Population Quantity, Quality, and Mobility

Jere R. Behrman and Hans-Peter Kohler

Abstract

Recent unprecedented changes in the quantity, quality, and mobility of the population will continue to affect the world throughout the 21st century, with important differences among countries, depending on each countries' stage of the demographic transition and level of economic development. The developed world will experience stable or declining populations, population aging, and rising age-dependency ratios. Many middle-income and (later) low-income countries will experience declining dependency ratios and the accompanying opportunities and challenges of "demographic bonuses," with their "youth bulges." World population will grow at much lower rates than in the last half century, albeit with some population increases, as a result of remaining high fertility in some low income countries and population momentum in many other countries that reflects the large numbers of women of childbearing ages. World population will continue to be increasingly concentrated in Asia and Africa, with Africa having the most rapid increase. Population mobility is likely to lead to substantial urbanization, particularly in Africa and Asia. The decline in the population growth rate and the substantial increase in the quality of the population, as reflected in health and education, lays the foundation for ongoing improvement in population quality throughout the century. Ensuring that changes benefit average citizens requires enhancing the freedom to move, internally and internationally; strengthening the early foundation for life; supporting aging with dignity and equity; and improving incentives for social service delivery.

Key words: Demographic transition, population quantity, population quality, human development, education, health, developing countries, advanced economies, nutrition, migration, dependency ratio, fertility, youth bulge, urbanization

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1. Introduction

Population quality, quality, and mobility are affected by past economic development, and they help shape current and future economic development. In some basic sense, the quality of the population is the essence of development—if development focuses on increasing human capabilities as an end in itself, as Sen (1985) and others have suggested. Such a definition seems intrinsically related to the concern of the Towards a Better Global Economy project with global citizens.

This paper considers how population quality, quality, and mobility have evolved in recent history to their present status. It presents projections of their evolution and examines possible policy implications of their evolution that might lead to a better global economy for global citizens as the century progresses.

The next four sections set the stage by reviewing recent developments and projections over coming decades. In section 2, the demographic transition framework is used to help guide understanding of the interactions between some important dimensions of population quality, quality, and mobility. Important dimensions of investments in the quality of the population are

then considered as they relate to education (section 3), to health and nutrition (section 4), and to the mobility of the population as they relate to urbanization and international migration (section 5). Section 6 discusses some major policy implications for future decades. Section 7 presents some concluding remarks.

2. Population Quality, Quality, and Mobility and the Demographic Transition
A useful framework for understanding the divergent contemporary and future trends in the quality, quality, and mobility of the human population in a global context is the *demographic transition* framework. It captures in broad descriptive terms the main trends that have, during the last one or two centuries, shaped national and global populations and that will continue to do so throughout most of the 21st century.

Demographic transitions, including transitions still in process in the developing world, are frequently perceived as resulting from the economic and technological changes of the modern era that have led to economic development, mass communication, effective public health programs, contraceptive methods, and related social changes. Before the start of the demographic transition, lives were short (about 30 years on average), survival at all stages of life was relatively uncertain, fertility rates were high (with total fertility rates [TFRs] of about five to seven children per woman), population growth was slow, and populations were relatively young (figure 2.1). During the demographic transition, first mortality and then fertility declines, resulting initially in an increase and then a decrease in the population growth rate. The age structure of the population is also transformed. Initially, the population becomes "younger," as a result of the rapid increase of births and a decline in infant mortality; later, the population becomes "older," as a result of smaller birth cohorts, increased longevity, and the aging of the earlier large cohorts. Toward the end of the demographic transition, population growth is lower (and potentially ceases or becomes negative); fertility is lower; life expectancy is higher, with mortality risks low to very low at young and adult ages and deaths concentrated at older ages; and the population age structure is relatively old (Lee 2003, 2011). Family structures, life courses, and social and economic contexts are also fundamentally transformed (Lee and Reher 2011), with important implications for social and economic development that may further facilitate the demographic transition (figure 2.2).

Figure 2.1 Past and Projected Trajectories of Life Expectancy and Total Fertility Rates with Population Growth Isoquants in More, Less, and Least Developed Countries
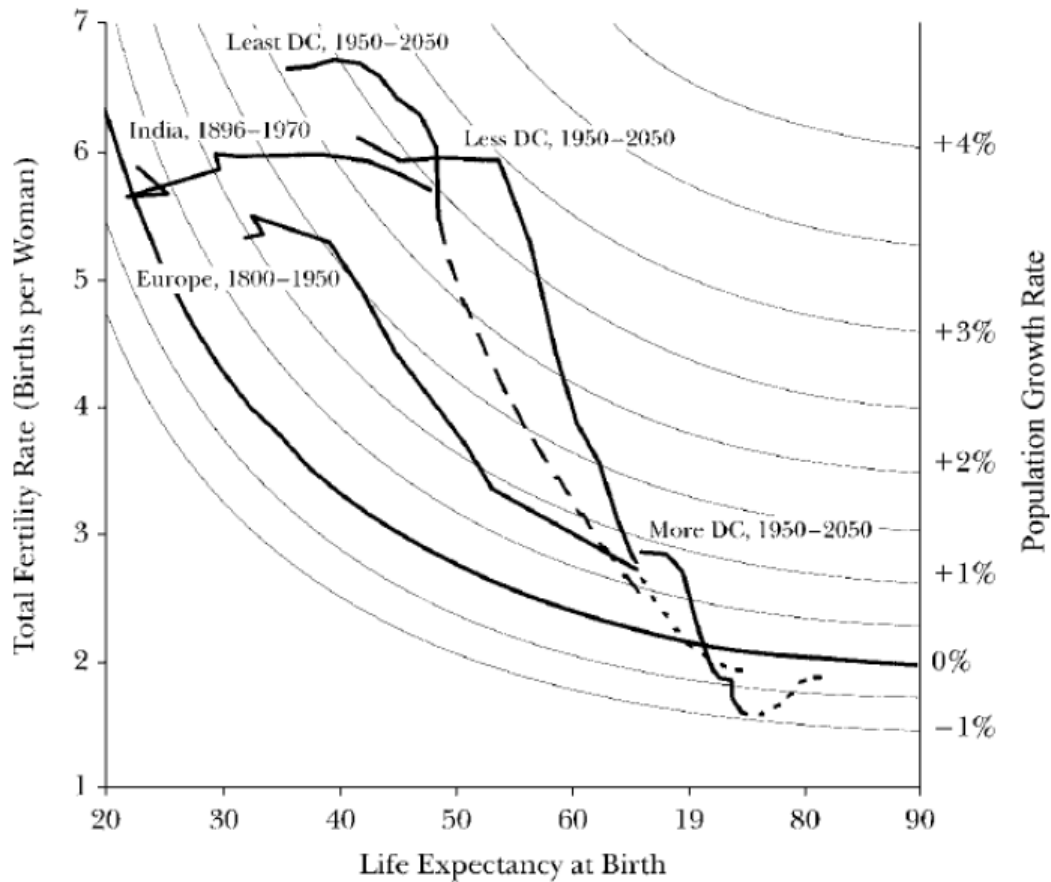
Note: The contours (iso-population growth curves) illustrate the steady-state population growth corresponding to constant fertility and mortality at the indicated levels, with zero population growth on the dark contour and positive population growth towards the upper right above this curve. The demographic transition appears first as a move to the right due to increased life expectancy with little change in fertility so higher population-growth contours are attained; then a diagonal downward movement towards the right occurs reflecting the simultaneous decline in fertility and mortality, recrossing contours towards lower rates of population growth.

Source: Lee 2003.

In contemporary high-income countries, the demographic transition occurred mostly in the late 19th and early to mid-20th century. Post–World War II population trends were often characterized by a baby boom and baby bust (including in some cases trends to very low fertility) and a continued increase in longevity. In these countries, the demographic transition often coincided with periods of rapid economic development, with the two trends inherently intertwined to facilitate broad economic growth and increases in per capita income for most citizens (Galor 2012).

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In today's low- and middle-income countries, most of the demographic transition commenced after World War II. It was initially characterized by a rapid and sustained increase in life expectancy, followed more recently by an—often rapid—decline in fertility. The demographic transition in developing countries during the second half of the 20th century is also widely considered a "success story." Between 1950–55 and 2005–10, life expectancy in less developed countries increased from 42.3 to 66.0 years (a total gain of 23.7 years, or an average annual gain of 0.43 years); in the least developed countries, life expectancy increased from 37.2 to 56.9 (a total gain of 19.7 years, or an average annual gain of 0.37 years). These rapid rates of increase also resulted in decreasing cross-country inequalities in life expectancy. In 1950–55, for example, life expectancy in the least developed countries was 44 percent below that of more developed countries, and life expectancy in less developed countries (excluding the least developed countries) was 35 percent lower than in the more developed countries. By 2005–10, these differences were reduced to 26 percent in the least developed countries and 12 percent in other less developed countries, as a result of more rapid increases in life expectancy than in the more developed countries.[1] Fertility rates declined from a TFR in less developed countries of about 6.1 in 1950–55 to 2.7 in 2005–10 (an annual decline of about 0.062); TFR levels declined from 6.5 to 4.4 in the least developed countries during this period (an annual decline of about 0.038). Global annual population growth rates declined from a peak of 2.1 percent in 1965–70 to 1.2 percent in 2005–10 (figure 2.3). The population growth rate in less developed countries also peaked during 1965–70, at about 2.5 percent per year; population growth rates in the least developed countries peaked during 1990–95, at 2.8 percent. By 2005–10, the population growth rates declined to 1.3 percent in less developed and 2.2 percent in least developed countries.

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[1] The United Nations Population Division definitions of more, less, and least developed countries are as follows: "More developed" regions comprise Europe, Northern America (Canada and the United States), Australia and New Zealand, and Japan. "Less developed" regions comprise Africa, Asia (excluding Japan), Latin America and the Caribbean, and Melanesia, Micronesia, and Polynesia. "Least developed" countries include 48 countries—33 in Africa, 9 in Asia, 5 in Oceania, and 1 in Latin America and the Caribbean. These definitions were constant across 1950–2010.

Figure 2.2 Schematic Framework for Demographic Transition and Associated Social and Economic Changes.
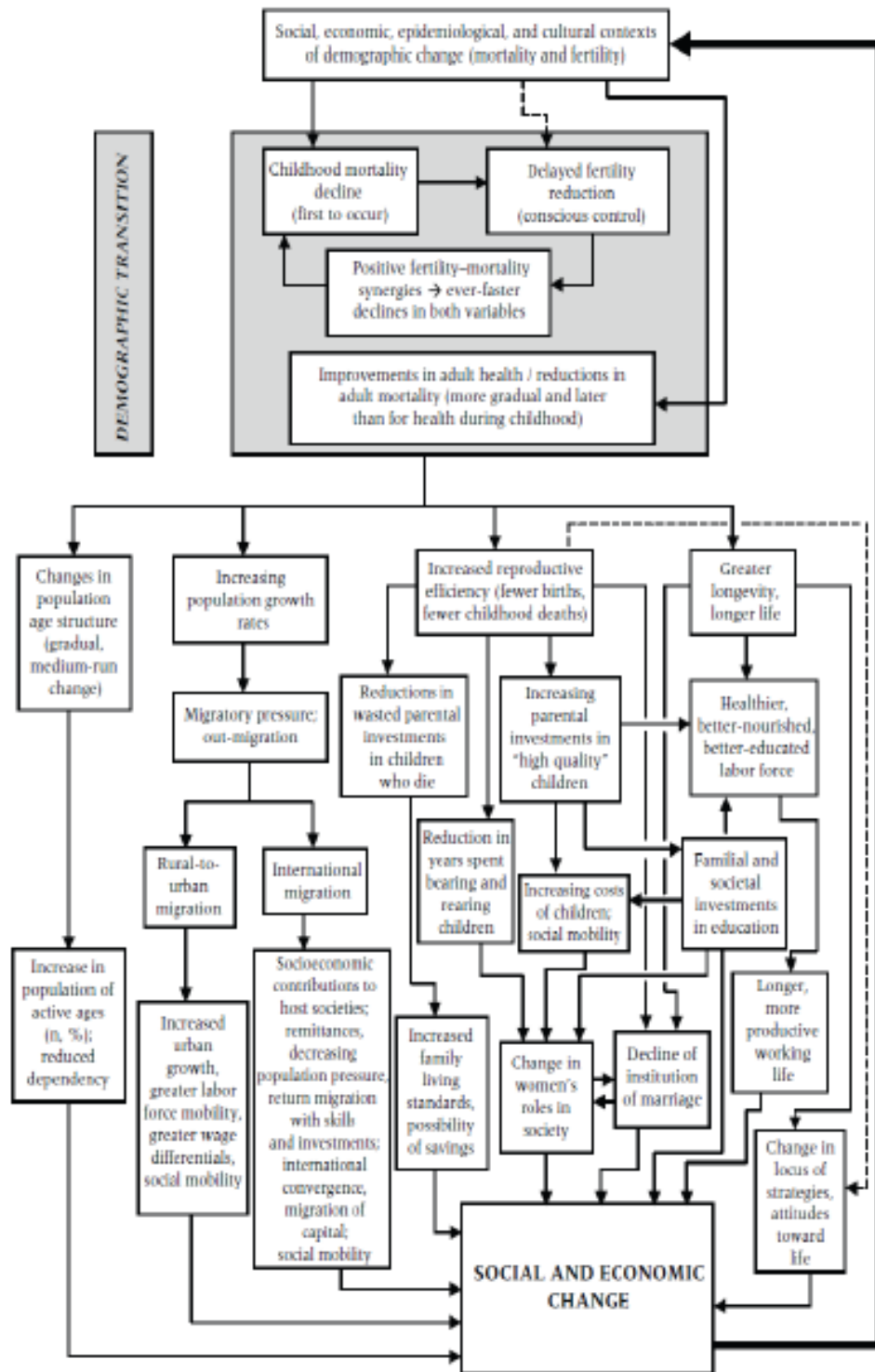
As a result of the global demographic transition, world population growth increased markedly in the 19th century and throughout much of the 20th century, reaching a peak of 2.1 percent in 1965–70 (see figure 2.3). The rate of global population growth declined to about 1.16 percent in 2005–10; it is expected to decline to 0.35 percent by 2050 (UN 2011b).

Figure 2.3. Annual Growth Rates of World Population and World Population According to Different United Nations Population Division Projection Variants
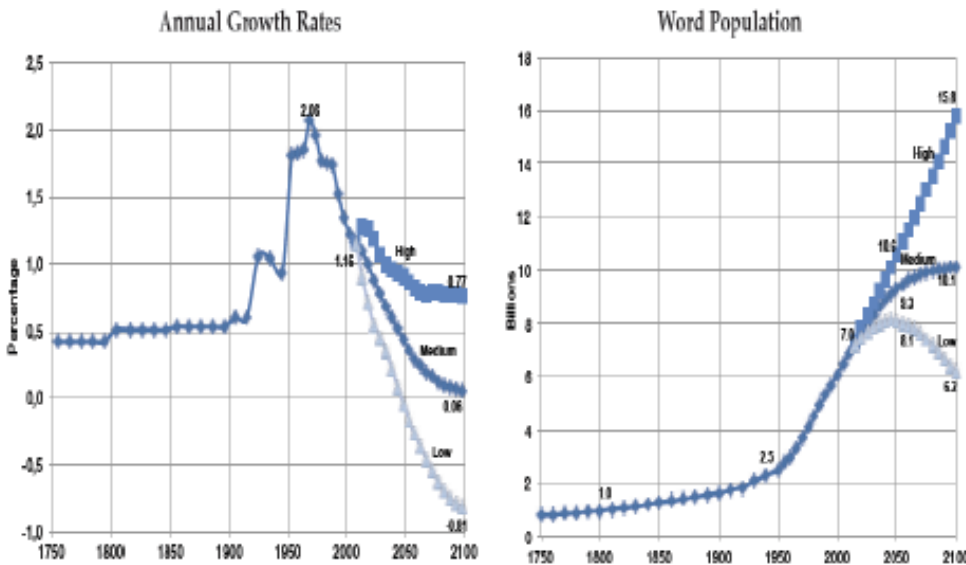
Note: The low, medium and high scenarios assume the same mortality trends but different fertility trends with the TFR 0.5 higher (lower) in the high (low) than in the medium scenario after 2015. In the medium scenario, global TFR declines from 2.52 in 2010 to 2.03 in 2100.

Source: Global Agenda Council on Population Growth (2012).

Since the 1950s, low- and middle-income countries have been the main contributors to the significant increase in the world population, from 3 billion to 7 billion. The majority of the world population is now estimated to live in regions with TFRs below replacement (that is, less than or equal to 2.1) (Wilson 2004); the global TFR is projected to reach 2.1—the conventional, albeit globally not necessarily correct marker for replacement level fertility (Kohler and Ortega 2002)—by 2070 (UN 2012b).

These rapid declines in mortality and fertility since the 1950s in the current low- and middle-income countries often have been associated with rapid economic development. For example, in

the Republic of Korea, life expectancy increased from 47.9 in 1950 to 80.0 years in 2010, and the TFR declined from 5.1 to 1.3; annual GDP per capita growth averaged more than 5 percent between 1960 and 2010.

Although often seen as a sufficient condition for fertility decline, rapid economic development is not always a necessary condition. In Bangladesh, for example, life expectancy increased from 45.3 to 67.8 and the TFR declined from 6.4 to 2.4 between 1950 and 2010. Annual GDP per capita growth averaged just 1.5 percent between 1960 and 2010, however. Both India and China saw large fertility declines before the onset of rapid economic growth. Iran holds the record for the most rapid decline in the TFR, from 6.5 in 1980 to 1.8 in 2010, when Iran was an Islamic republic and average economic growth was relatively modest, at about 1.3 percent a year (Abbasi-Shavazi, McDonald, and Hossein-Chavoshi 2009; Abbasi-Shavazi and others 2009).

During these diverse demographic transitions of the second half of the 20th century, the world population grew rapidly (see figure 2.3, panel b). It doubled from 1.5 to 3.0 billion between the late 19th century and 1960, doubling again from 3 to 6 billion between 1960 and 1999. In 2011, the world population reached 7 billion, adding the last billion in merely 12 years—not unlike the time periods it took to add the fifth and sixth billions to world population.

Despite the rapid population growth during recent decades, the doomsday predictions of the 1960s and 1970s did not materialize. Not only did the world avoid the major food crises and environmental degradation predicted in books such as *The Population Bomb* (Ehrlich 1968) or *The Population Explosion* (Ehrlich and Ehrlich 1990), but various measures of average individual well-being increased globally, in both more developed and less developed countries. Despite rapid population growth between 1960 and 2010, average global GDP per capita grew from $2,376 to $5,997 (in constant 2000 dollars) (an increase of 152 percent); average global life expectancy rose from 51.2 to 67.9 years (and increase of 33 percent); infant and maternal death rates declined substantially; schooling levels increased, particularly among girls; global per

capita food production and consumption rose; and the proportion of the global population living in poverty declined significantly (Lam 2011).[2]

This increase in well-being despite rapid population growth was far from taken for granted several decades ago. Lam (2011) attributes it to the combined effect of six factors, three economic and three demographic:

1. Market responses, which cause farmers to grow more food in response to higher food prices and people to substitute away from scarce resources whose prices increase in response to population pressures[3]

2. Innovation, because population growth increases the incentives (and potentially also the ability) to develop new technology and knowledge, such as the technology and knowledge underlying the Green Revolution, which use available resources more productively

3. Globalization (the increased economic integration of countries through the international flows of goods and capital), which improved the efficiency of both production and distribution

4. Urbanization, as cities absorbed a significant proportion of the population growth in recent decades, thereby contributing to innovation, economic growth, and improvements in efficiency that helped improve living standards despite growing populations

5. Fertility decline, which caused birth rates, with some lag, to follow declining mortality rates and lower rates of population growth

6. Investments in child quality, which contributed to reduced fertility, improved own and child health, increased productivity, and spurred economic growth, despite rapidly growing cohort sizes.

The first three factors are the subjects of other papers in this project. This paper addresses the last three.

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[2] These dire predictions about the impacts of the population explosion were questioned at the time in the so-called "revisionist" literature. See, for example, Preston (1986); National Research Council (1986); and Simon (1981).

[3] Indeed the United States Department of Agriculture (2013) estimates that real agricultural prices from 1900-2010 have fallen secularly by 1 per cent per year despite the large population increases and despite short-term relatively small prices increases in periods such as the 1970s and since 2000 that some interpret to reflect basic long-run shortages.

Recent decades are a unique period in global demographic history: after doubling in only 39 years from 3 to 6 billion, the global population is unlikely to double again. In the United Nations Population Division's medium projection, global population will level off at about 10.1 billion in 2100; even in the high fertility scenario, global population will remain below 16 billion.[4] Estimates of the Earth's carrying capacity are of little help in assessing whether this growth is sustainable or compatible with maintaining or even improving living standards (Cohen 1995a, b). And although adding another 3 billion people to the global population without undermining past progress in global living standards or measures of well-being—or perhaps even improving upon them—will remain a challenge, the tone of the population debate and the perceived urgency of "the population problem" has dramatically changed in recent decades. The *Economist,* for example, has featured major articles with titles such as "Go forth and multiply a lot less: Lower fertility is changing the world for the better" (2009) and "The world's population will reach 7 billion at the end of October [2011]. Don't panic" (2011). Although challenges of accommodating population growth remain, most recent press coverage of the world's 7 billion population (for example, *National Geographic* 2011; Osotimehin 2011; Roberts 2011; *The Economist* 2011a, b, c) has been much less alarmist than earlier discussions, which echoed the fears expressed in books like *The Population Bomb* (for analyses of earlier population discussion of the population problem, see Wilmoth and Ball 1992). One possible reason for this shift in perceptions is that, in many developing countries, as a result of substantial declines in fertility, future population growth is driven much more by population momentum—that is, expected increases in the number of people of primary reproductive ages in the next decades that result from young age distributions and high previous rates of population growth—than by high current or future TFRs. The major exceptions to this trend are a set of high-fertility low-income countries, concentrated in Sub-Saharan Africa, in which population is expected to grow significantly as a result of continued high fertility.

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[4] For most of the projections used in this paper, the United Nations Population Division presents high, medium, and low variants. Figure 2.3 includes different variants. In the rest of this paper, only the medium variant is presented in most cases, in order to keep the presentation clearer. The United Nations Population Division periodically revises their estimates. 2012 Revisions were announced on 13 June 2013 after this paper was completed (UN 2013).They imply an increase of about 3% for 2050 over the previous medium variant projections, a change over four decades that is within a 95% confidence interval for the previous estimates and that does not change anything substantive in this paper.

Because different countries have progressed (or are still progressing) through the demographic transition at different times and at different speeds, the systematic unfolding of changes in the population size, structure, and composition during the demographic transition continues to set the stage for major population trends—and major global divergences in these trends—for the 21st century. As a result of divergences in the global demographic transition during the 20th century, the global population faces a set of diverse challenges in the next decades that are likely to have profound impacts on both human and economic development. The following points focus on population quantity and age structure; issues related to population quality and mobility are covered in the next three sections.

- Almost everywhere, life expectancy is now longer and fertility lower. Arguably the most profound changes during the global demographic transition have been that lives almost everywhere became longer, mortality risks at most ages declined, and fertility rates decreased. The extent of these trends varies significantly across countries, regions, and sometimes subpopulations (these differences are discussed below). However, almost universally, the last decades brought about changes that resulted in significant increases in life expectancy (especially for children and young adults), a reduction in the variance in the age at death and thus reduced uncertainly about survival at young and adult ages, and a reduction in the fraction of the life course that is closely intertwined with child-bearing and child-rearing.

- Population growth remains significant in selected low-income countries. Despite decreases in global mortality and fertility—and the resulting recent declines in the rate of global population growth—the demographic transition remains an unfinished success story. High fertility and rapid population growth remain important concerns in many least developed countries, which may be most vulnerable to the consequences of population growth. For example, because fertility declines in Sub-Saharan Africa in recent years were less rapid than previously expected (Ezeh and others 2009), the United Nations unexpectedly revised its 2010 forecast for the world population to 10 billion, up from 9 billion (UN 2011b). A report prepared for the 2012 World Economic Forum (Global Agenda Council on Population Growth 2012identifies 58 high-fertility countries, defined as countries with net reproduction rates (NRR) of more than 1.5 that have intrinsic

population growth rates of 1.4 percent or higher. These countries are concentrated in Africa (39 of the 55 countries on the continent have high fertility), although some are in Asia (9 countries), Oceania (6 countries), and Latin America (4 countries) (figure 2.4). The United Nations classifies almost two-thirds of these high-fertility countries as least developed, and 38 of the 48 countries classified as least developed have high fertility. Most high-fertility countries have current population growth rates of 2.5 percent or higher, which, if maintained, would imply a doubling of the population every 27.7 years. Female education levels (as indicated by illiteracy) and contraceptive use tend to be relatively low in high-fertility countries. Despite currently having only about 18 percent of the world population, high-fertility countries account for about 38 percent of the 78 million people added annually to the world population. Based on UN median population projections, the TFR in high-fertility countries is projected to decline to 2.8 by 2050 and to 2.1 by 2100. Despite these projected declines, current high-fertility countries will make the largest contribution to the annual increment of the world population after 2018; after 2060, world population is projected to grow exclusively as a result of population growth in the current high-fertility countries. During the 21st century, therefore, these countries will be the major contributors to continued world population growth. Past and continued progress in reducing mortality, combined with sustained fertility levels that do not drop to 2.1 until 2100 in the United Nation's median projection, will be a primary cause of this rapid population growth (another important factor is the population momentum that results from the very young age structures in these countries). Because of these patterns, population is projected to become increasingly concentrated in Asia and Africa (figure 2.5). Asia is projected to remain the most populous major region in the world throughout the 21st century, but Africa will gain ground as its population more than triples, from 1 billion in 2011 to 3.6 billion in 2100.

- The population is aging in high-income—and increasingly in middle-income—countries. As a result of continued progress in reducing mortality, including at old and oldest ages, that and decades of low—sometimes very low—fertility, many high-income countries face rapid population aging. The most rapidly growing age segments in these countries— sometimes the only growing age segments—are old or very old, and old-age dependency ratios are likely to increase significantly in coming decades. These trends give rise to

concerns about the sustainability of intergenerational transfer schemes (such as public pensions, which shift resources from the working to the elderly) and the implications of population aging on productivity; innovation; and social, economic, and psychological well-being.

- In medium- and selected low-income countries, population growth is slowing, fertility is falling, and the population is aging. Population aging in high-income countries occurs in societies with well-developed social institutions, including extensive intergenerational transfer schemes. An accelerating trend in coming decades will be the emergence of rapid population aging in low- and middle-income countries. Slogans such as "China may get old before it gets rich" capture concerns that population changes in such countries pose unique challenges from the perspective of people and societies, including the need to provide health services to and prevent poverty among the elderly. Average ages are projected to increase most in coming decades in Latin America and the Caribbean and in South Asia, not in high-income or East Asian countries, where the population is already relatively old. The increases in the proportions of the population older than 60 or 65, however, will continue to increase most rapidly in high-income countries and in East Asia in the next few decades. This is a particularly relevant group for intergenerational transfers, given age-related retirement and morbidity patterns.

- A large cohort of young people—a "youth bulge"—is transitioning into adulthood in many lower-middle income countries. In many low- and middle-income countries that have experience significant declines in fertility in recent years, the total number of youth——often defined as 15– to 25-year-olds—is peaking, both absolutely and as a proportion of the population. This transition of large cohorts into adulthood has the potential to lower dependency ratios, yielding significant "demographic dividends" through the increased number of productive workers relative to the young and the old—but only if the large cohorts are effectively integrated into labor markets. Where such integration is not accomplished—as a result of failures of labor markets and related institutions and governmental policies—the economic benefits of low dependency ratios may not be fully realized. Moreover, a youth bulge that translates into high levels of unemployment or underemployment of young adults has the potential to cause political instability, potentially contributing to civil conflicts.

- Gender imbalances are increasing, with Asia becoming more male, and the elderly population everywhere becoming more female. Sustained long-term gender imbalances are likely to characterize large parts of the global population in the next decades. In some Asian countries—including China and India—longstanding preferences for sons have caused a shift in the gender ratio at birth toward boys and a significant overrepresentation of men among young adults. In China, for example, the ratio of males to females at birth increased from 1.07 in 1950 to 1.20 in 2010, and the ratio among people under the age of 20 increased from 1.12 to about 1.19 (UN 2011b). In India, these ratios increased from 1.06 to 1.08 at birth and from 1.05 to 1.09 for people under 20. Overrepresentation of men among young adult populations raises important concerns about marriage, fertility, intergenerational relations, and the support of aging populations, as well as political stability and labor markets. While men are increasingly overrepresented among young people in most of Asia (with some exceptions, such as Korea), globally the elderly population is becoming more and more dominated by women, as a result of their longer life expectancy and lower mortality.

Figure 2.4 Countries according to fertility levels, 2005-10

High fertility

Intermediate fertility
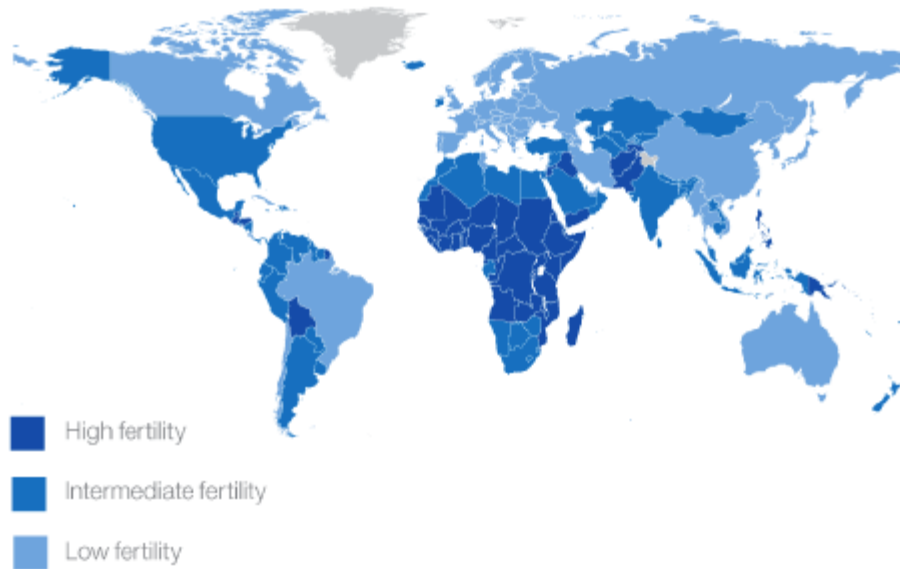
Low fertility

Note: Low fertility countries have net reproduction rates (NRR, daughters born per woman) of less than one; intermediate fertility countries have NRR between 1.0 and 1.5; high fertility countries have NRR above 1.5.

Source: Global Agenda Council on Population Growth (2012)

Figure 2.5. Estimated and Projected (Medium Variants) Regional Populations, 1950–2100
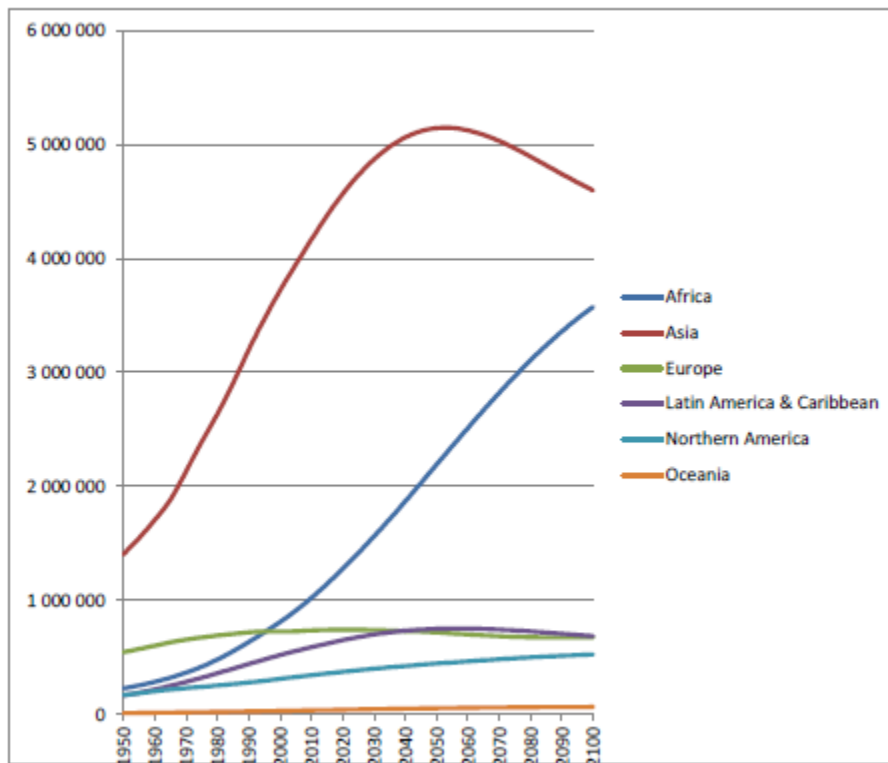
Source: UN. 2011b.

An important aspect of this discussion is that the divergent population trends projected over the next decades are systematically related to the demographic transition—and the different timing and speed of this transition across countries and regions—during the last century or so. Countries, regions, and subregions can therefore be placed in a three-by-three matrix in which the three columns refer to the quantity of the population (high population growth, demographic bonus possible, and posttransition older population structure) and the three rows refer to the quality of the population (as reflected by low, medium, and high levels of human capital) (table 2.1).

The changes in both the quantity and the quality of the population that are the driving forces behind the demographic transition are the result of billions of individual decisions made in response to the larger economic and policy environments (which themselves respond to the existing and expected quality, quality, and mobility of the population), albeit often with considerable lags. The quantity, quality, and mobility of the population are interrelated with each

other and with the process of economic development, with causality arguably going in all directions.

Table 2.1 Taxonomy of Population Quantity and Quality, Looking Forward from 2013

		Late stages in demographic transition and population quantity		
		High fertility, high population growth	*Potential "demographic dividend"*	*Posttransition older population structure*
Population quality (health, nutrition, education)	*Low*	Much of Sub-Saharan Africa	Much of South Asia	
	Medium		Most of Latin America and the Caribbean	Much of East Asia
	High			Most of Western Europe

Table 2.1 reveals strong diagonal trends, with more heterogeneity at the country level than at the regional level. Its taxonomy is useful for this paper, because the nature of the primary issues pertaining to the quantity and the quality of populations and related policies differ depending on which cell of this table a country (or region) falls in. In contrast, population mobility relates both to movements within cells (urbanization, some international migration) and across cells (particularly international migration).

Historically, there has been considerable controversy regarding the impacts of the quantity of the population on economic growth and the well-being of citizens, of changing age structures, and of urbanization and international migration. As a result there have been substantial debates about the rationale for various interventions. As discussed below, many policies have been and will continue to be directed toward population quantity, quality, and mobility, ranging from family planning to health and schooling subsidies to restrictions on internal and international migration.

3. Education

Education is the accumulation of knowledge. Standard economic models of investments in education (or other forms of human capital) imply that investments will occur at the level at

which the present discounted value of private marginal benefits equals the present discounted value of private marginal costs (see, for example, Becker 1967; Behrman and Birdsall 1983). The present discounted value of the private marginal benefits of investment in education is generally assumed to be negatively related to the discount rate (which may include a risk premium, given uncertainties regarding future market developments and even the survival probabilities for the individual in whom the investment is being made) and positively related to factors such as innate ability endowments, previous human capital investments, expected returns to labor market and other activities (including market-wide effects if increasing education for many people is under consideration), and the quality of educational services. The present discounted value of the private marginal costs is generally assumed to be positively related to interest rates; private prices of other factors used in education, including the opportunity cost of time; and, if capital markets for financing investments in education are imperfect or absent, the resources or income of the investors.

This formulation points to challenges in estimating the impact of education on income because important unobserved variables (such as innate abilities and motivations) are likely to be correlated with education and directly affect the expected outcomes of interest (for example, labor market earnings) and because there may be reverse causality, with higher income causing more current education. Of course, if there are differences between the private and social expected marginal benefits or costs, the privately optimal investment is likely to differ from the socially optimal investment. Although the literature tends to emphasize that the socially optimal investment may tend to be higher because of external benefits of knowledge, the systematic empirical evidence is limited, and some factors, such as congestion costs and public schooling subsidies, may work in the opposite direction.

Family decisions to invest in education are often posited to be made simultaneously with family decisions about the number of children and therefore fertility, as in the well-known "quantity-quality" fertility model of Becker and Lewis (1973) and Willis (1973). In this model, an important component of the price of the quantity of children is the opportunity cost of the time of caregivers, generally mothers. Mothers with more schooling are posited to be able to provide quality at lower costs. Therefore, as female education increases, the prices of child quality fall

relative to child quantity, inducing reduced fertility and more investment in the quality of children.

Education takes place in many venues—in households; in communities; in institutions focused primarily on education, such as schools and training programs; and in work activities. It also occurs over the life cycle. But emphasis in the literature is heavily on one form of education, formal schooling, which is generally concentrated relatively early in the life cycle.

Schooling Attainment

Lutz and collaborators (Lutz, Sanderson, and Serbov 2004; Lutz and others 2007; Lutz, Cuaresma, and Sanderson 2008; KC and others 2010; Lutz and KC 2011) have undertaken extensive work on age- and gender-specific schooling attainment in recent decades, with projections for the future in almost all countries. Their work—as well as the work of others, such as Barro and Lee (1993)—suggests that despite the rapid growth of the global population in the last half of the 20th century, schooling attainment has significantly increased, not just kept up with population pressures but expanded despite ever-increasing cohort sizes.

Figure 3.1 summarizes their estimates for four schooling levels between 1970 and 2000. Although the number of people 15–64 increased by about 80 percent—from a little below 2 billion to more than 3.5 billion in these three decades—the number of people with no schooling actually declined. The proportional distribution is even more striking. The percentage of the world's population with no schooling dropped substantially and the share of people with only primary schooling dropped slightly, while the shares of people with secondary or tertiary schooling increased significantly.

Figure 3.1 Population Distribution in Millions and Percentages by Education for Population Aged 15-64 in 1970-2000 in the World (120 Countries/Economies)

Population distribution by education for population aged 15-64 in 1970-2000 in the world (120 countries/economies)
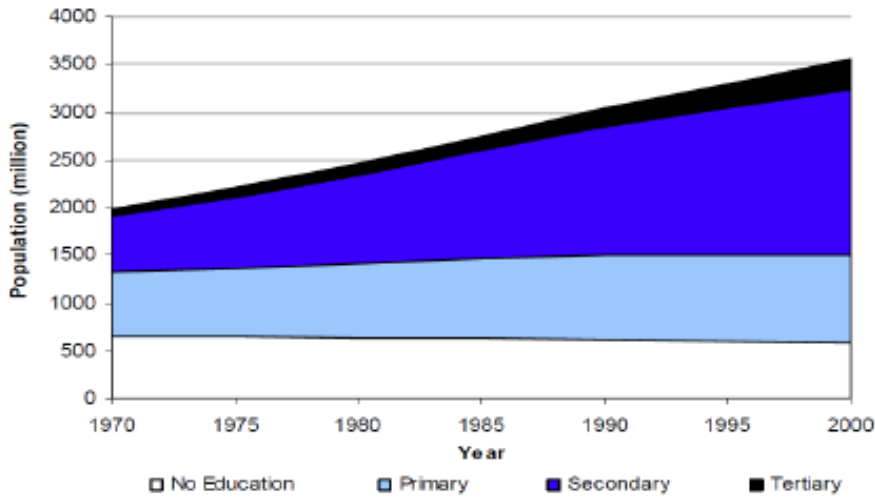
Proportion distribution by education for population aged 15-64 in 1970-2000 in the world (120 countries/economies)
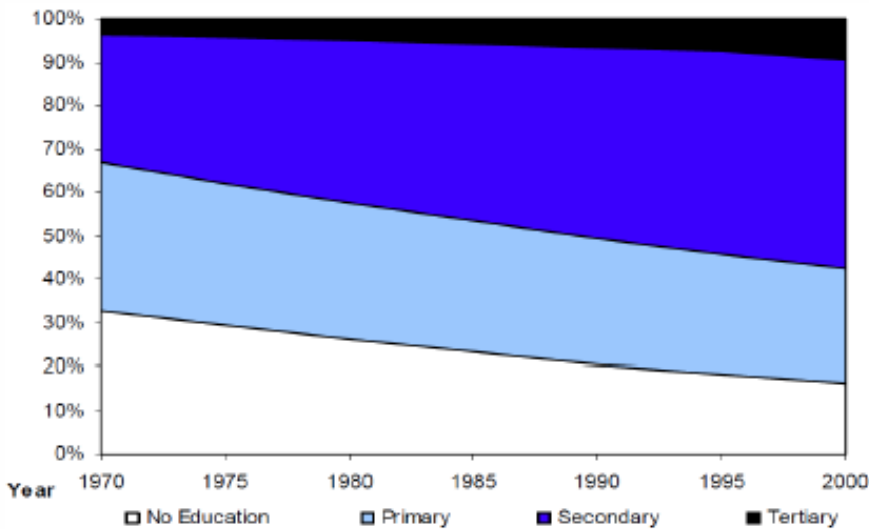
Source: Lutz and others 2007.

The figures for China and India are also striking (figure 3.2) They reveal substantial declines in the proportion of the population with no schooling, stability or declines in the shares of the population with only primary schooling, and significant increases in the shares of the population with secondary or tertiary schooling. In these two countries alone, the number of adults 20–64 with at least primary schooling increased from about 300 million in 1970 to 1,010 million in

2000, with projections to 2,156 million by 2050 (table 3.1). Between 1970 and 2000, the proportion of adults 20–64 with secondary education rose from 17 percent to 55 percent in China and from 11.5 percent to 27.6 percent in India. The figures for tertiary education were even more dramatic, rising from 1.4 percent to 5.4 percent of the population in China and from 2.1 to 7.2 percent in India. There was thus enormous expansion in the numbers of people with at least primary schooling and a substantial shift toward higher levels of schooling in the last third of the 20th century. Both of these trends are projected to continue until at least the middle of the 21st century.

Figure 3.2 Populations of China and India aged 20-64 by Education Level, 1970-2050

The population of China aged 20-64 by education level, 1970-2050
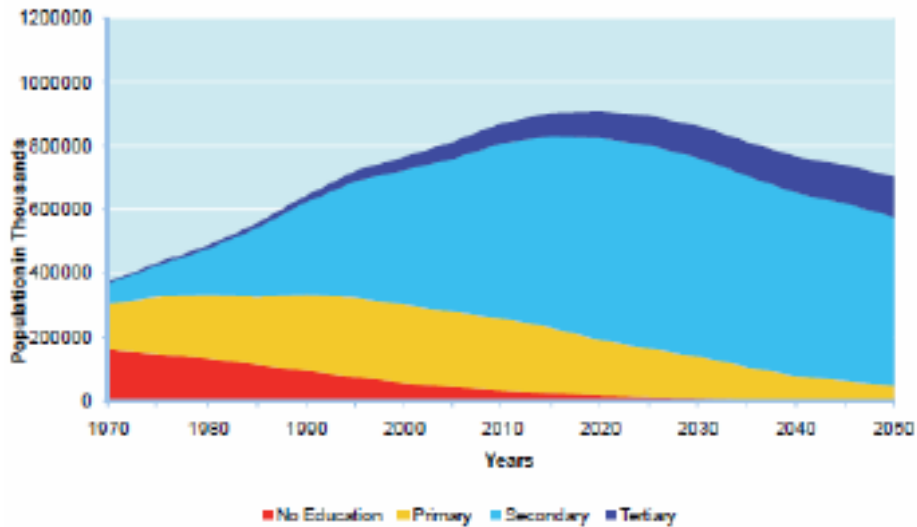
The population of India aged 20-64 by education level, 1970-2050
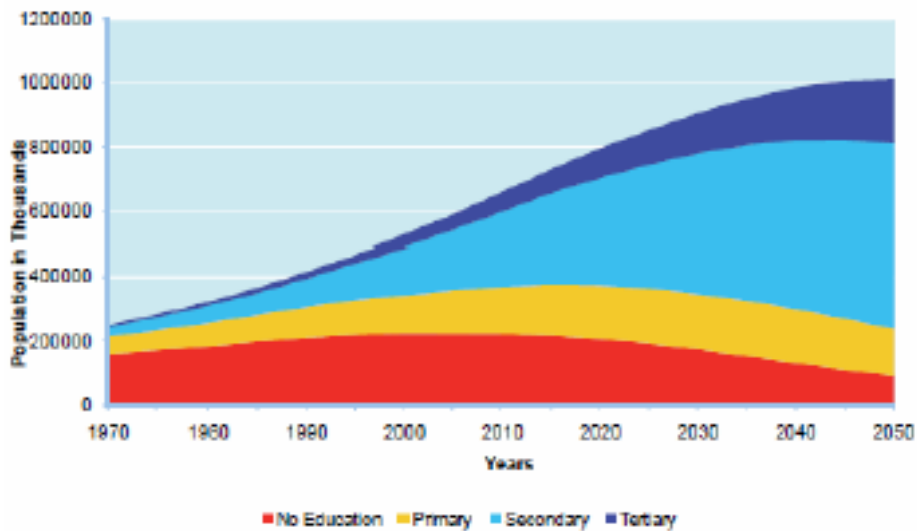
Source: KC and others 2010.

Table 3.1 Estimated Past and Projected Future Schooling Attainment in China and India, 1970–2050

| Country | Year | Population with at least primary school (millions) | Percentage of all adults 20–64 with | | | | |
			No schooling	Primary schooling	Secondary schooling	Tertiary schooling	At least primary schooling
China	1970	211	43.7	38	17	1.4	56.4
	2000	707	7.7	31.9	55	5.4	92.3
	2050	1,070	2.3	3.5	82.9	11.2	97.6
India	1970	89	64.2	22.2	11.5	2.1	35.8
	2000	301	42.7	22.4	27.6	7.2	57.2
	2050	1,086	34.2	21.4	37.5	6.9	65.8

Source: Authors, based on data from IIASA n.d.

The association between schooling attainment and economic growth has been a subject of some controversy, in part because of possible reverse causality and challenges in identifying causal effects of schooling (Barro 1991, 2001; Pritchett 2001). Lutz, Cuaresma, and Sanderson (2008) use schooling attainment data by age groups to estimate simple growth regressions based on five-year periods for a panel of 101 countries for which all the necessary economic and schooling data exist over 1970–2000. In their specification, schooling attainment by broad age groups enters production both as differentiated labor force inputs and through the absorption rate of new technologies, which, in turn, depend on the interaction between schooling attainment and distance to the technological frontier. They find consistently positive, statistically significant schooling effects on economic growth for some age and schooling groups, associations that may have been obscured in previous empirical investigations that used much more aggregated schooling data (for example, for all adults, as in Barro and Lee 1993, 1996) and different specifications.

They illustrate the implications of their results by simulating four scenarios based on their estimated coefficients, which they suggest roughly resemble alternative hypothetical schooling policy strategies for a poor African country (figure 3.3). Scenario 1 is their reference case of a country with a young age structure (70 percent of the population in the 15–40 age group and 30 percent in the 40–65 age group); a low starting level of income and investment rate; and half of

the population without any formal schooling, 40 percent with some primary schooling, and 10 percent with at least completed junior secondary school (but no tertiary education). On the basis of the estimated model, such a country would have slow economic growth.

Figure 3.3 Annual GDP Growth Rates According to Four Alternative Educational Attainment Distributions
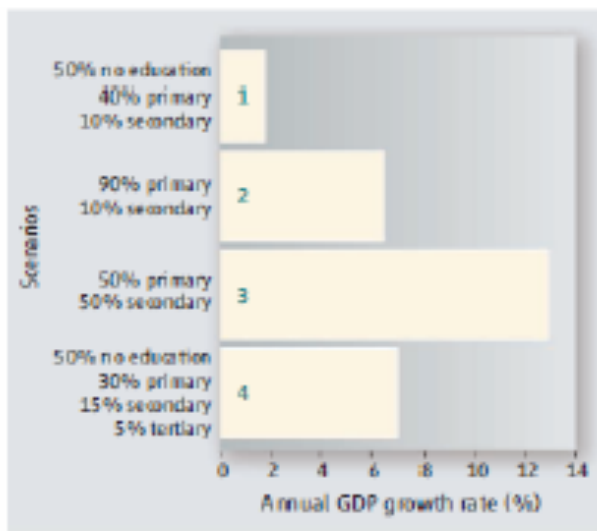
Source: Lutz and others 2008.

Scenario 2 considers an otherwise identical country under the hypothetical assumptions that it has long met Millennium Development Goal (MDG) 2 (universal primary education) and that the half of the adult population that had no education now has primary education. This case would lead to somewhat higher average growth.

Scenario 3 adds widespread secondary schooling—50 percent of the population achieving at least some secondary schooling—to universal primary education. This additional investment boosts economic growth, which is more than five times as high as in the baseline scenario and much higher than in the scenario of universal primary education alone.

Scenario 4 (which somewhat resembles India, according to the authors) presents another possible direction of improvement from the baseline. In this scenario, half the population remains without education, 30 percent have primary education, 15 percent have secondary education, and 5 percent have tertiary education. This case of elitist schooling in a context in which half the population has no schooling performs better than the baseline and Scenario 1, but it falls far short of the economic growth implied by Scenario 3.

If the associations in their analysis reflect causal effects, these simulations suggest that the schooling strategy adopted by countries can have important effects on economic growth and that schooling strategies that favor "average citizens" with universal primary and broad secondary schooling should rank high among priorities even if average economic growth alone is the policy objective. Such strategies are also likely to yield more equitable growth than strategies like Scenario 4.

In addition to possible impacts on economic growth, schooling attainment may have important impacts on demographic developments, as in the quality-quantity fertility model described above. A long history of research has considered the impacts of schooling, particularly women's schooling, on demographic outcomes such as fertility and mortality (Becker 1960; Schultz 1985, 1993, 2002; Rosenzweig and Schultz 1987). Although there is some debate about the extent to which the mechanisms reflect a higher opportunity cost of time, less costly adoption of contraceptive technologies, or changes in norms and preferences, the associations between more female schooling and lower mortality and fertility appear robust.

Lutz and KC (2011) simulate the relation between schooling attainment and future population growth by comparing four school enrollment scenarios for individual countries and world regions through 2050 (all based on identical schooling-specific fertility, mortality, and migration rates):
- Fast-track scenario: All countries expand their school system at the fastest possible rate, comparable with the rates of best performers in the past, such as Singapore and Korea.
- Global education trend scenario: Countries follow the average path of school expansion that countries that are somewhat further advanced have experienced.

- Constant enrollment rate scenario: Countries keep the proportions of cohorts attending school constant at current levels.

- Constant enrollment numbers scenario: Countries keep the absolute number of students at current levels (which, under conditions of population growth, reduces enrollment rates).

Figure 3.4 and table 3.2 give the global population projections by level of schooling for these four scenarios (table 3.2 also includes some country examples). The differences in the scenarios by 2050 show only the beginning of the schooling effects because of lags between increased investments in schooling in girls and demographic effects when they become adults and because of population momentum. Nevertheless, by 2050 the impacts of different schooling scenarios under otherwise identical schooling-specific relations with world population size are already very strong: population in the fast-track scenario will be more than 1 billion people smaller than under the constant enrollment numbers scenario, with about half of this difference projected for Africa. (To put this figure in perspective, the difference is greater than the entire African population today or three times the current population of the United States.) These simulations thus suggest a very important interaction effect between schooling attainment and population size. But as Lutz and KC (2011) note, there may also be important effects on other dimensions of the quality of the population, notably health and longevity (see section 4).

Figure 3.4 World Population by Level of Educational Attainment Projected to 2050 on the Basis of Four Different Educational Scenarios.

Source: Lutz and KC 2011.

Note: FT = Fast-track scenario (All countries expand their school system at the fastest possible rate, comparable with the rates of best performers in the past, such as Singapore and Korea); GET = Global education trend scenario (Countries follow the average path of school expansion that countries that are somewhat further advanced have experienced): CER = Constant enrollment rate scenario (Countries keep the proportions of cohorts attending school constant at current levels); and CEN = Constant enrollment numbers scenario (Countries keep the absolute number of students at current levels, which, under conditions of population growth, reduces enrollment rates).

Table 3.2 Population of World, Regions, and Selected Countries, 2000 and 2050 (millions)

Region/country	*Estimates for 2000 (base year)*	*Projections for 2050*			
		FT	*GET*	*CER*	*CEN*
World	6,115	8,885	8,954	9,728	9,977
Africa	819	1,871	1,998	2,236	2,393
Asia	3,698	5,102	5,046	5,487	5,560
Latin America and Caribbean	521	718	729	809	835
Ethiopia	66	153	174	203	214
India	1,043	1,580	1,614	1,732	1,789
Kenya	31	84	85	100	114
Nigeria	125	275	289	319	340
Pakistan	148	328	335	353	360
Uganda	24	89	91	105	116

Source: Lutz and KC 2011.

Note: FT = fast-track scenario (all countries expand their school system at the fastest possible rate, comparable to the rates of best performers in the past, such as Singapore and Korea); GET = global education trend scenario (countries follow the average path of school expansion that countries that are somewhat further advanced have experienced): CER = constant enrollment rate scenario (countries keep the proportions of cohorts attending school constant at current levels); and CEN = constant enrollment numbers scenario (countries keep the absolute number of students at current levels, which, under conditions of population growth, reduces enrollment rates).

The work of Lutz and his collaborators on schooling attainment and economic growth and on schooling attainment and demographic outcomes is thus suggestive of substantial effects. As suggested at the start of this section, however, some caveats are appropriate. A large body of literature, for example, examines the possible upward "ability bias" and "family background bias" in estimates of schooling impacts at the micro level (because people with more schooling tend to have greater ability and greater motivation; receive more out-of-school investments in their human capital; live in better neighborhoods, with higher-quality schools, in their youth; and have better family connections, all of which may increase their schooling and directly affect outcomes of interest such as their adult wages and health). A number of studies suggest that controlling for such factors results in much smaller, or even negative, schooling effects.

Behrman and Rosenzweig (2002), for example, find that significantly positive associations between maternal and child schooling in the United States become significantly negative when identical twins estimates are used to control for genetic and family background endowments.

They suggest that increased maternal schooling increases women's time in the labor market, reducing the time they devote to child-rearing. Other scholars, such as Black, Devereux, and Salvanes (2005), find that associations between maternal schooling and child outcomes are substantially weakened when endogenous schooling choices are controlled for using "natural policy experiments" such as changes in mandatory schooling laws. Behrman and Birdsall (1983) find that the estimated return to schooling attainment in Brazil drops about 40 percent with incorporation of school quality into the analysis. Behrman and others (2011) find that significant associations between schooling attainment and Danish mortality and hospitalization evaporate with identical twins fixed effects estimates, suggesting that in that context schooling attainment is primarily a proxy for family background. There may also be macro effects, some of which (such as positive externalities or reduced relative cohort sizes, which increase schooling quality) may increase the returns to schooling and some of which (such as more rapid expansion of the supply of skills than of the demand for skills) may reduce the returns to schooling attainment.

For all of these reasons, studies such as Lutz, Cuaresma, and Sanderson (2008) and Lutz and KC. (2011), which are based on estimates that do not address these estimation issues, may overstate the effects of schooling attainment. Even if the true schooling effects are less than suggested by such studies, however, they are likely to be significant and important.

Other Forms of Education
Education takes place in many venues. It occurs over the life cycle, from conception through adulthood. Indeed, looking forward, if world markets and technology continue to change as rapidly or even more rapidly as they have in recent decades, adult education and retraining may become ever more important.

The systematic empirical evidence for most forms of such education is limited. An exception for which there has been a substantial expansion of evidence in recent years is investments in early childhood development (ECD). ECD has been widely recognized as possibly yielding high returns over the life cycle in developing as well as developed countries. The cognitive, socioemotional, and physical health developments of preschool-age children are increasingly seen as critical factors in schooling attainment, skill acquisition, and health and socioeconomic well-being later in life. In a *Lancet* symposium on ECD, Grantham-McGregor and others (2007)

estimate that more than 200 million children under the age of five in developing countries do not reach their developmental potential in part due to inadequate early-life education in the form of stimulation,[5] which likely means that they are substantially less able to take advantage of educational opportunities later in life and are less healthy, less productive, and poorer as adults.

Delayed child development is a cumulative process that starts in the womb and may be difficult (or very costly) to reverse during school years and adulthood. Heckman (2006) and others argue that policies to improve human development are therefore most cost-effective if they begin as early as possible and are targeted to the most disadvantaged groups.[6] Advocacy for and resources devoted to ECD have increased rapidly, particularly in developing countries.

Figure 3.5 shows gross enrollment ratios in preschool programs in the major world regions between 1970 and 2003. It suggests that through the last decades of the 20th century and into the early 21st century, preschool enrollment rates for children increased monotonically in all of the regions included, although there is a fair amount of variance across regions in both levels and trends. Around 1970, only the developed and transition economies had enrollment rates above 10 percent (about 40 percent, increasing to more than 70 percent by 2003/04). By the end of the period covered, Latin America and the Caribbean had enrollment rates of more than 60 percent. Over the previous 30 years, this region increased enrollment more rapidly than any other. In contrast, none of the other developing regions included had enrollment rates of more than 40 percent, and enrollment rates for the Arab states and Sub-Saharan Africa were still less than 15 percent in 2003/04.

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[5] This is the interpretation the authors give though their empirical identification of the number of children who do not reach their developmental potential depends primarily on measures of nutritional status (i.e., stunting) and secondarily on living in poverty.

[6] This argument for investing more in early life is presumably based on perceptions that the marginal rates of returns to investing in early life are higher than the returns to investing in later life-cycle stages. It does not mean that more and more resources should be shifted unendingly from later-life to early-life investments. If enough resources were shifted from later-life to early-life investments, the marginal rates of return to early-life investments would decline and the returns to later-life investments increase until the two were equal, at which point further shifts in investments from later-life to early-life investments would not be warranted from a productivity point of view.

Figure 3.5 Preschool Enrollment Rates by Major World Regions, 1970/1-2003/4
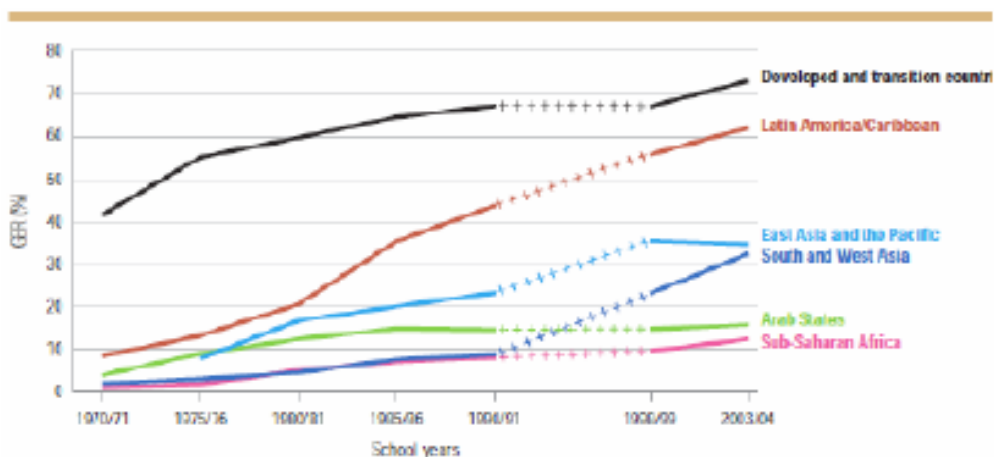
Source: Behrman and others 2013.

Note: Data for East Asia and the Pacific are for developing countries only. Australia, Japan and New Zealand are included with the developed economies. The broken lines reflect breaks due to a new classification.

This monotonic trend is less clear in recent data. Figure 3.6 displays more detailed and recent preschool gross enrollment ratios for children three- to five-years-old for selected years for major world regions. It shows a slow increase in preschool attendance since 1990 in most regions, although in both Central and Eastern Europe and Central Asia, the ending of the government-funded child care system of the Soviet Union initially resulted in rapid declines in the percentage of children enrolled. Attendance rates increased most rapidly in Latin America and the Caribbean and South and West Asia. Levels of enrollment are still low in Sub-Saharan Africa and the Arab states, although they are rising in Sub-Saharan Africa. Looking forward, there is potential for increasing preschool enrollment rates in all the major world regions, but particularly in Sub-Saharan Africa, the Arab States, and Central Asia, with intermediate possibilities in South and West Asia and East Asia and the Pacific.

Figure 3.6 Preschool Enrollment Rates for Major Wold Regions, 1990-2008.
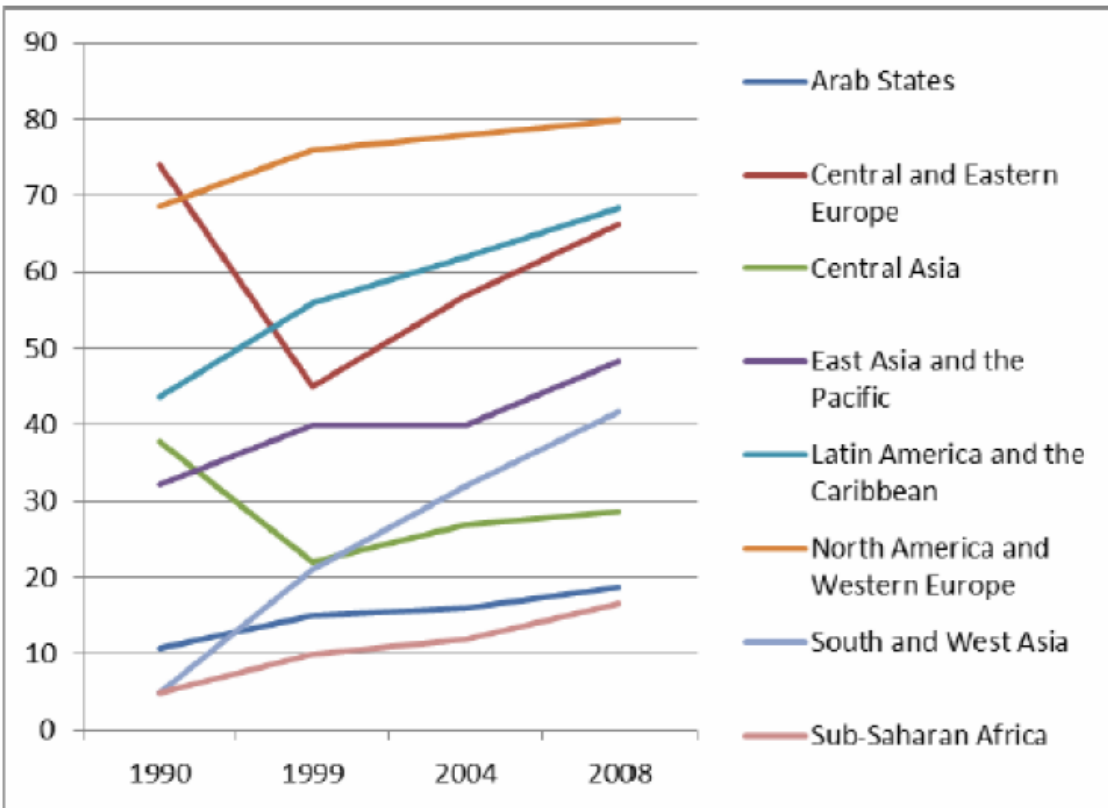
Source: Behrman and others 2013.

Most information about the impacts of ECD interventions comes from developed economies, particularly the United States. This evidence suggests that human development can be altered in early childhood by effective interventions that change the balance between risk and protection, thereby shifting the odds in favor of more adaptive outcomes. ECD programs that deliver carefully designed interventions with well-defined objectives and that include well-designed evaluations have been shown to influence developmental trajectories of children whose well-being is threatened by socioeconomic disadvantages, family disruptions, and disabilities. Programs that combine child-focused educational activities with explicit attention to parent-child interactions and relationship-building appear to have the greatest impact. However, the effects of ECD programs depend on their specific designs and on characteristics of the population. Out-of-home ECD services may have positive or negative effects depending on the quality of the ECD center, parental characteristics, and the child. The effects of ECD programs are more consistently

positive for cognitive outcomes than for noncognitive or social-emotional outcomes, except for high-quality child-care centers.[7]

These results from developed countries cannot necessarily be safely transplanted directly to developing countries because they depend on different market, policy, resource, and cultural contexts. Engle and others (2007) and Engle and others (2011) review the impacts of ECD programs in developing countries. The studies included in these reviews relate to programs that promote child development through psychosocial support, such as stimulation, responsive interaction, early education, or other social investments, often in combination with health, nutritional, social safety net, or educational interventions[8]; have been in operation since 1990; include adequate comparison groups to permit causal inferences; focus on children from birth to six-years-old; and report cognitive, language, social-emotional, or mental health outcomes (though analyses examining related outcomes, such as parent caregiving or preschool attendance, were also included). Engle and others (2007) identify 20 studies that meet these criteria; Engle and others (2011) identify 42 additional studies that meet these criteria. Most of these studies are of programs that target or exclusively serve children from disadvantaged backgrounds, particularly poor children. In a gross sense, they deal with the issue of heterogeneous impacts by focusing on children from disadvantaged backgrounds.

Few studies permit even relatively crude comparisons because of the range of interventions considered and the varying approaches to estimation. Of studies that present effect sizes (calculated using standard techniques), 8 examine parenting/family strengthening programs (often part of primary health care or other programs) and 14 examine organized early childhood learning centers (such as preschools).[9] Table 3.3 gives the medians and the ranges for the effect sizes on cognitive skills from these studies. For both parenting and center programs, the ranges

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[7] Behrman and Urzúa (2013) provide a succinct summary of these study results and references to relevant studies.
[8] Programs that have significant impacts on children in developing countries but do not have a psychosocial program component (such as salt iodization) are not included.
[9] For no other outcome measure are there as many as five studies with effect sizes. The estimates for comprehensive programs in Engle and others (2007) are included with the early childhood learning centers in this summary.

of estimated effect sizes are fairly large, but for both type of programs the median estimates are about 0.30, a considerable effect size.[10]

Table 3.3 Impact of Early Childhood Development on Cognitive Skills in Developing Countries

Type of intervention	Median	Range	Number of studies
Center-based preschool and day care	0.33	0.06–1.15	14
Parent and parent-child interactions	0.28	–0.05–0.80	8

Source: Authors, based on data from Engle and others, 2007, 2011.

To calculate benefit-cost ratios or internal rates of return, real resource costs are as important as benefits. It would therefore make sense that there would be more or less equal efforts to assemble information on real resource costs for ECD interventions as for ECD impacts. In fact, studies of the real resource costs of individual ECD interventions are not widely available for developing countries. Engle and others (2011) provide some suggestive estimates based on aggregate data of the potential productivity and income gains from narrowing the gap between preschool participation rates for children from families in the top quintile of the income distribution and other children in each of 73 developing countries. Subject to the caveats they discuss, their findings imply benefit-to-cost ratios in the range of 14.3–17.6 for a 3 percent discount rate and 6.4–7.8 for a 6 percent discount rate. These figures are suggestive of potentially large gains. However, they are fairly far removed from estimates for specific ECD interventions or even preschool interventions in specific contexts in developing countries, which would provide better policy guidance.

Less research has been conducted on extending education for adults. A conjunction of changes may increase the returns to such education in the future. In particular, the combination of longer expected lives, the shifts toward older age structures, the increased pressures on providing

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[10] For the other measures used, some of the median effect sizes are of the same magnitude as for cognitive skills. One study finds a 0.28 median effect of parenting on motor skills, for example, and three studies find an effect size of 0.35 for social/emotional skills. Three other studies, however, find a median effect size of just 0.17 for the effect of parenting on the Home Observation for Measurement of the Environment (HOME) measure of the quality and quantity of stimulation and support available to a child in the home environment in which the child is reared.

resources to aging people through traditional private or public mechanisms, and the apparently increasing rate of innovations and market integration in the globalizing economy are all likely to increase the returns to education and retraining later in the lifecycle.

4. Global Population Aging, Health, and the Epidemiological Transition
Investments in health and nutrition are investments in human capital, just like investments in education. The general frameworks for human capital investments and quantity-quality tradeoffs that are summarized at the start of section 3 thus apply equally to these investments. Although there are differences in institutions and details, the challenges in empirically identifying causal effects and differences between private and social returns carries over to health and nutrition.

Despite the rapid growth of the global population since the beginning of the 20th century, health and nutrition have improved substantially, as reflected in part in the substantial gains in life expectancies. In some dimensions, such as life expectancy, cross-country inequalities in health have diminished, as less developed countries experienced more rapid gains than more developed countries during recent decades. Many gender differentials in health and human capital that once favored males have been reversed, with possibly important implications for productivities, at least given the concentration of women and girls in activities such as home production, which have traditionally been viewed as having large externalities. There are strong associations between increased human capital on average and economic growth, poverty alleviation, and reductions in inequality, as well as with fertility reductions, though there is some controversy about the extent of the causal impacts and reverse causality. There have been rapid changes in the provision of social sector services related to human capital investments, with increasing private provision of health- and education-related services—and significant controversy over the implications of alternative provision mechanisms. Technological innovations in these sectors also seem to be occurring at an accelerating pace, particularly regarding the use of information and mobile technologies but also, for example, in the use of genetically customized health interventions.

There has also been a shift from communicable to noncommunicable diseases as primary health concerns. The epidemiological transition that occurred in connection with the demographic transition implied a shift from communicable disease and malnutrition-based health problems to

chronic health conditions related to such conditions as cardiovascular disease, cancer, chronic respiratory disease, diabetes, and mental health, with increasing relevance of certain forms of risk-taking behaviors, including diet, smoking, and inactivity. This shift toward noncommunicable diseases entails important new challenges with respect to disease prevention, the promotion of risk-reducing behavioral changes, and the provision of adequate health care with respect to ensuring (relatively) high levels of productivity and activities of people affected by chronic diseases and with respect to future improvements in health that will allow a continuation of the trend toward increased life expectancy.

The aging of the global population will imply a variety of individual-level economic and social adaptations as a result of longer lives and fewer children. With appropriate policy responses, the process of global population aging, along with its individual and population-level adaptations, has the potential to be among the most remarkable success stories of societal change during the 21st century, not unlike the accomplishment of much of the global demographic transition during much of the 20th century. The share of people 60 and older rose from 8 percent of the world population (200 million people) in 1950 to about 11 percent (760 million) in 2010, and it is projected to increase to 22 percent (2 billion) by 2050. While the global population is projected to increase by a factor of 3.7 from 1950 to 2050, the number of people 60 and older is projected to increase by a factor of nearly 10, and the number of people 80 and older is projected to increase by a factor of 26. The share of people 80 and older has already edged up from 0.6 percent of the world population in 1950 (15 million) to about 1.6 percent (110 million) in 2010, with projections to reach 4 percent (400 million) by 2050. Globally, the 60-plus population grew about 30 percent faster than the overall population between 1950 and 2010, and the 80-plus population grew twice as fast. In more developed countries, the 60-plus population grew 2.5 times faster than the overall population, and the 80-plus population grew 4.3 times faster. Looking forward, the fraction of the population 60 and older will grow significantly in the next decades in developed countries, but the current developing countries will experience the most rapid rise in both the number and the proportion of older people. In addition, in 2010, women accounted for about 55 percent of people 60-plus, 64 percent of people 80-plus, and 82 percent of people 100-plus. In both developed and developing countries, these shares are projected to increase.

The aging of the global population is the result of remarkable and almost global increases in longevity throughout the 20th century, with continued progress expected during the 21st century, and the widespread decline of fertility that has resulted in more than half the global population residing in regions below-replacement fertility. Life expectancy increased over the past 150 years—by almost 2.5 years per decade—and it continues to rise (Oeppen and Vaupel 2002). As a result of the diffusion of health knowledge and medical technologies, less developed and least developed countries are likely to continue to narrow the gap with more developed countries in terms of life expectancy. By 2050, life expectancy in least developed countries is projected to be only 16 percent below that of more developed countries (compared with 26 percent less in 2005–10); in less developed regions (excluding least developed countries), life expectancy is projected to be just 9 percent below that of more developed countries (compared with 12 percent less in 2005–10).

The global population aging that results from these increases in life expectancy combined with declining (or already low) fertility will be far-reaching; global aging is all but certain to substantially alter the life course of people, the structure of national and global economies, and the organization of families and societies. The specifics will differ across countries, as a result of different institutional and social contexts. But several broadly similar implications of population aging will occur in both developed and developing countries.

First, global population aging arguably provides significant opportunities for improving health and well-being, including at adult, old, and oldest ages; it may set the stage for ongoing economic growth if health and productivities can be maintained across longer periods across the life course and the opportunities provided by changing population age structures— including the different timing of age structure changes across different countries and regions—can be harnessed (Bloom, Canning, and Sevilla 2002; Beard and others 2012). However, as Beard and others (2012, p. 2) note, if "policy-makers and leaders fail to plan adequately for the changes ahead, they will be inundated by the effects of global aging, such as a dearth of workers, strained pension systems, and overburdened health care systems."

Population aging in developed countries is a fairly well-known and widely recognized phenomenon (for recent discussions of the social and economic challenges it entails, see, for instance National Research Council 1994, 2001, 2012). In these countries, the share of people 60-plus rose from 12 percent in 1950 to 22 percent in 2010, and it is projected to reach 32 percent (418 million people) by 2050 (figure 4.1). Although the social, economic, and fiscal implications of population aging often feature prominently in political debates and newspaper headlines, developed countries have the ability to mobilize significant resources to address the challenges of population aging. Moreover, improvements in the health—and arguably productivities—of the "young olds" (people 55–75) (Christensen and others 2009) have created opportunities to ameliorate the fiscal consequences of population aging through adjustments in social security, related transfer systems, and labor market reforms that facilitate a relatively high participation of young olds in the labor market (National Research Council 2012).

Figure 4.1 Proportion of People Age 60 and over in Developed and Developing Countries
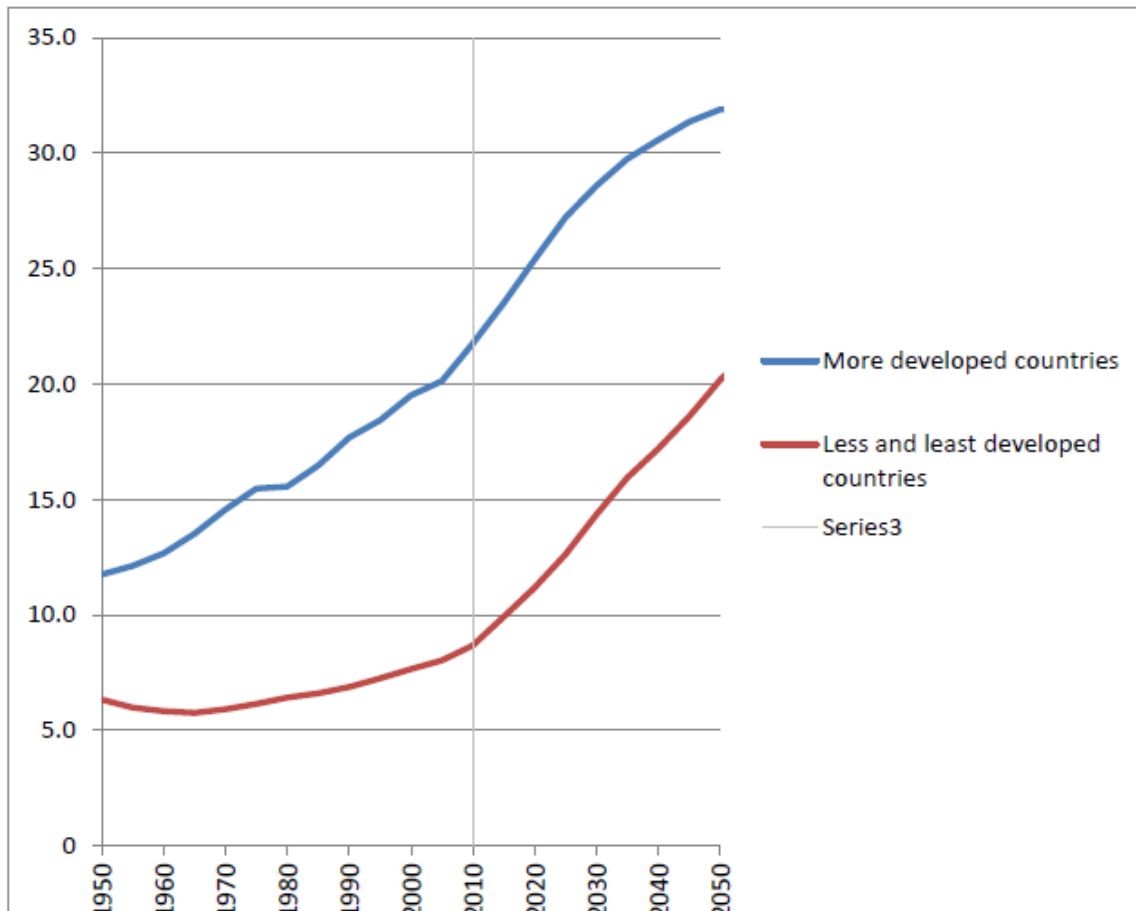
Source: Beard and others 2012, based on UN 2011b

Population aging in developing countries has only recently been recognized as an important challenge and opportunity. In these countries, the share of the population 60-plus rose from 6 percent in 1950 to 9 percent in 2010; it is projected to reach 20 percent (1.6 billion people) by 2050. Although by 2050 the proportion of the 60-plus population will still be smaller than it is in more developed countries today, the pace of this increase means that developing countries will have much shorter periods to adjust and establish the infrastructure and policies necessary to meet the needs of their rapidly shifting demographics.

Adjustments and policy responses will be challenging given the resource constraints in less developed countries. Unlike developed countries, many developing countries will thus need to cope with getting old before getting rich. From a fiscal perspective, this phenomenon may be an

advantage, as many developing countries have not adapted the extensive transfer and pension systems that characterize more developed countries—systems that may be difficult to sustain in their current form as life expectancy increases and populations continue to age.[11] But the challenges resulting from aging in developing countries will be massive. In the absence of resource transfer schemes that provide support in old age, older people in many developing countries rely on familial support, which may be increasingly challenging as migration disperses generations. Healthcare systems may be inadequate to provide prevention and treatment for the shifting disease burdens associated with population aging. Rapid urbanization may exacerbate aging in rural areas, which may be least equipped to deal with the health and social consequences of population aging.

From an aggregate economic and demographic perspective, global aging is leading societies into somewhat uncharted territory. The broad demographic changes are relatively predictable: there will more elderly people, a larger share of elderly in the overall population, longer healthy life expectancies, and smaller proportions of the primary working-age people. But the economic consequences of these changes in age structure may be complex, and they are likely to differ substantially across countries at different developmental stages and with different institutional settings and social policies.

In developed countries, alarmist views about the consequences of population aging are abundant, with worries ranging from concerns over declining rates of economic growth, overburdened family support systems, and unsustainable pension systems (where applicable) to concerns about "too many" old and possibly disabled people draining societal resources. There are, however, some reasons to believe that such fears are exaggerated, that with appropriate policy responses and changes in the economic life course of people, the economic challenges associated with population aging are more "manageable" than is often believed to be the case. For instance, a recent report on the United States by the National Academy of Science (National Research

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[11] A number of countries in Latin American, such as Brazil, Chile, and Mexico, as well as developing countries elsewhere, such as South Africa, have extensive pension and social security systems. Generally, however, such systems cover only workers with many years' experience in the formal sector, which excludes many adults, usually more women than men.

Council 2012, p. S-3) concludes that although "population aging is likely to result in a larger fraction of national output being spent on consumption by older persons, this does not pose an insurmountable challenge provided that sensible policies are implemented with enough lead time to allow companies and households to respond. The ultimate national response will likely involve some combination of major structural changes to Social Security, Medicare, and Medicaid, higher savings rates during working years, and longer working lives."

In the global context, Beard and others (2012) observe that, despite declines in the global labor force participation rate (the ratio of the global labor force to the population age 15 and over) since 1960 and projected future declines of another 4.4 percentage points by 2050 (table 4.1), the labor force as a share of the total population has been increasing and is projected to rise by about 1.9 percentage points between 2005 and 2050 as a result of falling fertility rates. Moreover, the actual increase might be even greater, as this projection does not account for the likely boost of lower fertility to female labor force participation that has been observed in other contexts during earlier fertility declines. In the next decades, therefore, the increase in elderly dependents that many developing countries will experience will be more than offset by a decline in young dependents, especially in contexts where older people are relatively productive (for example, as a result of the absence of a pension system, which encourages relatively early retirement) and where the consumption of older people does not exceed that of prime-age adults as much as it does in developed countries, where the health care costs associated with old age are high (figure 4.2) (Lee and Mason 2011). As a result, the total dependency ratio will increase less than the old-age dependency ratio, and the offsetting trends in the young-age and old-age dependency ratios may not necessarily pose an imminent economic crisis for the world. Quite to the contrary, research suggests that in countries that still have a relatively young age structure as a result of relatively high fertility and mortality levels (such as many Sub-Saharan African and South Asian countries), there is a potential for demographic dividends (Bloom, Canning, and Sevilla 2002). This dividend results from the fact that countries face a "window of opportunity" in the demographic transition when both young-age and old-age dependency rates are low, as a result of a largely accomplished fertility decline, significant gains in life expectancy, and recent declines in fertility and increases in life expectancy. At this phase in the demographic transition, there will be an increase in the fraction of the population at working ages. With associated

behavioral changes and appropriate institutional frameworks, these changes in age structure may be an important contributor to economic growth.

Figure 4.2 Economic Life Cycle of Hunter-Gatherers, Poor Agricultural Populations, and Rich Industrial Populations
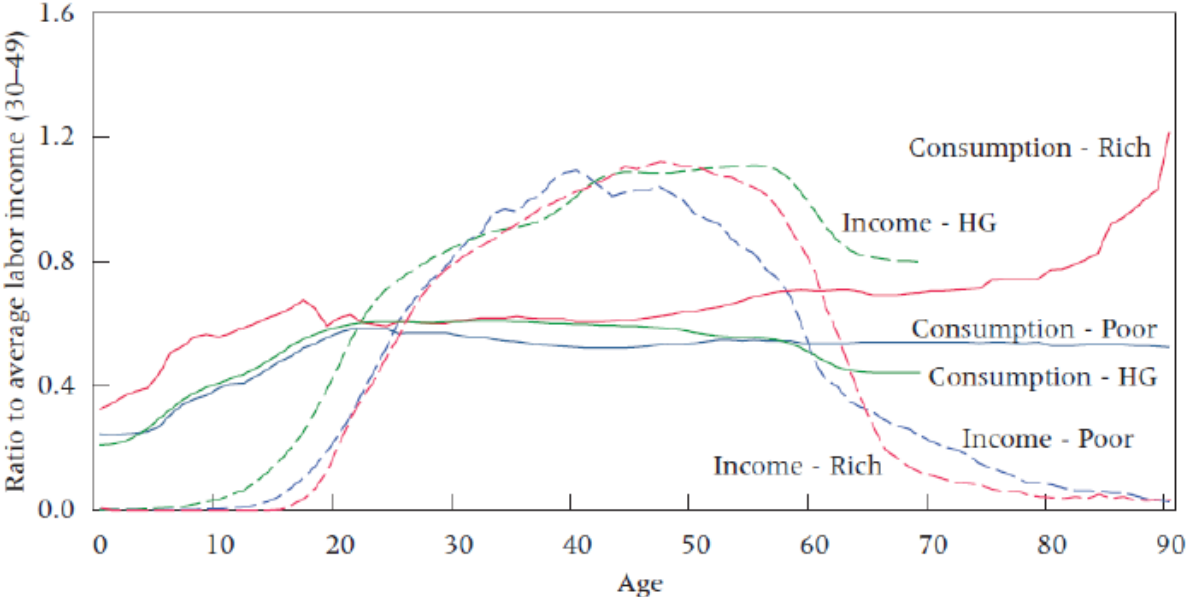
Source: Lee and Mason 2011.

Table 4.1 Actual and Projected Global Labor Force, 1960–2050

Measure	1960 actual	2005 actual	2050 projected
Labor force as percent of population 15 and older	67.4	65.8	61.4
Labor force as percent of total population	42.3	47.1	49.0

Source: Beard and others 2012.
Note: Projections assume that age- and gender-specific labor force participation rates in all countries remain at 2005 levels.

In summary, one of the most widely cited concerns about population aging—that there will be a crushing rise in old-age dependency unless the labor force participation of the elderly drastically increases—appears not to be warranted for the world as a whole. But population aging during the next decades will exhibit considerable heterogeneity, in both the pace and the extent of aging and the social and economic challenges that stem from it. In developed countries—which already have relatively old age structures, as a result of decades of low fertility and significant increases in life expectancy during the 20th century—additional gains in life expectancy occur primarily at older ages. Developed countries also have had low and below-replacement fertility for several decades, which is likely to persist. Together these trends imply that the size of the labor force—in both absolute numbers and as a fraction of the population—is likely to decline, if one assumes that the age range during which people are economically active remains constant, something that may not be the case.

To reduce the fiscal and economic consequences of population aging, countries can provide individuals with more choice with regard to the timing of retirement and encourage them to internalize some of the costs of early retirement and/or privatize some of the benefits of delayed retirement. This response is facilitated by improved health at "young old ages" and technological and medical progress that allows improved management of some chronic health conditions. In particular, many developed countries have social security systems that implicitly encourage relatively early retirement (at 60–65). As a consequence, despite substantial expansion of life expectancy at 65, the age at retirement in many developed countries declined or remained constant during the second half of the 20th century. Life expectancies in 43 countries, most of which are developed, rose an average of nine years from 1965 to 2005, but the average legal retirement age rose by only about six months (Börsch-Supan 2005). Eliminating some of the

incentives for early retirement by aligning the social and private costs and benefits of individuals' timing of retirement is therefore likely to result in delayed retirement.

These additional working years may be years of relatively high productivity: the evidence on declines of productivity with age is mixed, and the assumption that older people are less productive than younger people is not generally true. For example, a National Research Council (2012) report for the United States concludes that "the estimates all indicate that the age composition effect on productivity for the U.S. labor force over the next two decades is very small.… [Therefore] there is likely to be a negligible effect of the age composition of the labor force on aggregate productivity over the next two decades." Whether this optimistic assessment is accurate in the case of less developed and least developed countries, where the adult and "young old" population is often less healthy, is not clear, as detailed empirical evidence is missing.

Some countries, such as Germany and the United States, have made progress toward reducing incentives for early retirement. In other countries, raising the retirement age and making changes to the pension system that remove incentives to retire early have proven controversial and difficult. In France, for example, increases in the retirement age were reversed after social protests. Despite the difficulties of adjusting to the challenges of population aging, individually and collectively, there will almost certainly be fundamental changes in behaviors and individuals' organization of the life course.

At the same time, institutions and public policies will reflect the new meaning of aging, and along with it, the altered needs and capacities of older people. Broadly speaking, these changes will most likely entail a multifaceted response that includes raising the legal retirement age, investing in older people so that they can continue to learn and contribute to society, rethinking business practices (such as work schedules) to facilitate the participation of older workers, making sure that there are adequate social protections (such as pensions), and reforming health systems to better meet the needs of older people.

In addition, recognizing that health at older ages is affected by lifelong investments in health and the cumulative effects of behaviors (including diet, smoking, and inactivity) across the life course, an important response to population aging will be to emphasize investments in both physical and mental health throughout the life course so that people remain healthy as they age. Essential elements of such policies include the promotion of healthy behaviors, the provision of education throughout the life course, regular screening for risk factors and early treatment to minimize the consequences of chronic disease, the effective management of more advanced disease through tertiary care and rehabilitation, and the creation of age-friendly environments that foster a healthy lifestyle at younger, middle, and older ages. In developed countries, substantial progress has already been made, with gains in life expectancy resulting in significant expansions of "healthy life expectancy" rather than primarily expansions in years lived with disabilities (Christensen and others 2009; Vos and others 2012). Significant further progress also seems possible. In contrast, in developing countries, levels of disabilities and chronic health conditions at adult and "young old" ages are frequently very high, often as a result of the cumulative effects of poor nutrition, frequent exposure to infectious disease, limited knowledge about the prevention and cure of noncommunicable diseases, and inadequate health systems. Addressing these emerging health concerns will be challenging.

Beard and others (2012) argue that aging creates what may be the most important global public health problem of the 21st century: the large increase in chronic (noncommunicable) diseases. Noncommunicable diseases are currently responsible for roughly 60 percent of all deaths and nearly half of the loss of actual and effective life years to disability and death (figures 4.3 and 4.4). The most important noncommunicable diseases are cardiovascular disease, cancer, chronic respiratory disease, diabetes, and mental health conditions, including Alzheimer's disease. Many of these diseases share four modifiable risk factors (tobacco use, physical inactivity, unhealthy diets, and the harmful use of alcohol) and one nonmodifiable risk factor (age). Reducing behavioral risk factors is critical, but doing so has often been challenging, especially where resources for the promotion of healthy behaviors are limited.

Figure 4.3: Global Burden of Disease Study 2010: Global Death Ranks with 95% Uncertainty Intervals (UI) for the Top 25 Causes in 1990 and 2010, and the Percentage Change with 95% UIs between 1990 and 2010

1990			2010		
Mean rank (95% UI)	Disorder		Disorder	Mean rank (95% UI)	% change (95% UI)
1·0 (1 to 2)	1 Ischaemic heart disease		1 Ischaemic heart disease	1·0 (1 to 1)	35 (29 to 39)
2·0 (1 to 2)	2 Stroke		2 Stroke	2·0 (2 to 2)	26 (14 to 32)
3·0 (3 to 4)	3 Lower respiratory infections		3 COPD	3·4 (3 to 4)	−7 (−12 to 0)
4·0 (3 to 4)	4 COPD		4 Lower respiratory infections	3·6 (3 to 4)	−18 (−24 to −11)
5·0 (5 to 5)	5 Diarrhoea		5 Lung cancer	5·8 (5 to 10)	48 (24 to 61)
6·1 (6 to 7)	6 Tuberculosis		6 HIV/AIDS	6·4 (5 to 8)	396 (323 to 465)
7·3 (7 to 9)	7 Preterm birth complications		7 Diarrhoea	6·7 (5 to 9)	−42 (−49 to −35)
8·6 (7 to 12)	8 Lung cancer		8 Road injury	8·4 (5 to 11)	47 (18 to 86)
9·4 (7 to 13)	9 Malaria		9 Diabetes	9·0 (7 to 11)	93 (68 to 102)
10·4 (8 to 14)	10 Road injury		10 Tuberculosis	10·1 (8 to 13)	−18 (−35 to −3)
10·8 (8 to 14)	11 Protein-energy malnutrition		11 Malaria	10·3 (6 to 13)	21 (−9 to 56)
12·8 (11 to 16)	12 Cirrhosis		12 Cirrhosis	11·8 (10 to 14)	33 (25 to 41)
13·2 (9 to 18)	13 Stomach cancer		13 Self-harm	14·1 (11 to 20)	32 (8 to 49)
15·6 (12 to 20)	14 Self-harm		14 Hypertensive heart disease	14·2 (12 to 18)	48 (39 to 56)
15·8 (13 to 19)	15 Diabetes		15 Preterm birth complications	14·4 (12 to 18)	−28 (−39 to −17)
16·1 (12 to 20)	16 Congenital anomalies		16 Liver cancer	16·9 (14 to 20)	63 (49 to 78)
16·9 (13 to 20)	17 Neonatal encephalopathy*		17 Stomach cancer	17·0 (13 to 22)	−2 (−10 to 5)
18·3 (14 to 22)	18 Hypertensive heart disease		18 Chronic kidney disease	17·4 (15 to 21)	82 (65 to 95)
21·1 (6 to 44)	19 Measles		19 Colorectal cancer	18·5 (15 to 21)	46 (36 to 63)
21·1 (12 to 36)	20 Neonatal sepsis		20 Other cardiovascular and circulatory	19·7 (18 to 21)	46 (40 to 55)
21·3 (19 to 26)	21 Colorectal cancer		21 Protein-energy malnutrition	21·5 (19 to 25)	−32 (−42 to −21)
21·6 (18 to 26)	22 Meningitis		22 Falls	23·3 (21 to 29)	56 (20 to 84)
23·2 (21 to 26)	23 Other cardiovascular and circulatory		23 Congenital anomalies	24·4 (21 to 29)	−22 (−40 to −3)
23·7 (20 to 28)	24 Liver cancer		24 Neonatal encephalopathy*	24·4 (21 to 30)	−20 (−33 to −2)
23·8 (20 to 27)	25 Rheumatic heart disease		25 Neonatal sepsis	25·1 (15 to 35)	−3 (−25 to 27)
	27 Chronic kidney disease		29 Meningitis		
	30 Falls		33 Rheumatic heart disease		
	35 HIV/AIDS		62 Measles		

☐ Communicable, maternal, neonatal, and nutritional disorders
☐ Non-communicable diseases
☐ Injuries

—— Ascending order in rank
---- Descending order in rank

UI=uncertainty interval. COPD=chronic obstructive pulmonary disease. *Includes birth asphyxia/trauma.

Source: Lozano et al (2012)

Figure 4.4: Global Burden of Disease Study 2010: Global Years Lived with Disability (YLDs) Ranks wi?
Uncertainty Intervals (UI) for the 25 Most Common Causes in 1990 and 2010

	1990		2010		
Mean rank (95% UI)	**Disorder**		**Disorder**	**Mean rank (95% UI)**	**% change (95% UI)**
1·3 (1 to 3)	1 Low back pain		1 Low back pain	1·1 (1 to 2)	43 (34 to 53)
2·2 (1 to 3	2 Major depressive disorder		2 Major depressive disorder	1·9 (1 to 3)	37 (25 to 50)
2·5 (1 to 3)	3 Iron-deficiency anaemia		3 Iron-deficiency anaemia	3·3 (2 to 6)	–1 (-3 to 2)
4·4 (4 to 7)	4 Neck pain		4 Neck pain	4·3 (3 to 7)	41 (28 to 55)
6·0 (4 to 8)	5 Other musculoskeletal disorders		5 COPD	5·8 (3 to 10)	46 (32 to 62)
6·1 (4 to 9)	6 COPD		6 Other musculoskeletal disorders	5·9 (4 to 8)	45 (38 to 51)
6·1 (4 to 9)	7 Anxiety disorders		7 Anxiety disorders	6·4 (4 to 9)	37 (25 to 50)
8·7 (6 to 15)	8 Migraine		8 Migraine	8·9 (6 to 15)	40 (31 to 51)
10·0 (7 to 14)	9 Falls		9 Diabetes	9·1 (6 to 13)	68 (56 to 81)
11·4 (8 to 16)	10 Diabetes		10 Falls	10·1 (7 to 14)	46 (30 to 64)
12·1 (8 to 17)	11 Drug use disorders		11 Osteoarthritis	12·3 (9 to 17)	64 (50 to 79)
12·2 (6 to 19)	12 Hearing loss		12 Drug use disorders	12·5 (9 to 16)	40 (27 to 54)
14·0 (9 to 19)	13 Asthma		13 Hearing loss	13·5 (7 to 20)	29 (22 to 36)
14·9 (10 to 21)	14 Alcohol use disorders		14 Asthma	15·3 (10 to 20)	28 (21 to 34)
15·0 (11 to 21)	15 Osteoarthritis		15 Alcohol use disorders	15·8 (12 to 21)	32 (16 to 50)
15·2 (11 to 20)	16 Road injury		16 Schizophrenia	16·0 (9 to 22)	48 (37 to 60)
17·1 (9 to 25)	17 Bipolar disorder		17 Road injury	16·1 (12 to 20)	30 (13 to 49)
17·1 (9 to 24)	18 Schizophrenia		18 Bipolar disorder	16·6 (9 to 23)	41 (31 to 51)
19·5 (12 to 27)	19 Dysthymia		19 Dysthymia	18·6 (13 to 26)	41 (34 to 48)
19·8 (13 to 25)	20 Diarrhoea		20 Epilepsy	21·8 (18 to 27)	36 (27 to 47)
22·2 (13 to 35)	21 Eczema		21 Ischaemic heart disease	21·9 (17 to 29)	48 (40 to 57)
22·7 (19 to 28)	22 Epilepsy		22 Eczema	22·3 (16 to 35)	29 (19 to 39)
23·9 (18 to 32)	23 Tuberculosis		23 Diarrhoea	23·1 (19 to 28)	5 (-1 to 11)
24·5 (19 to 34)	24 Ischaemic heart disease		24 Alzheimer's disease	25·9 (21 to 33)	80 (71 to 88)
25·3 (21 to 33)	25 Neonatal encephalopathy*		25 BPH	26·3 (20 to 35)	84 (48 to 120)
	30 Alzheimer's disease		26 Tuberculosis		
	35 BPH		27 Neonatal encephalopathy*		

— Ascending order in rank -·-· Descending order in rank

Communicable, maternal, neonatal, and nutritional disorders
Non-communicable diseases
Injuries

COPD=chronic obstructive pulmonary disease. BPH=benign prostatic hyperplasia. *Includes birth asphyxia/trauma.

Source: Vos et al (2012)

Health systems in many developing countries are not prepared to meet the burden of chronic disease and disability that aging populations bring with them. Even in developed countries, few systems are prepared for the numbers of frail elderly who will need special living quarters, social supports, and nursing homes when their needs make home care inadequate.

Many people living with chronic diseases go undiagnosed, especially in contexts with inadequate health systems, which often results in later and more costly treatment—or missed opportunities for treating at all. The increased costs of chronic disease are difficult to bear in developed countries. The changing burden of disease and its potential costs—especially if prevention and early detection remain inadequate—risk overwhelming health systems in developing countries, threatening the allocation of public health resources and preventive measures aimed at treating infectious diseases. In most developing countries, the health care and related social systems are all ill prepared to address the shifting population needs that come with societal aging, including income support for a large population of retirees, special housing and social care needs, and new demands for adult education.

There is heterogeneity across regions within countries and across groups of countries. This heterogeneity partly reflects levels of development. For example, recent studies of settings with substantial malnutrition show that improving nutrition in early life has important outcomes decades later on such variables as adult cognitive skills, wage rates, and even intergenerational effects on the next generation (see, for example, Behrman and others 2009a; Hoddinott and others 2008; Maluccio and others 2009; Victora and others 2008). Well over 150 million children under the age of five are malnourished, as reflected in stunting, primarily in South Asia but also substantially in other areas, including parts of Sub-Saharan Africa as well as increasing numbers who are overweight (de Onis, Blössner, and Borghi 2010, 2011). For such children the rates of return to improving nutrition are likely to be high.

5. Population Mobility

The geographical distribution of population has changed substantially in recent decades, both within and across countries and regions. The basic proximate demographic factors that determine the population in a given area are fertility, mortality, and net immigration. This section first

addresses the total impact of these three factors on urbanization, for which there have been and are projected to be in the future huge movements. It then considers one particular form of migration: international migration.

How do these considerations pertain to the schematic in table 2.1? Migration, domestic or international, can cause movements within each of the cells and movements across cells if the assignment to cells is not by country but by the characteristics of subnational regions. For example, migration from poor, rural, high-fertility areas to relatively well-off low-fertility areas within some countries may be a movement along the diagonal cells in table 2.1. Migration from poor high-fertility countries to high-income low-fertility countries also tends to be a movement along the diagonal.

5.1 Urbanization
As Glaeser (2011) notes, In the United States, 220 million Americans crowd together in the 3 percent of the country that is urban, and 35 million people live in the vast metropolis of Tokyo, which he characterizes as the most productive urban area in the world.[12] Increasingly, people choose to live in dense urban settlements, despite the vast amounts of space available. Glaeser's research suggests that such urbanization follows from models of spatial equilibrium and agglomeration economies.

Benefits and costs of urbanization
Heilig (2012) identifies three reasons why "the urban advantage" has important implications for development:

1. Agricultural modernization releases previously low-productive rural workers for migration to urban areas (a "push" factor for urbanization).
2. Higher-wage urban employment attracts migrants from rural areas (a "pull" factor for urbanization), particularly women, who work in urban service sectors and the garment and electronics industries.
3. Urban areas provide numerous other advantages, including better schooling and health services, more entertainment, more anonymity, greater opportunities for political participation, and freedom from traditional norms (all "pull" factors for urbanization).

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[12] This subsection draws heavily on Heilig (2012) and UN (2012a, b, c).

Heilig claims that urbanization can moderate environmental degradation because it reduces rural population densities, decreasing population pressure on arable land and increasing possibilities of renaturalization; concentrates environmental impacts, making them easier to prevent and mitigate; and diminishes land-use impacts. He notes that the largest urban centers, with a fifth of the world's population, generate three-fifths of world output, suggesting potential productivity gains from greater urbanization (Richard and others 2011).

There are also widely recognized costs to urbanization. Congestion and pollution are not sufficiently internalized. Heilig (2012) identifies urban policy and planning failures, including inadequate low-cost housing, basic transportation, electricity and freshwater supplies, garbage collection, sewage systems, traffic control, air pollution regulations, noise control, green spaces, and crime control. He attributes the low quality of life in many urban areas to such failures in urban policy and planning.

The gains from urbanization seem to outweigh the costs, at least privately, if expected private gains are compared with expected private costs in migration decisions (see, for example, Harris and Todaro 1970). The world has been urbanizing rapidly and is projected to continue to do so, albeit with very different patterns for less and more developed countries. Heilig (2012) notes the share of the world's population living in urban areas rose from about 3 percent two centuries ago to about half today. Over this period, the number of cities with more than a million people rose from 1 (London) to more than 450.

Projections for u rbanization
Figure 5.1 summarizes the trend in world rural and urban populations since 1950 and projected through 2100. The changes are dramatic. In 1950, there were more than two rural residents for every urban resident. By 2010, there were slightly more urban than rural residents. By 2050, there are projected to be more than twice as many urban as rural residents, and by 2100, there will be more than five times as many. Between 1950 and 2100, the number of urban residents is projected to increase by more than tenfold, while the number of rural residents is projected to peak around 2020 and decline by 2100 to below the 1950 level.

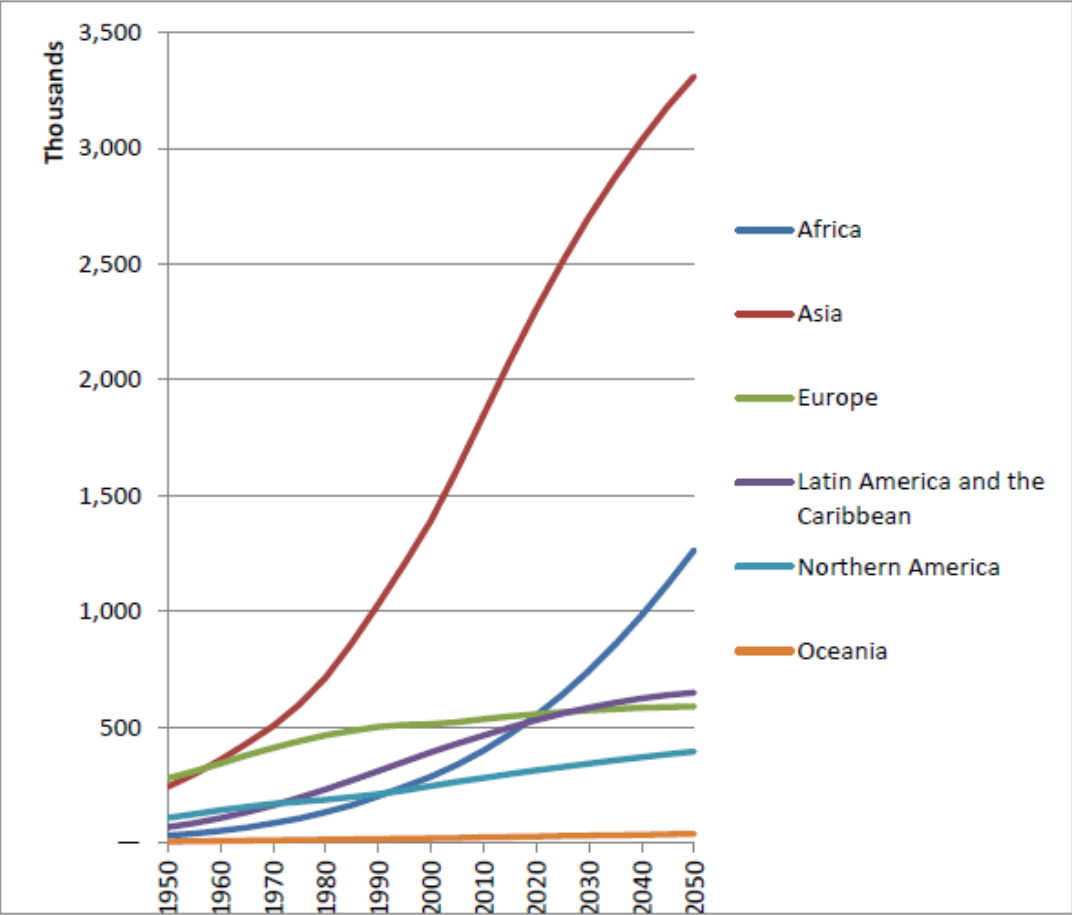## Figure 5.1. World Urban and Rural Populations 1950-2100
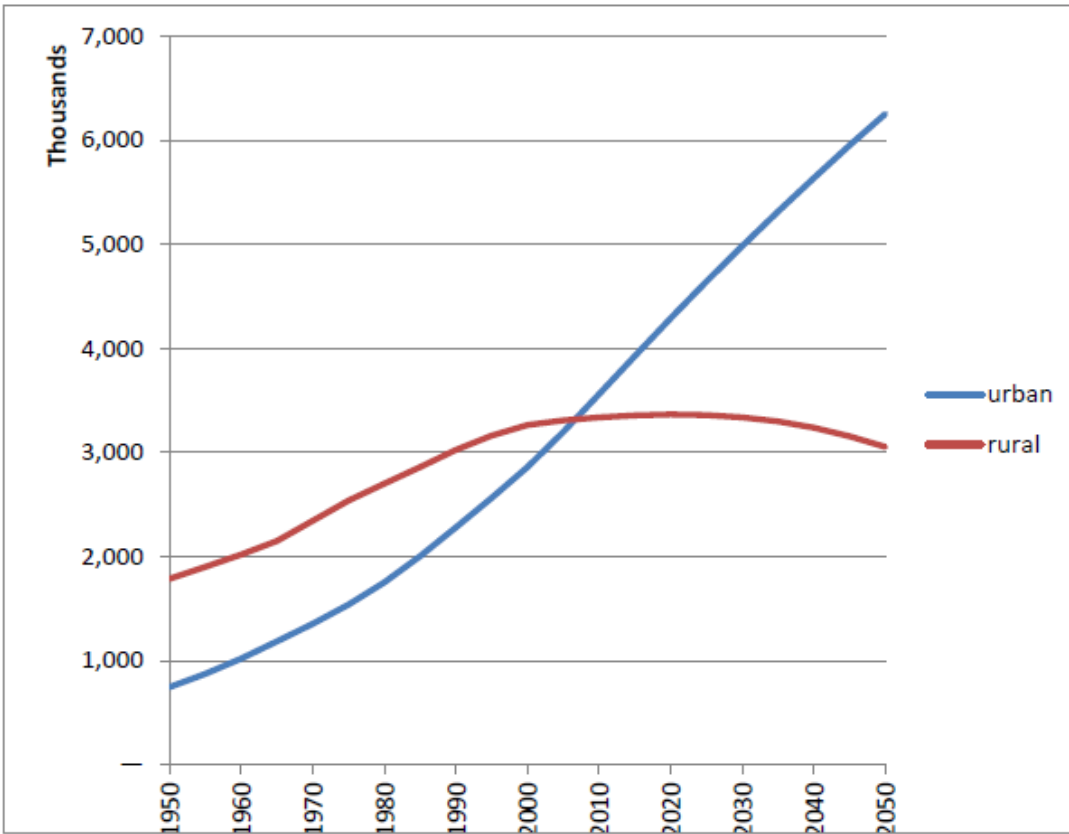
There are considerable differences in urbanization across major regions (figure 5.2). In 1950, Europe had the most urban inhabitants, somewhat more than Asia, and Africa had a very small urban population, with only Oceania among the regions included having a smaller urban population. By 2010, the Asian urban population had expanded considerably, to almost four times the European level, and the African urban population had expanded beyond the North American level. But the percentage of the population that was urban in 2010 was relatively low for Africa (39 percent) and Asia (44 percent), in comparison with Oceania (71 percent) and Europe (73 percent) and particularly Latin America and the Caribbean (79 percent) and Northern America (82 percent) (figure 5.3). The projections for 2010–2100 are for enormous increases in the urban populations of Asia and Africa, which are projected to account for more than 80 percent of the world's urban population by the end of the 21st century (see figure 5.2). These

projections are based on percentage changes in the urban population in these two regions between 2010 and 2100 that are more than 10 times as large as in the other regions (figure 5.4). Also of note are the reductions projected in the rural populations in all regions except Africa, where the rural population is projected to increase by 59 percent. This decline is projected to be particularly large in Asia.

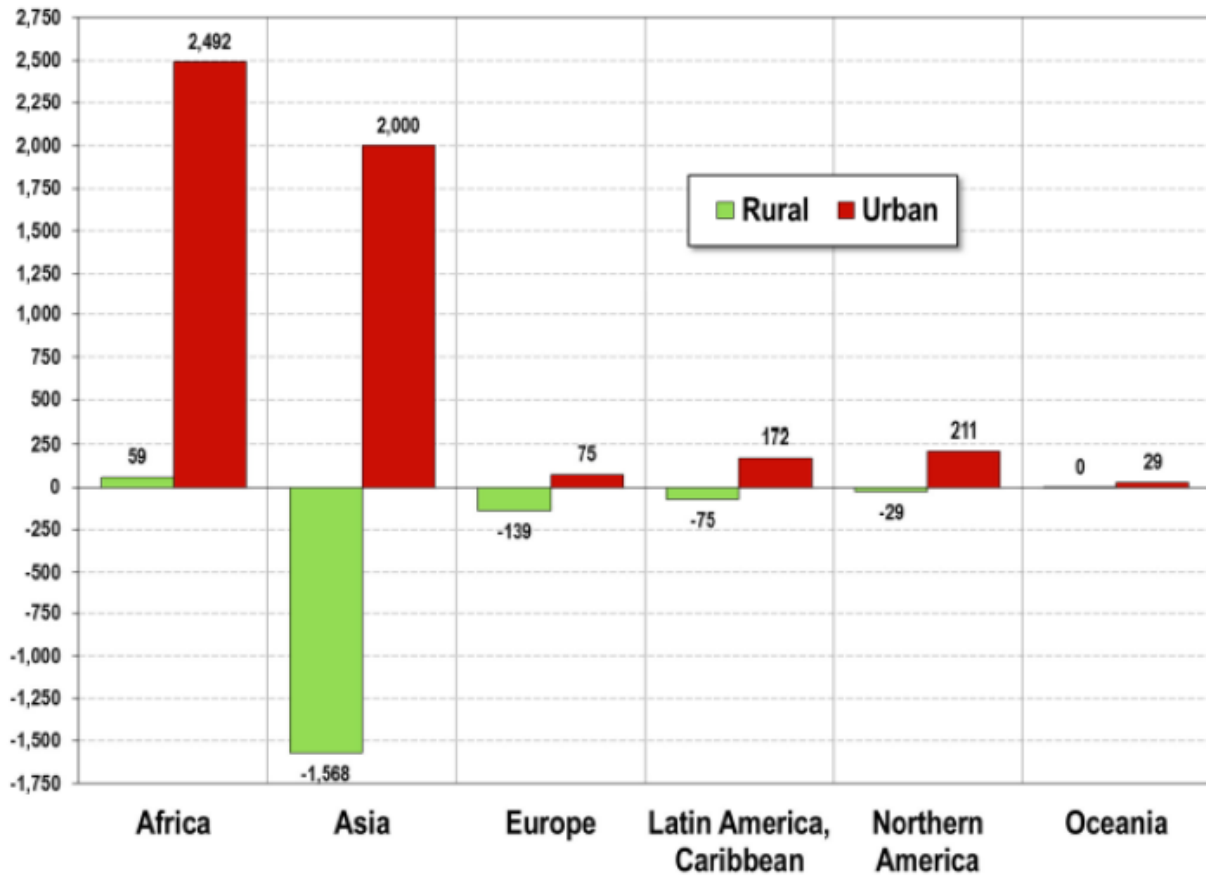## Figure 5.2 World Urban Population by Major Regions 1950-2100

Source: Heilig (2012)

Figure 5.3 Percentage Urban All Countries and Major Regions 2010
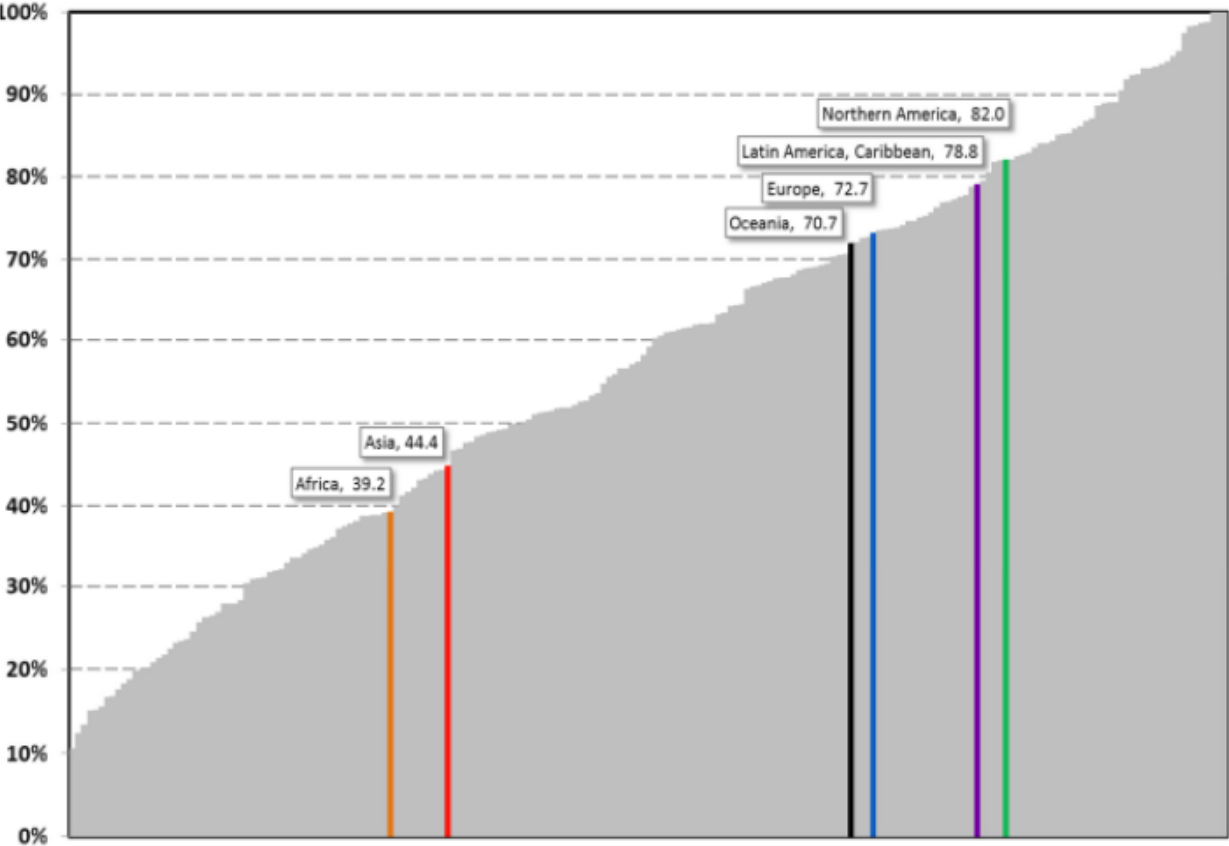
Source: Heilig (2012)

Figure 5.4 Urban and Rural Percentage Population Changes 2010-2100
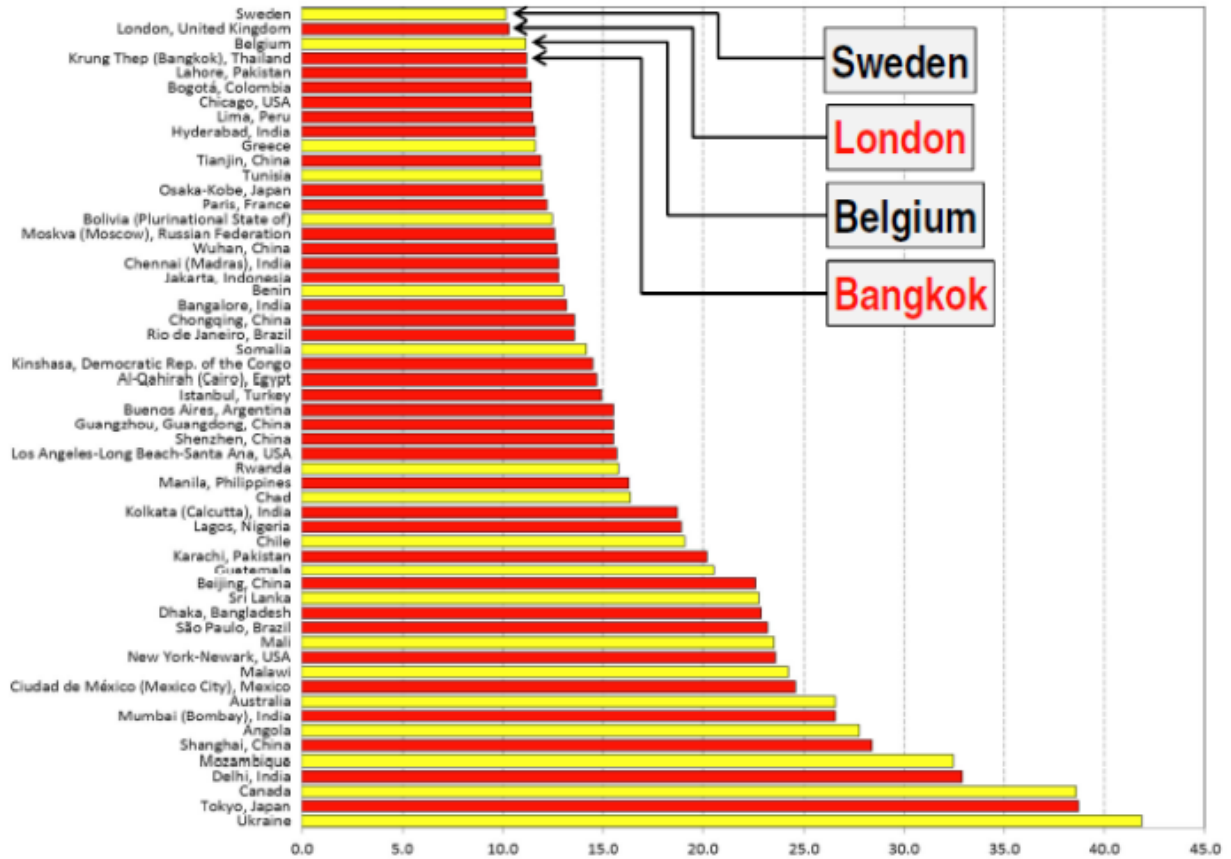

Source: Heilig (2012)

Megacities (cities with more than 10 million people) have been growing very quickly. In 1970, the world had just two megacities (Tokyo and New York), with a combined population of 40 million. By 2011, the number of megacities had increased to 23 (13 in Asia, 4 in Latin America, and 2 each in Africa, Europe, and Northern America), with a total population of 359 million. By 2025, the number of megacities is projected to increase to 37, with a total population of 630 million (figure 5.5). Most of these megacities are projected to be in Asia (22), with a few of the larger ones in the Americas (6 in Latin America, 3 in Northern America) and some of the smaller ones in Europe and Africa (figure 5.6). The populations of many of these megacities are projected to be on the order of magnitude of the populations of many countries.

Figure 5.5 Mega Cities with Population > 10 Million, 1970-2025

Number

Year	Number
1970	2
1990	10
2011	23
2025	37

Population (millions)

Year	Population
1970	40
1990	145
2011	359
2025	630
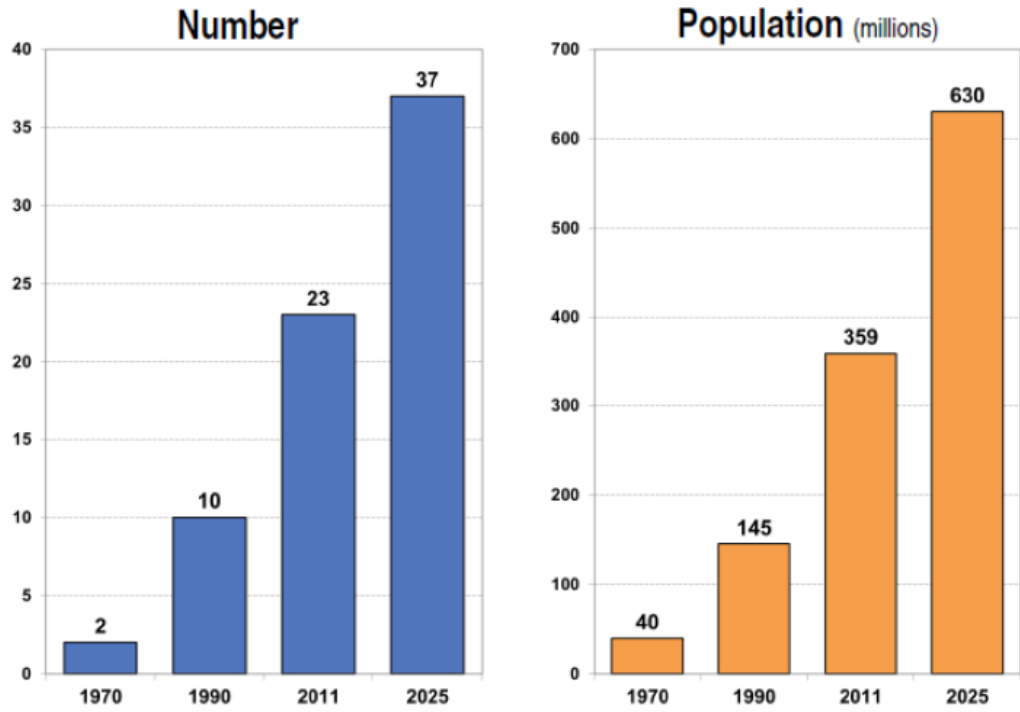
Source: Heilig (2012)

Figure 5.6 Mega-Cities and Selected Countries in 2025


Source: Heilig (2012)

Population density

Urban population densities vary widely, with important implications for living standards and welfare, especially in relatively poor areas. For example, the global ranking of the most densely populated urban areas (areas with populations of more than 0.5 million) is led by Dhaka (Bangladesh), with a total population of about 15 million and a population density of 44,000 population/km^2. It is followed by Hyderabad (Pakistan), with a total population of 2.6 million and a density of 39,000 population/km^2. Hong Kong is ranked eighth, with a density of about 26,000 population/km^2. The most densely populated urban area in the United States, Los Angeles, is ranked 724th, with a density of 2,400 population/km^2 (Demographia 2012).

Vulnerability to natural disasters

One concern about a number of cities pertains to the risks they face with regard to natural disasters. The United Nations Population Division (UN 2012a, b) classifies a city as at "relatively high risk" of a particular natural disaster if it is ranked in the top three deciles of the global risk distribution in terms of scale and frequency of occurrence in recent decades. By this measure, of the more than 450 urban areas with more than 1 million inhabitants in 2011 (with 1.4 billion people), 60 percent (with about 890 million people) are in areas of high risk of exposure to at least one natural hazard. Depending on the region, between half and two-thirds of these cities face high risk of exposure to at least one natural disaster. The major cities of Europe and Africa are least exposed, with only 26 percent of European cities and 37 percent of African cities at high risk of exposure to at least one natural disaster.

In contrast, cities in Latin America and the Caribbean, Northern America, and especially Asia are often located in areas exposed to natural hazards (figure 5.7). Flooding is the greatest and most frequent hazard for the 633 largest cities or urban agglomerations: 37 percent of these cities —13 percent of them coastal—are at risk of flooding, endangering 633 million inhabitants. The next most important natural hazards are drought (21 percent, affecting 227 million inhabitants); cyclones (11 percent, affecting 229 million inhabitants); and earthquakes (6 percent, affecting 113 million inhabitants).

Figure 5.7. Distribution of Cities by Population Size and Risk of Natural Hazards in 2011
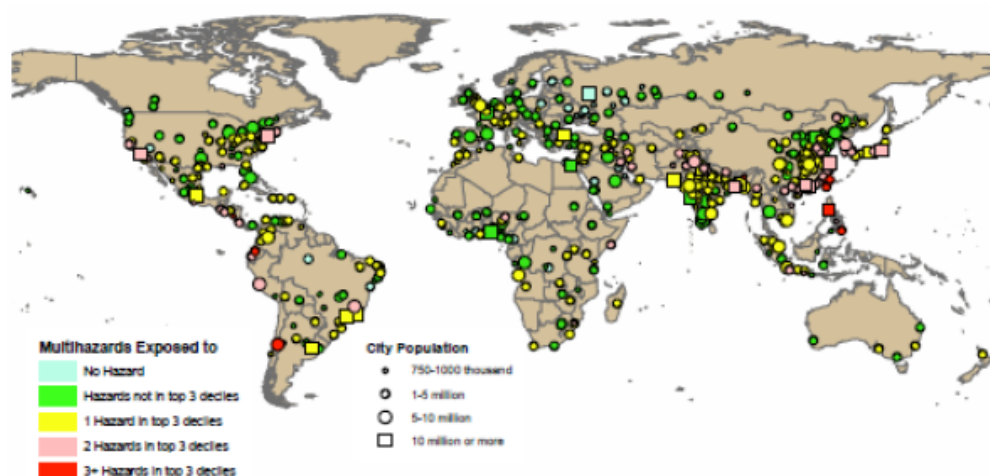
Source: UNPD (2012)

Among the 63 most populated urban areas (areas with 5 million or more inhabitants in 2011), 39 are located in regions that are exposed to a high risk of at least one natural hazard; 72 percent are located on or near coasts, and 67 percent are in Asia. In 2011, the five most populated cities located in areas with exposure to at least one major natural hazard were Tokyo, Delhi, Mexico City, New York-Newark, and Shanghai. All except Tokyo face high risk of floods; Delhi faces a medium risk of drought, Mexico City a medium risk of landslides, and New York-Newark a medium risk of cyclones.

Concern over spatial distribution of the population

Many governments have expressed concerns about their populations' spatial distributions. Most of these concerns relate to problems associated with urbanization, such as congestion and slums; in some cases, concerns are related to risks of natural disasters. In 2009, 83 percent of governments expressed concerns about spatial distribution (table 5.1). Among developing countries, 58 percent expressed desires to modify in major ways the spatial distributions of their populations and 28 percent wanted minor changes. Among developed countries, 29 percent desired major changes and 43 percent minor changes. Reported dissatisfaction regarding patterns of population distribution was highest in Africa (where 75 percent of countries wished to make major changes in the spatial distribution of their populations) and Asia (where 57 percent desired

major changes). In Latin America and the Caribbean, Oceania, and Europe, about 40 percent of governments considered major changes in spatial distribution desirable. It is notable that such concerns are greatest in the two regions that recently experienced the highest rates of urbanization but that still have relatively small shares of urban population and are projected to have the most rapid future rates of urbanization (figures 5.2 and 5.3). This finding suggests that governments perceive such problems, quite possibly with good justification, when changes are significant.

Table 5.1 Government Views on Internal Spatial Distribution of Population, 2009

Item	Less developed regions	More developed regions	World
Number of countries			
Major change desired	85	14	99
Minor change desired	41	21	62
Satisfactory	20	14	34
Total	146	49	195
Percent of all countries			
Major change desired	58	29	51
Minor change desired	28	43	32
Satisfactory	14	29	17
Total	100	100	100

Source: UN 2009.

Policies aimed at modifying the spatial distribution of a population often focus on ways to reduce migrant flows to large cities. According to the United Nations Population Division (UN 2012b), in 1976, 44 percent of developing countries reported having implemented such policies; by 2011, 72 percent reported having done so (83 percent in Oceania, 77 percent in Africa, 68 percent in Latin America and the Caribbean, and 66 percent in Asia). Among developed countries, the percentage of countries with policies to reduce migrant flows to large cities declined from 55 percent in 1976 to 26 percent in 1996 before increasing to 34 percent in 2009. These policies, as well as reported concerns, thus seem related to recent and projected rapid urbanization.

5.2 International Migration
As a result of the differential timing of the demographic transition, population growth differs significantly across different regions and types of economies and is projected to continue to do

so (see section 2). These differences primarily reflect differences in fertility and mortality rates, but they are also affected by international migration.

The cumulative effects of international migration flows on absolute population numbers are considerable. In 2010, the global stock of migrants (defined as people living in a country other than the one in which they were born) is estimated to have been 214 million (see figure 5.2). Although this number is large—3.4 times the population of France—it represents just 3.1 percent of the world population. Of course, migrants are not distributed equally across types of countries or regions. As would be expected from simple "push and pull" models of migration, migrants are concentrated in more developed regions, which accounted for 128 million migrants, or almost 60 percent of the total. But historically, migrant destinations have not been limited to the more developed regions of Europe, Northern America, Japan, Australia, and New Zealand. Almost 40 percent of all migrants—more than 86 million people—lived in less developed regions in 2010.

The age distribution of migrants tends to be different from that of their destination populations. Globally, people born in other countries tend to represent relatively large shares of the prime working age population (people 20- to 64-years-old) and people 65 and over (table 5.2). But there are striking differences between more- and less-developed regions, in both the shares of foreign-born inhabitants and their age patterns. In more-developed regions, migrants represent 12.8 percent of the 20–64 segment of the population (19 percent in Northern America and 21 percent in Oceania), 4.8 percent of the population under the age of 20, and 8.5 percent 65 and older. In less-developed regions, the largest percentage of migrants is in the 65 and over group (2.4 percent); migrants represent just 0.9 percent of people under the age of 20 and 1.8 percent of people 20- to 64-years-old. The smaller shares of migrants in less-developed regions are partly offset by their large absolute numbers of total populations. As a result, the absolute number of migrants is about two-thirds as large as in more-developed countries.

The stocks of migrants in 2010 are a snapshot that reflects dynamic processes of flows of net migrants over a number of years. Figures 5.9 and 5.10 summarize estimates back to 1950 and provide median projections through 2100 of the absolute numbers and proportions of international migrants (note that the number of net migrants for the less-developed countries in

figure 5.9 is the mirror image with a negative sign of that for the more-developed countries; also note that it is assumed for figure 5.10 that international migration will fade out at the end of the 21st century).

Table 5.2 International Migrant Stock as Percentage of Total Population, by Age Range, 2010

| *Region*	*0–19*	*20–64*	*65+*
World	1.3	4.0	4.7
More developed regions	4.8	12.8	8.5
Less developed regions	0.9	1.8	2.4
Africa	1.0	2.8	2.3
Asia	0.9	1.7	2.3
Europe	4.9	11.5	8.1
Latin America and the Caribbean	0.8	1.5	2.3
Northern America	5.2	18.6	12.8
Oceania	5.9	20.8	27.5

Source: UN 2011b.

The patterns are striking. Net international migration into more-developed regions is estimated to have increased substantially to more than 17 million people in 2000–05; the figure is projected to decline over the rest of the 21st century at about half the rate it increased in the last half of the 20th century, so that the projection for 2050–55 is less than half the estimate for 2000–05. With the exception of the first decade of the 21st century, Northern America has been and is projected to be the largest recipient of absolute number of net migrants, with Europe close behind. Latin America and the Caribbean was the largest source until about 1990. Since then, Asia has become the largest source. It is projected to continue to be the largest source of migrants through the 21st century. By the mid-21st century, Africa is projected to replace Latin America and the Caribbean as the second-largest source.

**Figure 5.8 Stock of International Migrants in 2010: World and Major Regions**
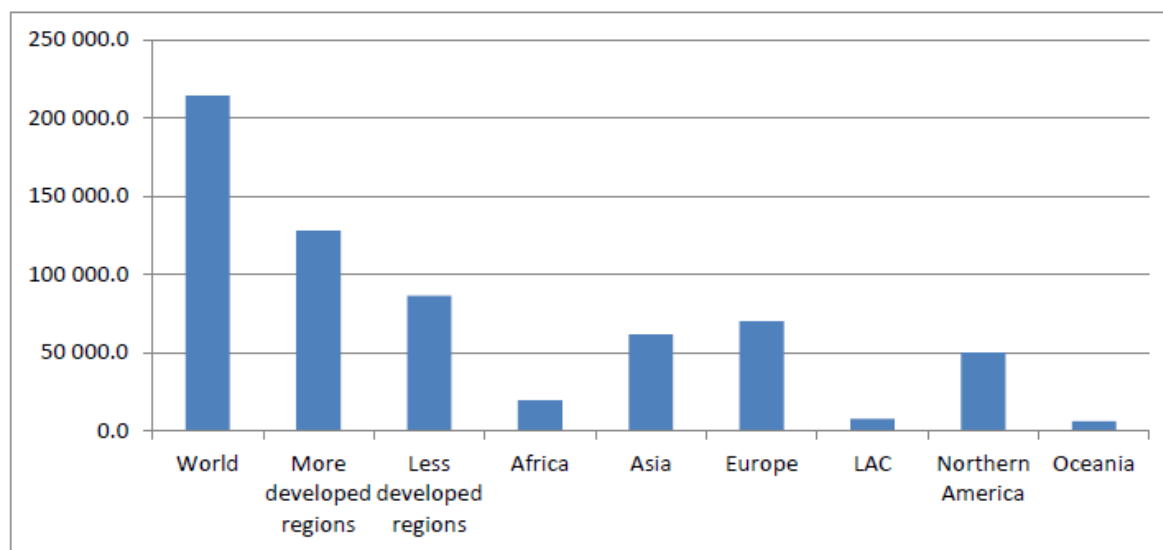
Source: Authors' Calculations from (UNPD 2011)

Figure 5.9 Numbers (in 1000's) of Net International Migrants by Major Regions 1950-2100 (Medium Variant Projections)
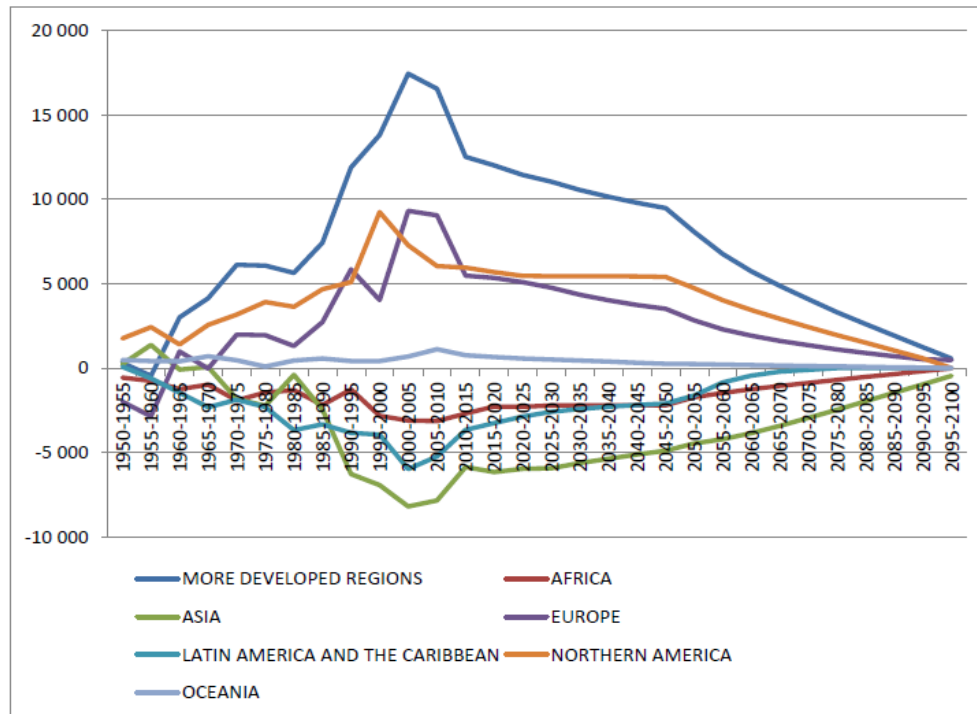
Source: Authors' calculations from (UNPD 2011)

Figure 5.10 International Net Migration Rates (per 1000 Population) by Major Regions 1950-2100 (Medium Variant Projections)
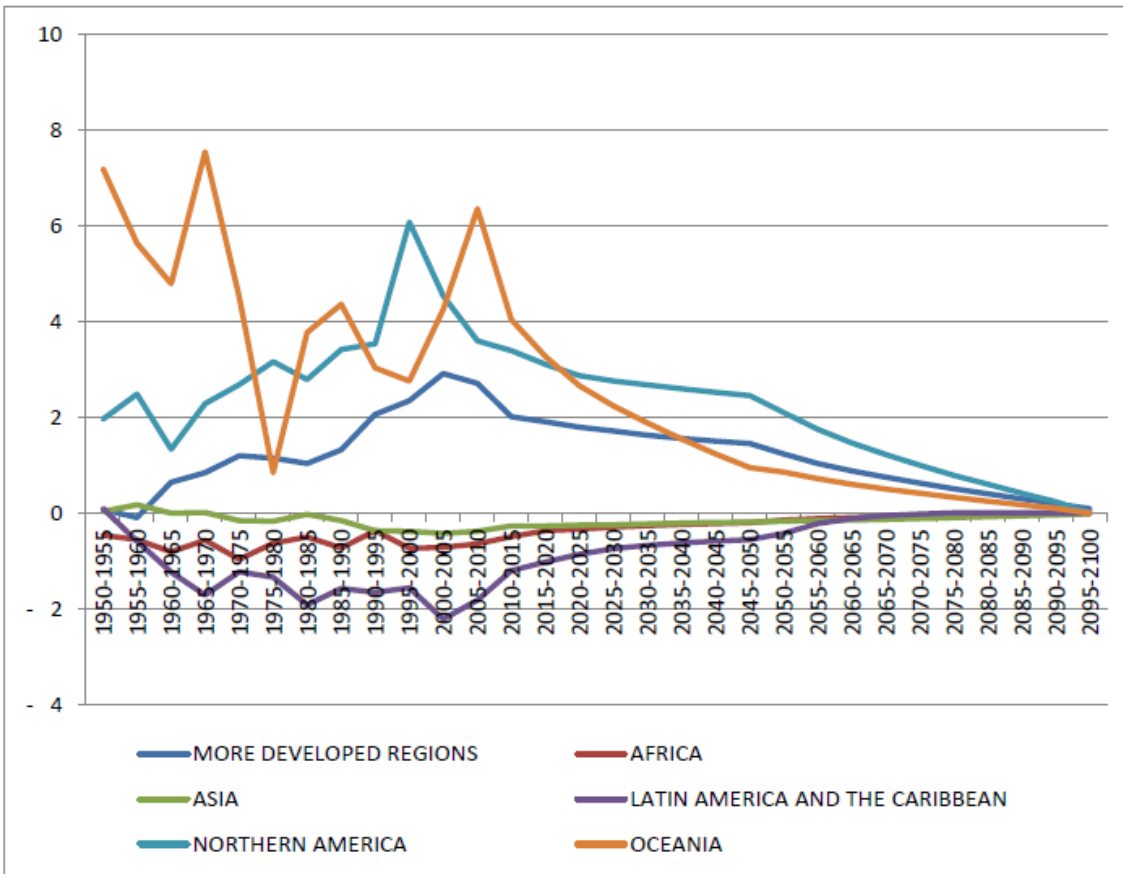
Source: Authors' calculations from (UNPD 2011)

If international migration rates relative to population are considered instead of absolute numbers, Oceania has tended to have the highest (positive) net rates in the past (albeit with much variation) (see figure 5.10). Beginning around 2020, Northern America is projected to have higher (positive) net migration rates. Latin American and the Caribbean have had and are projected to continue to have the largest negative rates of international net migration over most of the period covered in the figure.

6. Policy Implications

Four general considerations are important in crafting policy recommendations for the future. These challenges for assessing probable rates of returns to alternative policies are important not only for considering policies for the quality, quality, and mobility of the population but also for the policy areas covered in other papers in this project.

1. *Both distributional and efficiency policy motives are relevant for policies related to the quantity, quality, and mobility of the population*. Concern about the "average citizen" raises questions about the distributional impact of policies, presumably with more emphasis on people in the lower and middle part of the distribution than in the upper part. But efficiency is also relevant in assessing whether policies pose tradeoffs between distributional and efficiency objectives or may instead be "win-win" in terms of both objectives. In addressing any problem, there is generally a policy hierarchy, in which alternative policies that could be used to attain a particular objective can be ranked in terms of their costs, including distortion costs, and distributional implications. Policies that are highest in this hierarchy tend to be, but are not always, policies that most directly affect the problem being addressed and work through prices rather than quantitative restrictions and mandates.

There may also be tradeoffs between efficiency and antipoverty distributional goals for human capital investments. If, for example, such investments complement various endowments (genetics, family background), the highest rates of return accrue to investments in people with the largest endowments. But there may also be "win-win" possibilities with regard to human capital investments. If, for example, capital and insurance markets are imperfect or nonexistent for certain human capital investments and the incidence of these market imperfections falls disproportionately on the poor, a policy to correct market failures can increase both efficiency and equity.

2. *Assessing the probable rates of return to policies is challenging, because of several factors*.
   - Estimation issues (unobserved heterogeneities, endogeneities) make it hard to assess both the probable impacts and the probable costs.
   - Policies related to the quantity, quality, and the mobility of the population require a long time horizon in many cases. But past or current data used to try to assess the impacts and costs were generated in contexts different from those that will prevail in the future, given changes of the sorts summarized here.
   - Many big issues are aggregate questions that are much more difficult to assess empirically than more micro questions, because changes in the quantity, quality, and

mobility of the population are likely to have market- or economy-wide effects on relative prices.

The context of the concerns of this thematic paper are determined by the concerns of all the other papers in this study. These important limitations on empirical analysis circumscribe what can be said confidently about future policy options. Nevertheless, we are proceeding to venture forth, while trying to be clear about the quality of the underlying evidence.

3. *Macro heterogeneities are considerable, because countries are at differing stages of the demographic transition and economic development*. Because the quantity and the quality of the population are interrelated with each other and with economic development, there are likely to be strong diagonal elements in table 2.1, with more heterogeneity within countries and regions than across regions. The primary issues and related priorities of policies differ across table cells (though of course policies related particularly to mobility pertain to how integrated countries/regions in different cells are by human movements).

4. *Policies are more likely to be effective if they (a) create incentives for desired outcomes rather than micromanage inputs and (b) do not restrict entry or provide subsidies that depend on public ownership given difficult-to-observe (by policy makers and analysts) heterogeneities*. But these considerations mean that transferring "best practices" across contexts is not likely to be effective without careful attention to differences in prices, resources, environments, and culture.[13] These considerations also mean that ongoing monitoring and evaluation are likely to be critical. These general considerations underlie the policies discussed below.

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[13] The J-PAL website (http://www.povertyactionlab.org/) provides an illustration of some of the pitfalls of efforts to identify best practice. It examines comparisons of the estimated added grades of schooling that could be obtained with $100 of additional service provider expenditures for interventions ranging from providing information about the rate of return to schooling to deworming programs to conditional cash transfers. Among a number of other issues—not incorporating private costs, failing to recognize that programs have multiple outcomes, focusing exclusively on increasing schooling enrollment—the comparisons presented occur in contexts with very different preprogram schooling enrollment rates, which would seem to substantially affect the possibility of increasing enrollments through the programs and make comparisons of different programs across different contexts very difficult to interpret correctly. That is, the informative comparison would seem to be of different programs in the same context, including the same preprogram enrollment rates, not different contexts including different preprogram enrollment rates.

6.1 Policies on Population Quantity

- In high total fertility rate (TFR) contexts, increased investments in programs providing family planning information, subsidies for contraceptives, a broader range of reproductive health services and incentives for greater contraceptive use and better reproductive health if the social rates of return exceed the private rates of return are likely to yield high payoffs (Kohler 2013). Distributional benefits are likely to be high because the highest TFRs tend to be in relatively poor countries and regions, such as Africa. Such policies are likely to yield efficiency gains, because of the public-good characteristics of information and the negative spillovers, at least under present institutions, of greater demands for subsidized schooling and health services. It is possible to reduce the efficiency costs by pricing health and educational social services to reflect their true social marginal costs. Doing so, however, would have negative effects on the poor. There is therefore a distributional argument for some form of public subsidy for the poor. As usual, lump-sum transfers would cause fewer distortions than transfers conditional on educational and health investments. However, tied transfers, such as conditional cash transfers, may provide offsetting advantages, such as reducing the stigma associated with participating and increasing support for the program by nonbeneficiaries, including "median voters."

- In low TFR contexts, institutions and legal restrictions should be adapted to accommodate child-rearing that occurs when parents are older and more educated and often jointly active in the labor market (for example, time off from work for both fathers and mothers, more support for child-care and preschool programs, neutrality regarding adult household composition for related policies). Such adaptations are not necessarily particularly pro-poor, but they may produce efficiency gains if the social gains from higher fertility exceed the private gains because of the impact on the overall age structure.

- Public pension systems should be based on expected years of remaining life given fixed characteristics (for example, gender, formal schooling, race/ethnicity, birth year) and perhaps some measure of income or wealth rather than years since birth (though there is some risk of creating negative incentives for income generation and wealth maintenance; to a lesser extent, this risk also applies to formal schooling). Basing pension eligibility on

remaining life years, given fixed characteristics, rather than accumulated life years (that is, age) would reduce the bias toward the better-off (who have longer life expectancies).[14] This change might exacerbate gender differentials, however, because it would result in delays in the receipt of pensions for women relative to men, given women's longer life expectancy. However, rather than using the age of pension eligibility to attempt to address lifelong gender discrepancies in economic opportunities, it would seem to be higher in the policy hierarchy to consider delinking these pension systems from formal employment histories, thereby reducing the disadvantages for people with interrupted formal employment associated with bearing and raising children.[15]

- Institutions and labor market and related policies should be adopted in low- and middle-income countries that have experienced or will soon experience large increases in the working-age share of their population in order to permit exploitation of the "demographic dividend," as a number of East Asian countries appear to have done through higher economic growth. For example, formal labor market flexibility should be increased and barriers to labor transitions reduced. Despite pro-poor rhetoric, policies that reduce labor flexibility tend not to favor the poor, but instead benefit people who are better-off and have claims to formal sector labor benefits.

6.2 Policies on Population Quality

Education
- Education should be broadly defined to include all acquisition of knowledge rather than limited to formal schooling.
- The highest social rates of return to investments in human capital are probably not to increased formal schooling, even if the social rates of return are fairly high compared with returns to investments in many assets other than human capital. In most societies, subsidies for formal schooling are much higher at higher schooling levels, the beneficiaries of which come primarily from middle- or upper-income households. From

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[14] Kalwij, Alessie, and Knoef (2013) find that even in the Netherlands, a relatively equal society, remaining life expectancy at the statutory retirement age (65) for low-income individuals is about 2.5 years lower than for high-income individuals.
[15] The Chilean pension reform of 2008 took a step in this direction with regard to the minimum pension system.

the point of view of pro-poor concerns about distribution, shifting toward a more targeted subsidy system would seem to be justified, although the transition to such a system might be difficult because of the vested interests of the middle- and upper-income classes in the current system.

- Programs to increase parental knowledge about the importance of and means of stimulating their children, particularly in the early years of life, are likely to yield high private and social rates of return and benefit particularly children from poorer families. The limited evidence suggests that the rates of return to such preschool investments in children in a variety of developing country contexts are likely to be high (Engle and others 2007, 2011; Victora and others 2008). Ongoing studies on scaling-up such programs in a variety of contexts, including in South Asia, are likely to be very informative for future policy development.

- Preschool programs for children three- to five-years-old are likely to have high social rates of return. Moreover, expansion of such programs is likely to benefit primarily children from poorer families, given that current enrollment rates are higher for children from higher-income families. Benefit-cost estimates of reducing the gap between preschool enrollment for children from the highest income quintile and other quintiles based on data from more than 70 developing countries are well over 1 (Engle and others 2011). Studies for the United States also indicate high rates of return to preschool children from poor families (Heckman 2006).

- More than 100 million girls, most of them in low- and middle-income countries, have never been enrolled in school. Increased incentives for enrollment of girls at all levels of schooling in contexts in which significant numbers of girls are not enrolled are likely to yield high social rates of return and benefit members of poorer families.

- Increased incentives for boys to progress through school on time are likely to yield fairly high social returns and benefit poorer families, as among students enrolled in school, boys tend to lag on average behind girls in almost all countries, particularly boys from poor families (see, for example, Grant and Behrman 2010).

- Private schooling has expanded rapidly in recent years (among poor households in rural South Asia, for example). Looking forward, it will be important to craft schooling policies that are neutral with regard to school ownership rather than favoring public

ownership, successfully monitor and make available information about the nature and quality of schooling, and create appropriate incentives for improving schooling quality. Some recent studies suggest substantial promise for performance-based incentive systems, albeit with some qualifications concerning the types of behaviors that are induced to improve test scores (see, for example, Thorne-Lyman and others 2010; Muralidharan and Sundararaman 2011; Behrman and others 2012).

- Social returns to more general education (learning how to learn) and to education over the life cycle are likely to increase in an aging and rapidly changing world. Renewed efforts to assess formal and informal means of making education over the life cycle more effective through transparent and open institutions (rather than institutions captured by groups of employers or employees) may yield high rates of return. Such efforts are likely to be warranted on efficiency grounds, given the public-goods nature of new knowledge and the social costs of hobbling potential workers by outdated knowledge. They may also be warranted on distributional grounds, although historically, investments in lifelong learning have been made by large formal sector employers and organized labor and have not served the relatively poor.

Health and nutrition
- Human capital is multifaceted. It is not identical with schooling or even with education more broadly defined to include all acquisition of knowledge. It is important that analysts and policies recognize that there are likely to be important human capital investments in health and nutrition.
- Nutritional investments are likely to yield high social rates of return, with beneficiaries concentrated among poorer families. Particularly important are macronutrients during and pregnancy and just after birth in contexts in which women and children tend to be undernourished and micronutrients such as iron and iodine are inadequate. Such investments are particularly important in South Asia, in a number of countries in Sub-Saharan Africa, and in individual countries or regions within countries elsewhere (such as Guatemala). Recent estimates suggest high rates of return to investing in nutrition, particularly in early life (see, for example, Hoddinott and others 2008; Victora and others 2008, 2010; Adair and others 2009; Behrman and others 2009b; Maluccio and others 2009a; Martorell and others 2010). Public support for improved nutrition in such contexts

is likely to be "win-win," as beneficiaries come primarily from poor families and efficiency improves as a result of filling gaps in knowledge and correcting market imperfections that primarily affect poor families.

- Investments in adult health and human capital may yield significant returns, especially in contexts where "healthy aging" can facilitate higher labor force participation and productivity at older ages. Currently or in the near future, the most rapidly growing age groups in some relatively poor countries, including countries in Sub-Saharan Africa, will include adults over the age of 40, many of whom who are prematurely old and limited by chronic conditions and disabilities that might be treated with current knowledge. These investments are likely to be "win-win," as beneficiaries would be primarily people from poor families who may be marginalized within their families because of their limited productivities and efficiency would improve as a result of filling gaps in knowledge and correcting market imperfections that primarily affect poor families.

- Prevention of common chronic diseases through behavioral changes (for example, stopping smoking); regulatory changes (for example, requiring that nutritional information be provided and restricting the use of certain ingredients, such as salt and transfats); and structural changes (such as creating walkable neighborhoods) may yield important returns by maintaining the health and human capital of aging workforces and populations in many countries. Rapidly aging populations may mean that such changes yield high social rates of returns—by, for example, reducing the private and social pressures for private and public transfers to the rapidly growing older segments of the populations. Such changes in turn are likely to reduce the probability of the collapse of intergenerational transfers to support older populations who, in the absence of such transfers would in many cases be very vulnerable, with private and social consequences.

- Health systems in low- and middle-income countries and international public and private agencies, including nongovernmental organizations and foundations, need to be reoriented to the changing realities of disease composition (the growing importance of noncommunicable diseases and accidents relative to traditional communicable diseases, on which many health systems and international agencies currently focus). Doing so is likely to result in efficiency gains given the increasing prominence of noncommunicable diseases in the developing world and various externalities associated with them. It is also

likely to be somewhat pro-poor, given the relatively high incidence of diseases, including the "diseases of development," among poorer members of societies.

- Social safety nets and health and pension systems should be untied from formal labor market participation, to reduce distortions and benefit the poorer members of society, who tend to work in informal employment that is not covered by formal sector benefits.

6.3 Policies on Population Mobility

Urbanization
- Public transportation systems should be subsidized to reflect large positive externalities, and tolls should be used for private vehicles to reflect the negative externalities they generate. Both policies are likely to yield efficiency gains and positive distributional effects particularly for poorer and middle-income citizens.[16]

- Infrastructure of new cities should be planned and built from the ground up, given scale economies and externalities. Pure market-driven approaches are likely to be inefficient, with widespread negative distributional effects.

- Megacities should be decentralized into independent districts with their own political leadership, but infrastructure planning should be centralized in order to increase efficiency. This combination would yield efficiency and distributional benefits, because it would increase the responsive of local leadership for many functions while recognizing the larger-scale and geographically interrelated implications of much urban infrastructure.

- Legislation on and enforcement of quality of life issues (air and water quality, noise reduction, sewage treatment, waste recycling, energy efficiency) should be strengthened. Doing so would increase efficiency by reducing negative externalities and improving the distribution of benefits, particularly for poorer and average citizens.

- More effective crime prevention policies should be devised, such as adoption of "smart" crime prevention ("low-tolerance" policing policy, public investments in neighborhood projects and clubs). Corruption and land grabs should be combatted, by, for example, requiring greater openness, expanding/improving monitoring and evaluation, and rotating

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[16] This subsection draws heavily on Heilig (2012).

public officials among cities. These strategies are likely to be "win-win," yielding particularly large efficiency gains for the poor.

- City zoning should include some minimum green space and parks in all areas, including poor ones. Such a policy would probably yield "win-win" outcomes, given externalities and the fact that distribution of green space is otherwise likely to favor high-income citizens.

- Barriers to migration within countries should be reduced, but mechanisms should be introduced so that the incentives for migration more closely reflect social rates of return. Measures could include changes in transportation systems, quality of life measures, and the mandating of green spaces along the lines noted above. These strategies have the potential to yield "win-win" outcomes, particularly given the relatively high prevalence of poverty in rural areas in most countries.

International migration

- Barriers to migration within low- and middle-income countries as well as between low- and middle-income countries and high-income countries should be reduced.

- Receiving countries should develop migration policies that are better informed by the demographic, economic, and social needs of destination countries.

- Criteria for any restrictions on migration should be rationalized. They should be based on well-defined efficiency and distributional criteria, not family connections.

- Frameworks should be created that allow for more transitory migration between countries and improved monitoring of transitory movements across countries and regions that affect the transmission of infectious disease.

Recent studies indicate that liberalizing international migration along the lines described above could significantly increase global output. They show that millions of people could move from developing countries to developed ones without reducing wages in developed countries, particularly if the pace of movement is slow enough to allow investment to adjust.

Kennan (2012) notes that if workers are much more productive in one country than in another, restrictions on immigration lead to large efficiency losses. He quantifies these losses, using a

model in which efficiency differences are labor augmenting and free trade in product markets leads to factor price equalization, so that wages measured in efficiency units of labor are equalized across countries. The estimated gains from removing immigration restrictions within a simple static model of migration costs are about as large as the gains from a growth miracle that more than doubles income levels (by $10,100 a year) in developing countries. Mukand (2012) examines the effect of movement by half of the developing world's workforce to developing countries if migration closes a quarter of the migrants' productivity gap. He estimates that migrants' average income would rise by $7,000, increasing global output by 30 percent (about $21 trillion). Pritchett (2007) estimates that even a modest easing of restrictions could produce high returns: a 3 percent increase in the labor force in developed countries through migration would yield annual benefits larger than those from eliminating remaining trade barriers. A survey of the literature on the impact of immigration on domestic wages find that few studies report a negative impact (Blau and Kahn 2012). D'Amuri and Peri (2011) find that immigration encourages nonmigrants in Western Europe to take on more complex work. They find that such "job upgrades" are responsible for a 0.6 percent increase in nonmigrants' wages for each doubling in migrants' share of the labor force.

From a global perspective, liberalizing international migration in the developed countries would produce considerable output gains benefiting poorer people in developing countries. Thus, migration liberalization is likely to be a major "win-win" option on the global agenda. Of course, some people will lose out from competition with migrants' labor, and adjustment costs will be incurred. Despite these costs, however, liberalizing international migration would seem to have major potential.

7. Conclusions

Population quantity, quality, and mobility are affected by past economic development and shape current and future economic development, individual well-being, and the distribution of well-being among global citizens. In some basic sense, the quality of the population—defined to include education and health—is the essence of development, if development is defined to focus on increasing human capabilities as an end in itself, as Sen (1985) and others have suggested. This emphasis seems intrinsically related to the Global Citizens Foundation's general concern with global citizens as well as the concerns of its project "Towards a Better Global Economy."

Widely improving the quality of the human population, and reducing distributional inequalities in population qualities, is very consonant with this project's basic aims.

Recent decades have seen enormous changes in population quantity, quality, and mobility. The world population doubled from 3.5 billion in about 1970 to more than 7 billion in 2010, a rate of increase never before experienced for a sustained period and never likely to be experienced again. Over the same period, population quality (as measured by schooling and other forms of education and by health, nutrition, and life expectancy) improved dramatically, and cross-country inequalities in some important aspects of population quality (such as schooling attainment, enrollment in preschool programs, life expectancy, and some related health measures) narrowed. Population mobility also increased, with substantial urbanization in most regions of the world as well as significant international mobility.

These changes affected the world as a whole. Because of heterogeneity across countries and regions in both their stages of economic development and the timing and duration of the demographic transition, however, they have had different effects in different places—with repercussions that will be felt throughout the 21st century. Differences in the stage of development and the timing and duration of the demographic transition mean that prospects and optimal policies differ across regions and countries. Much of the more developed world—including, as time goes on, middle-income countries—will experience stable or even declining populations, rapid population aging, and rising age-dependency ratios. Many middle-income and (later) low-income countries will experience declining dependency ratios and the associated challenges of accommodating "youth bulges." These countries will have opportunities to exploit the demographic dividend to enhance growth. Low-income countries with relatively high fertility rates will contribute most to world population growth during the 21st century (Africa's population in particular is projected to grow throughout the rest of the century, in both absolute and relative terms). In Asia and Africa, the population will become more urban, and these regions' share of the global labor market, global human capital, and the total urban population will rise.

The previous section highlights various policy implications of these changes. Four policy areas are particularly important and promising:

1. *Enhancing the freedom to move, internally and internationally*. Increasing internal and international mobility could yield enormous potential gains, particularly for poorer citizens, with possibly few offsetting losses for more affluent citizens.

2. *Strengthening the foundation for life*. The private and the social gains from establishing a stronger foundation during the early years of life—through stimulation, nutrition, and health in the first five years—are substantial, particularly for children from poorer families.

3. *Supporting aging with dignity and equity*. As populations age, the potential private and social returns and equity gains from increasing the labor force participation and productivities of aging adults—and providing social support based on expected remaining life years rather than accumulated life years (age)—appear significant.

4. *Improving incentives for social service delivery.* Improving both markets for and policies regulating the delivery of services that provide essential inputs for achieving socially desired levels of human reproduction and child-rearing; mortality; schooling, preschooling, and other forms of education; and internal and international mobility has substantial potential for enhancing productivities and well-being, with gains often largest for poorer citizens.

Improvements in these four policy areas have enormous potential to enhance future economic growth, improve the welfare of global citizens broadly, and in many cases ensure that poorer citizens share more extensively in such growth. The "win-win" characteristics of many of these policies—the fact that they both enhance economic growth and disproportionately benefit the poor—justify them both morally and economically

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