generate prudential habits among the lower classes of society, the most essential is unquestionably civil liberty. No people can be much accustomed to form plans for the future, who do not feel assured that their industrious exertions, while fair and honourable, will be allowed to have free scope; and that the property which they either posses, or may acquire, will be secured to them by a known code of just laws impartially administered. But it has been found by experience, that civil liberty cannot be secured without political liberty. Consequently, political liberty becomes almost equally essential" (Malthus, ibid.).

During the long nineteenth century—which may be thought of as stretching to the outbreak of World War I—the politics in Europe and in its overseas offshoots favored, even if imperfectly, the development of institutional and legal frameworks in harmony with such principles. This, in interaction with economic and cultural changes shaped by the industrial revolution, created a milieu that fostered the prudential habits of parents, rendering the micro-level calculus of the costs and benefits of children increasingly salient. Rising demand for labor, including greater use of child labor, and rising income levels tended to sustain high fertility or even to stimulate it. But im-

proving health conditions and lower death rates, rising literacy and education, rising material expectations and broadening opportunities for social mobility, the progressive emancipation of women and their increasing participation in the formal labor force, and the general patterns and less child-friendly circumstances of urban living soon pulled in the opposite direction. This tendency was powerfully reinforced by programmatic activities consistent with the limited role the liberal state claimed in managing the economy. Beyond establishing and maintaining the rule of law and protecting property rights, this role included programs providing better sanitation and promoting public health as well as projects aimed at improving basic infrastructure for transport and communication. Late in the nineteenth century, state-organized arrangements for income security for the elderly started to be adopted, lessening and eventually largely eliminating reliance on children as a source of support in old age. In the increasingly complex economy, the required length of formal education for children grew longer. To reduce those costs that fell directly on parents, the state or local government assumed a key role in financing public education. At basic levels, school attendance was made mandatory and labor laws curtailed the employment of children. On balance, the costs to parents of raising children increased substantially.

Reflecting long-standing cultural values and religious injunctions, and contrary to laissez-faire principles, the liberal state generally banned the spreading of contraceptive information and the sale of contraceptive devices and made abortion illegal. Such restrictions typically remained in effect well into the twentieth century. But by all evidence, any upward pressure on fertility from these restrictions was swamped by diminishing the number of children parents wished to have, reflecting rising material aspirations, fears of loss of social status, and rational responses to signals from a competitive market economy in which large families became a disadvantage. During much of the nineteenth century birth rates were slowly falling in France and the United States, and by the turn of the twentieth century they were falling rapidly in virtually every country of the West. In many cases, rates of population growth fell also, despite continuing reductions in mortality and the temporary moderating effect of population momentum reflecting earlier higher fertility. In most countries of Europe this trend was reinforced by net outmigration, which both sending and receiving countries—notably the United States, Canada, and Australia—positively encouraged or at least permitted.

The effects of the institutions of the liberal state on fertility behavior thus heralded the prospect of a new demographic equilibrium in the West. Contrary to the original Malthusian formulation, that equilibrium could be consistent with continuing material progress: convergence to a stationary population at low levels of fertility and mortality, at a population size not necessarily optimal in an economic sense yet not conspicuously excessive in relation to the physical environment.

New policy concerns for transition's pioneers

The massive losses of life resulting from World War I and from the influenza pandemic in its immediate aftermath, and the sharp drop in the number of births during the war years, were temporary disruptions in the steadily declining trends of fertility and mortality that characterized the prewar decades in the West. Those trends soon made it evident that there is no built-in guarantee that the sum total of individual fertility decisions will eventually converge to a point at which, in the aggregate, the rate of population growth will be zero or will fluctuate tightly around a zero rate (Demeny 1997). By the late 1920s demographers realized that fertility rates in several Western countries had fallen to such a low level that, in the long term, natural increase would become negative. This trend became more accentuated and more general under the impact of the Great Depression. Some observers foresaw a "twilight of parenthood."

Just as excessive reproduction perceived in a Malthusian framework called for corrective fertility-moderating public policies, in an increasing number of Western countries there were calls for corrective action to achieve the opposite result: increasing fertility so as to ensure at least the maintenance of the current population size. In some countries the ban on contraceptives was tightened and the penalties on abortion were increased. These measures had little effect. Neither, predictably, did governmental exhortation to families to have more children.

The most promising avenue for population policy seemed to be to use the instruments available to the state for redistributing income so as to reward demographic behavior considered socially desirable and to discourage contrary behavior. By the 1930s pronatalist policies came to be fairly widely if tight-fistedly applied in low-fertility countries (Myrdal 1941). Among Europe's emerging democratic welfare states, Sweden and France were pioneers in providing financial rewards and services in kind to families with children, especially to larger families. (Sweden, however, also allowed liberal access to contraception.) Similar policies were applied with greater vigor in fascist Italy and Nazi Germany.

Invariably, the proponents of such policies claimed results in terms of birth rates somewhat higher than would have been expected in their absence. But the latter quantity is a hypothetical one, which introduces a necessary caution to such claims. More pertinently, when average fertility is low, the birth rate or the total fertility rate in any given year is an unreliable measure of long-run fertility. Couples have considerable latitude to time the birth of their children earlier or later, without affecting the number of children they ultimately wish to have. Logically, pronatalist policies seek to affect that lifetime total rather than aiming at temporary increases in the birth rate.

By the mid-point between the two World Wars, around 1930, Western fertility levels were typically near replacement level and often below it. The

net reproduction rate was 0.71 in Austria, 0.74 in England and Wales, 0.75 in Germany, 0.86 in Sweden and France, and 0.94 in the United States. Relatively young age distributions temporarily sustained positive rates of natural increase, but maintenance of the existing fertility levels clearly presaged eventual population decline. The economic and social forces bearing on the micro-level calculus of the costs and benefits of reproduction that powered that transformation have been described by countless analysts essentially following and further refining the insights of Cantillon and Malthus.

Observed fertility trends during the interwar years thus clearly signaled the end of the demographic transition in the West. The criteria satisfying the definition given at the start of this chapter were either already met or their achievement seemed imminent. Both fertility and mortality were "low"—the latter index at least as reflected by the relevant measure: survival up to the upper limits of childbearing age. But the implication of those low levels did not necessarily suggest the smooth attainment of a stationary state as envisaged in stylized models of the demographic transition. Below-replacement fertility rates experienced in the 1930s demonstrated the possibility of an overshoot in the declining trend. And the possible workings of a spontaneous mechanism that would restore fertility to equilibrium were far from evident. If the mature Malthus was right—that once the "character of the lower classes" became elevated, they would exercise restraint in reproduction because "they cannot acquiesce patiently in the thought of depriving themselves and their children of the means of being respectable, virtuous and happy"—why could not such virtue and happiness be consistent with having on average less than two children surviving to adulthood? And could not "social capillarity" as perceived by Arsène Dumont result in below-replacement fertility (Dumont 1990)? Indeed, demographers, like the most prominent French transition theorist, Adolphe Landry, foresaw a coming population decline (Landry 1934). Landry argued that the end of the transition (he called it "demographic revolution") would be a long-term disequilibrium in which fertility levels sink below replacement for a long duration. Oswald Spengler predicted Europe's "appalling depopulation…that will last for centuries" (Spengler 1956). Keynes, who in the early interwar years still worried about the "Malthusian devil," by the 1930s came to see the demographic future as one of stagnation or plausibly decline (Keynes 1937).

Such perspectives suggested that governments' indifference to population matters in the West would be replaced by policies seeking to counteract an undesired trend. Writing in the late 1940s, when the reappearance of low prewar birth rates was still the common expectation in the United States as well as in Europe, Frank Notestein contemplated the likely reaction: "Between now and the end of the century…many of the forces tending toward a reduction of family size are likely to continue in effect. On the other hand, we have yet to see a nation approaching a stationary population that did not launch strong measures to stimulate childbearing. I expect that efforts to in-

crease births will be one of the major preoccupations of those concerned with social legislation in the Western world" (Notestein 1950: 339).

But this was not to be. After the war was over, the baby boom intervened, demonstrating the fallibility of population forecasts even when these are elaborated from a well-developed statistical base. The boom at least temporarily dispelled any talk about prospects of population decline, let alone discussion of action aimed at counteracting such prospects. Policy ambitions in the domain of population became refocused, instead, on population change in countries at an earlier phase of the transition: countries characterized by steeply falling death rates and high levels of fertility, hence rapid population growth.

International population policy: The drive to complete the transition

In the countries that the United Nations categorizes as less developed, population policy issues attracted little attention until the middle of the twentieth century. Fertility remained high, more or less at its pre-modern level. Population growth was slowly increasing, however, as a result of improvements in mortality. Following the end of World War II, mortality decline accelerated greatly and as a result so did population growth. In 1950, world population was 2.5 billion. Some 1.7 billion of that was in countries classified as less developed, with an average annual birth rate of 44 per 1000 population—twice as high as in the more developed group. Unless a decline of the birth rate got underway fairly rapidly, an unprecedentedly large expansion of human numbers was inevitable.

Although the trigger of such population growth—falling death rates—was a welcome development, growth rates that would double or even treble a population within a generation seemed a major obstacle to development and a potent generator of mass poverty. And the large and widening opposite-signed differentials between the more developed and the less developed countries in population size and average income levels were seen as holding out the prospect of major dislocations and long-term instabilities within the international system. As a result, in the 1950s an intense debate started on what policies could reduce fertility in the less developed world. This policy debate was primarily Western, much of it American, just as the diagnosis of the problem itself had been. The proposals that emerged were to be applied in countries representing a large and growing share of the global population. Population policy became "international" (Piotrow 1973; Donaldson 1990).

The West of course already had relatively low fertility, and with it much historical experience on why birth rates fell. Social science analysis was virtually unanimous in how it interpreted this experience. The explanation centered on the role of changing structural conditions of the economy,

conditions to which micro-level units of the population tended to respond, in demographic as well as in other matters. Demand for smaller families was seen as the primary force determining birth rates; the means by which couples regulated their fertility were not unimportant, but seen as a distinctly secondary factor. If the demand was strong enough, fertility would be low, even if birth control technology was primitive. A transition to low fertility presupposed changing preferences, and such preferences were responses to market signals. If policy was to have an explicit role, it would be through reinforcing those signals.

In the experience of past fertility transitions, four components of the incentive structure seemed especially pertinent in determining the prospects of fertility change in the developing world: the direct costs parents must incur in bringing up children; the opportunity costs of children to parents, that is, the earnings a couple (and especially the wife) must forgo because of children; the contribution of children to family income through labor services; and the contributions of children to parents' economic security in old age, in comparison to alternative sources of security.

Fertility declines when shifts in these components make family limitation advantageous to couples, overcoming cultural resistance supporting traditional behavior. Patterns of development generate that effect when at least some, but especially when all of the following conditions are fulfilled: social expectations and formal institutional arrangements place on parents the major financial responsibility for raising their own children, including much of the cost of education and health care; women have access to income-earning opportunities in the labor market, including jobs not easily compatible with childbearing and childrearing; social institutions make formal education (primary and early secondary) compulsory and effectively enforce school attendance; child labor is made illegal; and effective legal guarantees of property rights, legal enforcement of private contracts, and the development of public and private insurance and pension schemes provide attractive and comparatively secure alternatives to children as a source of old-age security.

Social and institutional conditions that make such changes potent generators of fertility decline include emphasis on personal economic contribution (rather than, for example, class status or political loyalty) as the primary factor determining a person's earnings, thus providing an incentive for increased investment in human capital; systems of promotion that provide opportunities for upward social mobility according to merit and tolerate downward social mobility; openness to outside influences that create rising expectations with respect to material standards of living; and emphasis placed not only on the rights but also on the social and economic responsibilities of the individual.

Some of the factors that prompted the fall of fertility in the West also became operational in the less developed countries as concomitants of economic and social change, not least a precipitous fall in mortality, promising

the expected results in fertility behavior. International conferences, for example the 1974 Bucharest conference on population, spelled out many of the socioeconomic developments necessary for fertility to shift from high to low levels. But assembling the instruments so identified into a coherent strategy of institutional-structural reforms remained an elusive task. In promoting development, governments, encouraged by much international advice backed up by foreign aid allocations, came to see their roles not in harnessing the market, but in replacing it in performing key developmental tasks through specific goal-oriented programs. In the matter of population policy, the rapid postwar progress in the technology of birth control provided an apparent short-cut for achieving fertility decline through programmatic means. Markets, it was held, could not be relied on to bring that technology to those wishing to practice birth control. Governments could, instead, organize free delivery of birth control information and provide effective means for preventing births to all those, primarily (it was assumed) women, who wished to plan their families. Surveys indicated that a substantial latent demand existed for such services. Satisfied customers, in turn, would serve as role models, bringing new clients to the program.

By the mid-1960s, in programmatic terms the international population policy debate on the relative importance of demand versus supply was essentially decided in favor of the latter. The existence of demand for fewer births was taken for granted, but supply of contraceptives and ability to home-produce birth control were lacking. For the next quarter-century, population policy in the developing world became essentially synonymous with family planning programs. Financial and administrative limitations within developing countries were seen as necessitating heavy involvement of foreign assistance in launching and sustaining such programs. Although donor countries' own domestic experience in this area was practically nonexistent, such aid, justified by the seriousness of the "population problem," was readily forthcoming, partly in the form of bilateral assistance and partly through international aid institutions.

The cost of birth control technology was, in itself, relatively modest. But sustaining an effective delivery service represented significant claims on scarce human and material resources. Declared demand for birth control does not necessarily translate into effective willingness to practice it: conflicting desires may interfere. Perceived weakness of latent demand, or "unmet need," was reflected in the requirements that programs were supposed to satisfy if they were to be successful. These typically included items such as those spelled out by a director-general of WHO, "doorstep accessibility of quality services," "broad choice of contraceptive methods," "forceful IEC [information, education, and communication] programs," "sound financing strategies," "sound management with proper logistics," "evaluation systems," "a continuous process of strategic thinking, planning and management," and "staff leadership for program parameters" (Mahler 1992).

This internationally approved and exported programmatic approach was justified by the sluggish interest in "population control" commonly exhibited by aid-recipient governments. As a remedy, it was felt, organizational machinery had to be set up by outside experts, and the machinery had to be oiled by foreign aid. But that approach seldom sparked local ingenuity, innovation, and enthusiasm. Such dynamism, as history in other fields of developmental endeavor tends to demonstrate, is most vigorous if home-grown by local elites, nurtured by observing other societies' successes and failures, and fueled by a local mixture of admiration, frustration, contempt, and intention to imitate yet determination to do better than the original model. And the model is seldom an organizational chart drawn up by international experts: it has more to do with getting acquainted with foreign products and technologies, studying statistics, watching foreign films, reading foreign fiction, observing tourists, and coming home from a study year abroad and deciding that traditional ways of behaving are not compatible with modern ways of living and getting rich and determination that things at home must change. (This rudimentary characterization of reforming instincts has its even more important micro-level equivalent, prompting grass-roots changes in thinking, attitudes, and preferences and leading to action to change fertility behavior.) Apart from China, whose population policy was fully home-grown, although with unsuspecting intellectual godfathers from far-away lands, government-organized family planning programs in the developing world in the last third of the twentieth century tended to be transplants of a very different model (Greenhalgh 2008).

The effectiveness of family planning programs in reducing fertility remains a matter of controversy.[2] According to international guidelines, programs recruit their clients on a strictly voluntary basis. By accepting the service voluntarily, the individual acceptor demonstrates that she (or, sometimes, he) values that service. But some of the more successful programs, notably in Asia, tended to increase acceptance by heavy-handed methods of persuasion (as, for a brief period, in India) and (in the especially important case of China) by administrative fiat backed by legal sanctions (Connelly 2008). Where fertility fell in less developed countries with active family planning programs, free program-provided services typically accounted for a large percentage of those practicing contraception. This unsurprising result is then often taken as an indicator of success in reducing aggregate fertility. But what would have happened in the absence of the program is conjectural, hence routinely ignored. Some less developed countries that lacked government programs also experienced major falls of fertility: Brazil is a conspicuous example. Similarly, if programs had seemingly only minor success in reducing fertility, this could be taken as evidence that the program was inadequately financed, organized, and managed: greater efforts would have led to better results.

Family planning programs as they were commonly conceived bore a strong resemblance to health programs. But given the special priority ac-

corded to family planning services in foreign assistance, typically they were organized as a separate "vertical" program, or kept administratively distinct within the broad health program. The justification for such treatment was that while acceptors of family planning services are recruited because the program satisfies their individual need, the program also serves a national developmental need by helping to reduce aggregate population growth, hence deserves priority. Once a family planning program is organized, its managerial and professional cadres form a natural advocacy group strongly motivated to secure the program's sustenance. Invoking the public interest in lowered fertility, as distinct from simply serving the needs of the clients of the program, has long been a key supporting argument in that endeavor.

Over time, this developmental prop has eroded. This was in part a result of criticisms of the intrinsic scientific merit of the argument (Pritchett 1994; McNicoll 2006). Even when outside financing for the programs was abundant, little attention was paid to understanding the relationship between population dynamics and economic and social change. The link between these factors was taken as self-evident: population growth takes out a big chunk from the growth of income per capita or even entirely wipes it out. This is a primitive formulation of a complex matter, but it seemed to serve its purpose. But when developing economies can grow fast in terms of national income as conventionally measured—at a clip of 5 percent or more per year—the rationalization loses force. Over time, erosion of support was also a reflection of the extensive decline of fertility that has occurred, a decline often attributed to the success of the family planning programs themselves. On the eve of the 1994 International Conference on Population and Development, a review, considered highly respectful of the importance of fertility decline for successful development, reached the guarded conclusion that the relevant data "mostly support the view that rapid population growth in poor countries under conditions of high fertility is inimical to many development goals"—with "rapid" defined as "in excess of 2 percent annually" (Cassen 1994). By that time, among world regions, only Africa and West Asia had a population growth rate meeting that criterion.

Accordingly, the development rationale of family planning programs was gradually replaced by the argument that the programs satisfy important health needs and help people exercise a fundamental human right. The Cairo conference formalized this shift: even though the name of the conference for the first time included a reference to development, scant attention was paid to that concept. Family planning programs were redefined, instead, as reproductive health programs, responding to a broader range of women's health needs, such as prevention of unsafe abortions and sexually transmitted diseases, including HIV and AIDS. Beyond this, new emphasis was put on some requirements that would contribute to women's empowerment: reduction of infant and maternal mortality, improvement in girls' education, and women's

opportunities for employment and political participation. Although the connection was not highlighted, these conditions are likely to help reduce the birth rate through stimulating the demand for smaller family size. The Cairo conference, in effect, reverted to some key elements of a demand strategy for reducing birth rates.

The future of family planning service programs is thus left in a tenuous status. Without invoking a collective interest in a wider practice of birth control, it is not clear what level of priority should be accorded to such programs as part of publicly financed health programs, or indeed relative to many other social welfare programs that also serve demonstrable human needs. Not surprisingly, growing respect in national policy debates is accorded to suggestions to rely on the market in enhancing access to contraceptives and to provide program services on a fee-for-service basis. The spectacular speed of the spread of wireless methods of communication was driven by felt needs, not by free distribution of cell phones and forceful IEC programs on how to use them. Rapid diffusion of contraceptive technology could rely on the analogous mechanism of demand eliciting supply, provided that demand was strong enough.

Yet slighting the significance of the connection between population dynamics and development is not warranted (Birdsall, Kelley, and Sinding 2001). Among numerous ramifications of the benefits of slower population growth, by the 1990s characteristics of the age distribution and changes in it received renewed emphasis from a number of economists. The transitional period, when the share of the age groups in the productive ages is especially high—because lowered birth rates in the preceding decades have thinned out the numbers of the very young, and because population aging has not yet heavily increased the numbers of the elderly—came to be seen as an uplift to development, at least in those countries well enough organized to capture the "demographic dividend" offered by this temporary peculiarity of the age distribution. East Asian development is presumed to demonstrate this benign demographic effect. Where fertility decline is still laggard, its policy-induced acceleration thus promises measurable if temporary potential economic benefits.[3]

Perhaps more controversially, economic thinking in the early twenty-first century may be said increasingly to exhibit a distinctly Ricardian hue. Resource constraints, especially environmental constraints, faced by a global population heading toward 9 billion by mid-century are seen as potentially highly problematic. Can the high consumption levels attained in the rich countries become a characteristic of populations that are still relatively poor, and if so, with what social, economic, and geopolitical effects? Optimists see all countries proceeding toward economic growth, albeit with time lags and differential speeds (Easterlin 1996). According to this view, a world with 9 billion inhabitants can eventually accommodate everybody in material com-

fort; indeed, some day Nepal should become as rich as Switzerland is today, while Switzerland will continue its progress to even higher standards of living. Cross-sectional income differences—between countries and, within countries, between social strata—are less important than the overall upward developmental dynamics. And such dynamics are both achievable and certain to moderate and even reverse the growth in global population numbers. Generalizing from past trends, the relationship between wealth and wealth-generated problems—for example, environmental pollution—appears in this optimistic outlook as tracing a Kuznets curve: first a rise in pollution, then a leveling-off, followed by steady improvement. Other informed observers dismiss this view of world economic and population dynamics as Panglossian (Ehrlich and Ehrlich 2004; Daly 2008). They see the twenty-first century as a time when the combination of growing material consumption per capita with still-increasing population numbers is bound to clash with the globe's biophysical limits. And the limits themselves may be adversely affected by the product of human numbers and per capita consumption, as is signaled by forecasts of global climate change. Competition for resources and darkened prospects for steady economic growth, especially in countries that are still poor in social and human capital and short of special natural resources, suggest a twenty-first century characterized by sharpening domestic economic and social problems and political instability, with potentially dire consequences for international conflict. Pessimistic scenarios would call for renewed recognition of population growth as a problematic element in developmental dynamics and for a rethinking of policy approaches promising appropriate remedies.

Beyond the transition: Policies confronting below-replacement fertility

During the second half of the twentieth century, debates about population policy and consequent programmatic action were centered on rapid population growth in the less developed world. Toward the end of this period, however, a quite different demographic phenomenon began to attract attention: aggregate fertility levels that are inadequate for the long-run maintenance of the population. Analytically, the potential policy issue raised by below-replacement fertility is identical to the problem inherent in fertility levels that generate rapid population growth: it is caused by the disjunction between the sum total of individual reproductive decisions and the collective interest in a long-run demographic equilibrium. But this time, individual aspirations imply decreasing population numbers. The syndrome, as was noted above, is not entirely novel. But in the decades immediately following World War II, the baby boom seemed to make the issue of low fertility moot. Indeed, by any historical standard, population growth was rapid during the second half of the twentieth century even in the developed

world. Europe's population, for example, grew during that period from 550 million to about 730 million.

The baby boom was, however, a temporary interruption of the secular downward trend in fertility. By the 1970s, the net reproduction rate was at or below unity in most countries in Europe and also in the United States. In the United States fertility stabilized at or very close to that rate, but in Europe fertility continued to decline. By the beginning of the twenty-first century, the average total fertility rate in Europe was 1.4. Such a level, if maintained indefinitely, would result in a population loss of one-third roughly every 30 years. In a dozen or so countries, notably in Southern, Central, and Eastern Europe, period fertility rates were at low levels without historical precedent for large populations. If continued in the absence of large compensatory immigration, this would not only lead to rapid population decline but also result in very high proportions of the population at old ages. It might be expected that in the affected countries such prospects would prompt vigorous policy response.

By and large, however, this response has not been evident. Most governments and the general public tend to view below-replacement fertility with an equanimity quite unlike the alarmed reaction that the same phenomenon elicited when it first emerged between the two World Wars. And introduction or at least advocacy of explicitly pronatalist policies, common in the 1930s, is conspicuous by it absence. There are a variety of reasons for this indifference.

First, the preeminent population issue confronting policymakers in the post–World War II period was rapid global population growth. Programs aimed at moderating fertility in the developing world received assistance and encouragement from the rich, low-fertility countries. Although the rationale was modified over time, such assistance and encouragement have continued, as indeed substantial further population increase in the less developed countries is anticipated in the early decades of the twenty-first century. Even though population issues tend to be sui generis, reflecting differences in demographic behavior country-by-country, there remains a perceived dissonance between fertility-lowering assistance to other countries and engaging in action at home serving the opposite aim. Faulty logic notwithstanding, the international terrain has not been favorable for domestic pronatalism.

Second, the rate of natural increase—the difference between the number of births and the number of deaths—is still positive in many of the countries with fertility well below replacement. In the instances where the number of deaths exceeds the number of births, the loss still tends to be marginal. This is the result of age distributions—reflecting past fertility and mortality and notably the effects of the postwar baby boom—that still favor population growth or moderate population decrease. While this momentum effect is temporary, the fact that the longer-term implications for population

decline and aging are only dimly perceived by the public provides an excuse for inaction by policymakers.

Third, when those longer-term demographic effects *are* understood, a calmer attitude still prevails. There is an inclination, reinforced by increasing concern with the quality of the natural environment, to regard a degree of demographic "decompression" as a welcome prospect, especially in countries with already dense populations. And it is assumed that the economic and social disadvantages that might be imposed by a declining population—population aging, intergenerational transfers, slower economic growth, industrial restructuring—can be effectively managed through institutional adjustments and social policy measures other than those aiming for a higher birth rate. A demographic policy often regarded as potentially helpful in this regard is encouragement of immigration. That willing immigrants are available to compensate for low birth rates is taken for granted—a realistic assumption in high-income countries. But the assumption underlying this thinking is that the shortfall of fertility from replacement level is moderate and compensatory immigrant inflows are correspondingly small.

Fourth, there is a vague expectation that the population decline, impending or already begun, will in due course trigger corrective homeostatic mechanisms, leading to a spontaneous rebound in the level of fertility. Another baby boom may not be in the offing, but fertility may rise sufficiently to once again reach or at least approximate replacement level. Governments, it is assumed, would be ill-advised to interfere with this natural process by trying to increase birth rates and then seeking to fine-tune them at the desirable level. According to this view, a laissez-faire fertility policy is justified since, apart from broad upper and lower limits, governments are not competent to determine what constitutes an optimal fertility rate, or growth rate, or population size in any given year, decade, or even longer time interval. Partial recoveries of birth rates in many low-fertility countries in the first decade of the twenty-first century give added credence to this hopeful stance. The influential UN medium population projections support this optimistic outlook. They stipulate a slow but steady recovery of fertility rates from present-day low levels. By around 2050, the assumed TFR is typically about 1.85 or very near to it.

Finally, even if the will existed, there is a scarcity of effective pronatalist policy instruments. Exhortation from governments is not a promising approach, and in any case is unlikely to be tried in a democratic polity. Restrictions imposed on access to modern contraceptive technology are not politically acceptable; they would also be certain to prove a failure. This leaves the traditional levers of social policy: dispensing material incentives and disincentives so as to increase the willingness of couples to have children. Such incentives can be engineered by the government through fiscal measures, such as differential taxation favoring families with children, and/or through services

in kind, such as free or subsidized day-care centers for pre-school children provided by public programs, and also by mandates imposed on the private sector. Creation of a generally child-friendly environment—maintenance of public playgrounds and extension of lower public transport prices (often routinely granted to older people) to children and similar measures—is a logical part of such pronatalist measures. This approach was tried in the interwar years with at best limited success, which proponents attributed to insufficient funding and scale. In recent decades low-fertility countries once again introduced fertility-supporting policies; in fact, with the steadily expanding welfare state, they were often upgraded and their scope was extended. However, they were no longer justified by a "pronatalist" intent but were adopted as a logical part of the more encompassing frame of family and welfare policy. The new label partly reflects a political-ideological preference, but in part also the fact that some distinctive features of pronatalism—such as rewards that differentially favored large families, and non-means-tested or even regressive allocation of family and child benefits—are generally considered no longer politically acceptable.

Although the redistributive policies of the contemporary welfare state are biased in favor of the elderly and the poor, government-organized transfers to parents of children, or to children directly (including publicly financed or subsidized education often beyond secondary school), are substantial in all low-fertility countries. Indeed, it is typically assumed that existing family and welfare policies sustain fertility above a level that would ensue in their absence. Accordingly, socializing an even larger share of child costs is often seen as a means toward achieving a higher level of fertility, whether as an outright policy objective or as an unintended but expected byproduct. Ambitious deployment of such measures, however, is difficult, given the fiscal constraints of already overcommitted welfare states. And more to the point, the net effect of family-friendly redistribution of incomes and provision of services in kind is uncertain. Redistribution involves administrative costs and inefficiencies, and beyond a low limit is bound to generate dissatisfaction. When income levels and parity distributions are compressed, redistribution becomes dominantly churning: people left alone could pay for the costs of their children but in fact pay also for other people's children, and in turn other people repay the donors in kind. Not only is the efficiency of the arrangement questionable, but so is its positive effect on the willingness to have children. It is notable that in the United States, where such schemes are distinctly less well funded than, for example, in Western Europe, fertility is nevertheless relatively high.

In recent decades in modern industrial economies, women's participation in the formal labor force has expanded rapidly. This tendency, reflecting market forces but also encouraged by government policy as the population becomes older, is likely to continue. Among the factors explaining low fertility despite general material affluence, many observers point to the double

burden on women of raising children and working outside the home. To the extent that higher birth rates are seen as socially desirable, the policy prescription is to adopt measures that make motherhood and women's labor force participation more compatible. The higher fertility in countries (notably in Scandinavia) where such measures are strongly applied, compared to countries (for example those in Southern Europe) where they are largely absent, suggests that enhanced compatibility is an effective pronatalist policy even if motivated by other considerations. But it is unclear whether the fertility differential so generated is high enough to bring the total fertility rate back to replacement level. Steady labor force participation of women during the childbearing years can certainly be made compatible with having one child or even two. It is likely to be far less compatible with sustaining, or even increasing, the proportion of women who have more than two children. Many career-oriented women voluntarily remain childless; many others prefer a single child. It follows that to achieve average replacement-level fertility, the proportions of such women need to be counterbalanced by high enough proportions of women who have chosen third, fourth, or even higher numbers of births. There is little indication at present that policies directed at enhanced compatibility between motherhood and career achieve that result.

When fertility is high, as it still is in most of Africa and in many parts of West Asia, it is a safe prediction that with economic development it will eventually decline, at least to replacement level. Once fertility is lower than that, predictions of fertility become highly uncertain. European and East Asian experience suggests that fertility has a tendency to settle below an average of two children per woman, hence a tendency toward sustained population decline. The question, to which no satisfactory answers exist, is "how far below?" "Scandinavian"-style family policies may stabilize fertility only modestly below replacement—such as around a total fertility rate of 1.8. That would imply a fairly moderate shortfall of births compared to deaths, and population stability in rich countries with such vital rates could be fully or nearly compensated with a modest level of controlled immigration. Population aging would then be kept within relatively narrow limits, to which postindustrial economies could readily adjust. The demographic weight of such countries within the global total in the foreseeable future would continue to shrink, raising possible problems of a shifting geopolitical balance. Still, such demographic configurations and dynamics would be likely to push the day of demographic reckoning beyond the policy horizons that are of concern to governments. Pronatalist interventions would then find only a marginal place on governments' policy agendas.

In contrast to the likely quiet acceptance of sub-replacement fertility by governments and by public opinion at large, debates and policy conflicts concerning immigration in low-fertility countries are almost certain to get more heated. The logic of economic globalization, allowing minimally

impeded movement of goods and capital, also calls for free international mobility of labor, hence of population. It questions the relevance and appropriateness of population policies conceived for national entities with essentially closed borders, that is, precluding free and possibly large-scale net immigration. But the fundamental difference between people crossing national borders permanently and goods and capital moving across such borders will be increasingly recognized, and social and cultural considerations will tend to contradict purely economic arguments. The notion that whatever the social costs of immigration may be, below-replacement fertility must be compensated by immigrants will be considered by many in the native population as spurious. The resolution of the debate between these conflicting views and interests is difficult to predict. The economic argument may prevail, as it did in Western Europe and the United States in recent decades. The polar opposite would be the emergence of a broad consensus supporting an indefinite pause in mass immigration and adoption of policies to enforce such a pause. The latter outcome could eventually also undermine some other tenets of economic globalization, leading to a return to circumstances in which large countries or contiguous blocs of smaller countries seek greater self-sufficiency and industrial balance than present-day economic prescriptions would predict.

Policies to avert population collapse: Options "outside the box"

Contrary to the benign assumptions just described, the lowest-fertility countries—those with a total fertility rate of 1.5 or below—instead of creeping back toward replacement-level fertility might stabilize at that level, or even shrink further. Such an outcome, impervious even to heavy application of pronatalist social policies, might also foreshadow reproductive behavior in countries in which fertility is still fairly close to replacement level. Should this happen—transition with a vengeance—it would create a qualitatively different demographic situation for which no precedents exist in modern history. It would represent a clear threat to the continuing viability of the countries affected. Compensatory immigration flows would have to be so large as to be inconsistent with any reasonable degree of cultural and ethnic long-term continuity. Alternatively, population aging in the absence of immigration would create virtually unsolvable economic and social challenges, and, in the case of formerly powerful countries, there would likely be a drastic loss of relative geopolitical status. Yet the economic and socio-cultural forces that reduced birth rates in the West and in Japan in the 1970s and 1980s to historically unprecedented levels, and did so somewhat later in many other countries, may not have run their full course. Further declines, sparked, for example, by major economic disturbances or further fertility-depressing cultural shifts, cannot

be ruled out. Spontaneous homeostatic mechanisms may not come into play to save the day, or may do so too sluggishly to matter. A demographic collapse would then become a real prospect, and a radical rethinking of fertility policy would become a necessity for social and national survival.

In very-low-fertility countries, a search for potentially more effective pronatalist measures would then receive high priority on the public policy agenda. Governments would need to think "outside the box" and to search for and, if politically feasible, apply more effective measures. This is a tall order, thus far largely ignored by demographers and other social scientists. More than a quarter-century ago, I noted some of the types of remedies that should be considered—not with any expectation that they might lead to actual policies in the foreseeable future, but simply as matters that ought to be discussed as measures that some day may be needed (Demeny 1987). The remedies mentioned were borderline-utopian and received very little attention, as did similar proposals bruited in the past. I still believe that they deserve debate and critical examination, possibly leading to actionable policies kept in reserve. I describe them very briefly below.

One of these measures was not a population policy per se, but one whose adoption could create a more hospitable reception for effective pronatalist measures in democratically elected legislatures. It was a proposal for electoral reform, seeking at least to partially counterbalance the near electoral majority of the older population—itself a result of population aging. Because of that near-majority, legislative acts are disproportionately influenced by the interests of age groups with low average life expectancy, hence relatively low time horizons. As a result, even with generous allowance for statesmanship and altruism, a strong bias exists to the detriment of the young. The very young—for example those under age 20 in Japan—constitute a completely disenfranchised group. They could, however, be granted full voting power, to be exercised by their parents or caregivers. (Mothers, for example, could vote on behalf of their minor daughters; fathers on behalf of their minor sons.) This proposal was actually debated in the Bundestag in 2004 and more recently received attention in Japan. The objection that, owing to the very age-bias just noted, such a reform is doomed in the legislature is no doubt valid. Yet its advocacy still has merit as a signal calling attention to a flaw in intergenerational negotiations, and as a symbolic recognition of the parents who are raising the future generation. Various refinements of the proposal, making the intended change more modest or else amplifying it further, can easily be envisaged. For example, in the case of a bicameral legislature, votes for representatives in the upper chamber could be weighted by the average life expectancy of the voter's age—something technically feasible in electronic voting systems.

Among other reform proposals, now directly motivated by the aim of increasing fertility, I sketch three.

First, compatibility of motherhood and labor force participation of both parents is a desirable goal for many couples, typically as a matter of personal fulfillment and for economic necessity. But that goal, even under family-friendly policies, tends to be inconsistent with the desire to have a large family—in contemporary terms, a family consisting of three, four, or five children. Economic considerations and consideration of children's interests are likely to bar the choice of a large family to all but couples in the richest segment of the income distribution. Yet there is evidence that a substantial fraction of couples would chose three, four, or five children if that would not unduly disadvantage themselves and their children, either economically or socially. Family policy, which now subsidizes childbearing—first and second children who in the large majority of cases would be born anyway—could be reconfigured to support large families. Rearing children in such families is full-time work: in the collective interest it could be recognized as such by society and rewarded by pay at a level equivalent to what the caretaking parent could command in the formal labor force given her or his qualifications. Society may rely on responsible self-selection of couples into that category, or require screening and imposition of a degree of control over suitability for and predicted performance in the caretaking role, resembling routinely applied aptitude tests in the formal labor force. A variety of intermediate solutions between those two approaches could be acceptable for the general public.

Second, with population aging, support in old age becomes a growing source of anxiety in the population at large. Collective commitments, taken under conditions of a more favorable ratio between those in working ages and those in retirement than the ratio generated by persistent low fertility, become increasingly untenable, generating pressure for accumulation of private assets to be used in retirement. Having children, especially more than two, represents a distinct disadvantage in that endeavor. Linking high individual fertility with an assurance of preferential treatment in old age through government-provided pension and health services could be seen as socially just and could act as a potent pronatalist measure. A variety of solutions for such a linkage could be designed, recognizing not only the number of children a person or a couple had, but also the quality, reflected in the educational qualifications and the economic productivity of offspring once children enter the labor force and become taxpayers.

Third, low-fertility, high-income countries have elastic access to potentially willing immigrants at least for many decades into the future. UN projections posit a net population increase by 2050 of over half a billion in India and over a billion in Africa. Yet, as was suggested above, the massive net immigration that would be necessary to moderate the speed of population decline and lessen population aging in very-low-fertility countries is likely to be inconsistent with cultural preferences in the host populations. But restricting immigration in the context of very low fertility reimposes the

need to search for measures to increase the birth rate of the native population. One argument favoring immigration is the claim that certain tasks in the labor force necessary for the functioning of the economy, and especially of social services within it, cannot be secured from the use of the native labor force. That claim is likely to be weak in a well-functioning market economy and under conditions of a not over-solicitous welfare state, but may nevertheless have some validity. There is a long historical tradition, once accepted and considered honorable in most affluent countries, of compulsory military service for young males. A society that wishes to restrict immigration or to screen immigrants in favor of a demographically insignificant highly qualified flow may contemplate introduction of an obligatory civilian service corps, now embracing both sexes, as part of the duties required from all citizens at a particular stage of their lives. There is indeed recurrent discussion of creating such a civilian corps in many countries. On a purely voluntary basis, it is unlikely that such plans could come to fruition beyond marginal significance. Current ideological attitudes notwithstanding, striving for national viability and indeed long-term national survival may yet create conditions where, on the analogy of compulsory military service of past times, a civilian service corps could be socially accepted. In modern conditions, the age of entry for a service lasting perhaps for two to three years would be flexibly chosen by the participants, but the youngest age allowed would be appreciably higher than once was the case in military service—past the age when contemporary formal education is generally completed. The only significant exemption from such a service would be a service equally valued by the community: maternity and paternity. Even if only a minority opted for such an exemption, reappearance of early parenthood would represent a break with current trends and arguably set into motion behavioral repercussions appreciably counteracting socially harmful demographic developments.

Such propositions may seem utopian today, especially in the ideological environment of the European Union and the United States. They may not seem so in a not-too-remote future. At least their discussion, and discussions of similar or even farther-reaching reform proposals, may well attract demographers and policymakers even today.

Notes

1 United Nations 2009 presents a comprehensive description of population trends since 1950 and projections according to three variants with respect to future fertility up to 2050. These data and estimates, detailed by country units and in regional aggregates, are also available on line at «http://www.un.org/esa/population/unpop.htm».

2 For an assessment of the empirical evidence, see Bongaarts 1997.

3 The significance of the "demographic dividend" is discussed, for example, in Bloom and Canning 2008. This age distribution effect is reminiscent of the argument set forth in Coale and Hoover 1958 with a focus on India's developmental prospects. In that influ-

ential study the emphasis was on gains from diminished youth dependency, consequent upon fertility decline. The contemporary variant stresses the advantages of a larger fraction of the population in the labor force ages. Arguably, in either case, the transitional economic advantage conveyed by changing age structures could easily be matched by relatively modest improvements in total factor productivity, presumably achievable by non-demographic means.

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Demographic transition is the central theoretical concept in the population field. As empirical fact, the transition's nearing completion—in low mortality and fertility—is the dominant feature of global population dynamics. While the determinants of demographic transition have been explored in depth over more than half a century, far less attention has been given to the consequences of transition, aside from its immediate effect on population aging. Yet the transition also has major implications for family and kinship patterns, for the process of urbanization, for public finance and the welfare state, and more broadly for intergenerational relations. In the longer run it may give rise to (and possibly entrench) negative natural increase, presenting radical new challenges for public policy. The chapters in this volume explore aspects of the transitional and post-transition landscape from a variety of disciplinary perspectives. They cover both modern industrial societies and emerging economies, and take note of the circumstances of latecomers in the transition process.

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