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ECONOMIC DEVELOPMENT

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6 Population Growth and Economic Development: Causes, Consequences, and Controversies

6.1 The Basic Issue: Population Growth and the Quality of Life

In 2017, the world's population reached about 7.6 billion people. In that year, the United Nations Population Division projected that population would rise to about 8.6 billion in 2030, 9.8 billion by 2050, and 11.2 billion in 2100.[1] The overwhelming majority of that population will inhabit the developing world.

In this chapter, we examine many of the issues relating population growth to economic development. We begin by looking at historical and recent population trends and the changing geographic distribution of the world's people. After explaining basic demographic concepts, we present some well-known economic models and hypotheses regarding the causes and consequences of rapid population growth in contemporary developing countries. We will see that some forms of market failure may be among the factors leading to high fertility rates, including limited information, externalities including environmental impacts, and complementarities potentially leading to coordination failure. This suggests specific roles for public policy in providing information, and perhaps offering financial incentives. It may also require legal changes and civil society action to promote equality for women. We will also see that in a growing number of cases, including many upper-middle-income countries, births per woman have fallen to below-replacement levels, leading to an ageing population and raising new questions for economic growth and old-age security. For example, this process is well under way in China, which has a shrinking labour force and forecasted population decline, as explored in Box 6.3. Controversies surrounding the significance of the population factor in general and these models and hypotheses in particular are then explored. We evaluate a range of alternative policy options that developing countries may wish to adopt to influence the size and growth of their populations, as well as ways in which industrialised countries can contribute to a more manageable global population and resource environment. Population and economic development policies in Rwanda and Burundi, sometimes described as "twins" but now on quite different trajectories, are the focus of this chapter's case study.

Every year, about 83 million people are being added to the world's population. Almost all of this net population increase is in developing countries. Increases of such magnitude are unprecedented. Thus, global population is expected to continue rising, even assuming that the declining trend in average fertility in recent decades continues. But the problem of population growth is not simply a problem of numbers. It is a problem of human welfare and of development, as defined

in Chapter 1. Rapid population growth can have serious consequences for the well-being of all humanity. If development entails the improvement in people's levels of living—their incomes, health, education, and general well-being—and if it also encompasses their capabilities, self-esteem, respect, dignity, and freedom to choose, then the really important question about population growth is this: how does the contemporary population situation in many developing countries contribute to or detract from their chances of realising the goals of development, not only for the current generation but also for future generations? In addressing this central issue, we examine the reasons and consequences for the positive relationship between poverty and family size. More broadly, we examine what drives high population growth in developing (particularly low-income) countries, why population growth in general subsequently falls as countries grow and develop, and the causes and implications of these patterns. Finally, when population growth slows to zero and then turns negative, what are the implications and opportunities for still-developing countries?

6.2 Population Growth: Past, Present, and Future

6.2.1 World Population Growth Throughout History

For most of human existence on earth, humanity's numbers have been few. When people first started to cultivate food through agriculture some 12,000 years ago, the estimated world population was no more than 5 million (see Table 6.1). Two thousand years ago, world population had grown to at least 175 million,

TABLE 6.1 Estimated World Population Growth		
Year	**Population (millions)**	**Annual Increase (%)**
8000 BCE	5	
2000 BCE	25	0.03
1000 BCE	50	0.07
1 CE	175	0.13
1000	250	0.04
1500	450	0.12
1800	950	0.25
1850	1 250	0.55
1900	1 650	0.56
1950	2 536	0.86
1960	3 033	1.81
1970	3 700	2.01
1980	4 458	1.88
1990	5 331	1.8
2000	6 145	1.43
2010	6 958	1.25
2018	7 621	1.14
2050 (forecast)	9 800	0.79
2100 (forecast)	11 200	0.27

Sources: Selected historical estimates based on data from the United Nations Population Division, the US Census Bureau, and the Population Reference Bureau. Data starting in 1950 are from the UN Population Bureau.

less than a fifth of the population of China today. From year 1 on our calendar to the beginning of the Industrial Revolution around 1750, it tripled to 728 million people, less than three-quarters of the total number living in India today. During the next 200 years (1750–1950), an additional 1.8 billion people were added to the planet's numbers. But in just four decades thereafter (1950–1990), the earth's human population more than doubled again, bringing the total figure to around 5.3 billion. The world entered the twenty-first century with over 6 billion people and reached 7.7 billion by 2019.
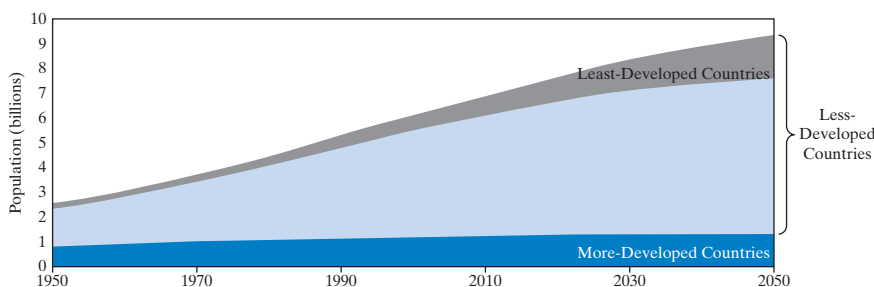
As seen in Figure 6.1, in 1950 about 1.7 billion people lived in developing countries, representing about two-thirds of the world total; by 2050, the population of less-developed countries will reach over 8 billion, nearly seven-eighths of the world's population. In the corresponding period, the population of the least-developed countries will increase by tenfold, from about 200 million to 2 billion people. In contrast, the population of the developed countries will grow very little between now and 2050, even accounting for immigration from developing countries.

Turning from absolute numbers to percentage growth rates, for almost the whole of human existence on earth until approximately 300 years ago, population grew at an annual rate not much greater than zero (0.002%, or 20 per million). Naturally, this overall rate was not steady; there were many ups and downs as a result of natural catastrophes and variations in growth rates among regions. By 1750, the population growth rate had accelerated to 0.3% per year. By the 1950s, the rate had again accelerated, tripling to about 1% per year. It continued to accelerate until around 1970, when it peaked at 2.35%.[2] Today the world's population growth rate remains at a historically high rate of nearly 1.2% per year, but the rate of increase is slowing. However, the population growth rate in Africa is still an extremely high 2.3% per year. (Note that estimates of population numbers and growth rates differ according to research methods, but the broad trends are similar across major studies.)

The relationship between annual percentage increases and the time it takes for a population to double in size, or **doubling time**,[3] can be calculated from the annual percentage increase (calculation of doubling time is explained in endnote 3).

Doubling time Period that a given population or other quantity takes to increase by its present size.

FIGURE 6.1   World Population Growth, 1950–2050

Source: Population Reference Bureau World Population Data Sheet 2012, page 4; data are drawn from United Nations Population Division, World Population Prospects: The 2010 Revision (2011), medium-variant estimates.

We see that before 1650, it took nearly 36,000 years, or about 1,400 generations, for the world population to double. Today it would take about 58 years, or two generations, for world population to double at current growth rates. Moreover, whereas it took 1,750 years to add 480 million people to the world's population between year 1 and the onset of the Industrial Revolution, this same number of people is today being added in less than 7 years.

The reason for the sudden change in overall population trends is that for almost all of recorded history, the rate of population change, whether up or down, had been strongly influenced by the combined effects of famine, disease, malnutrition, plague, and war—conditions that resulted in high and fluctuating death rates. In the twentieth century, such conditions came increasingly under technological and economic control. As a result, human mortality (the death rate) is now lower than at any other point in human existence. It is this decline in mortality resulting from rapid technological advances in modern medicine, improved nutrition, and the spread of modern sanitation measures throughout the world, particularly within the past half-century, that has resulted in the unprecedented increases in world population growth, especially in developing countries. In short, population growth today is primarily the result of a rapid transition from a long historical era characterised by high birth and death rates to one in which death rates have fallen sharply but birth rates, especially in the least-developed countries, have fallen more slowly from their historically high levels.

6.2.2 Structure of the World's Population

The world's population is very unevenly distributed by geographic region, by fertility and mortality levels, and by age structures.

Geographic Region   More than three-quarters of the world's people live in developing countries; fewer than one person in four lives in an economically developed nation. Figure 6.2 shows the regional distribution of the world's population as it existed in 2010 and as it is projected for 2050.

World population distribution is put into dramatic perspective by the map in Figure 6.3. Attention is drawn to the large size of India in comparison with Europe. China is bordered on the north and west by a thin strip of land that represents Russia. Mexico looms very large in comparison with Canada—a dramatic reversal of conventional maps; taken together, even the Caribbean islands are larger than Canada. Bangladesh, smaller in size than the state of Wisconsin, is larger than Germany and France combined. In Africa, the prominence of Nigeria stands out. Indonesia, which gets comparatively little international attention, dwarfs its neighbour Australia while appearing nearly as large as the United States.
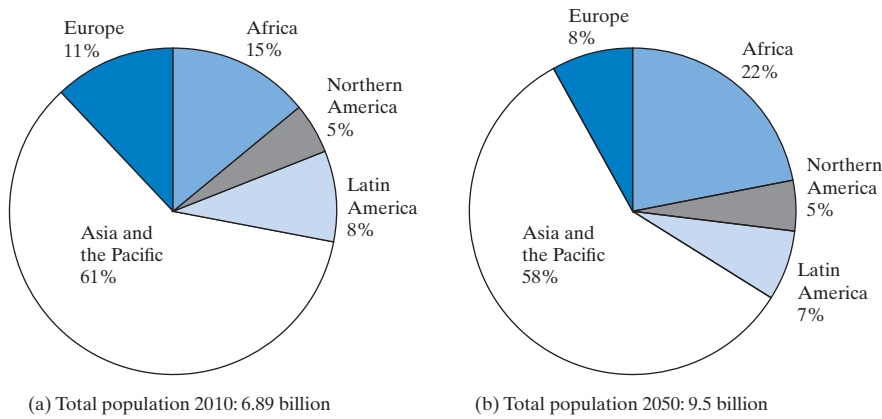
Rate of population increase   The growth rate of a population, calculated as the natural increase after adjusting for immigration and emigration.

Natural increase   The difference between the birth rate and the death rate of a given population.

Net international migration   The excess of persons migrating into a country over those who emigrate from that country.

Fertility and Mortality Trends   The **rate of population increase** is quantitatively measured as the percentage yearly net relative increase (or decrease, in which case it is negative) in population size due to **natural increase** and **net international migration**. Natural increase simply measures the excess of births over deaths or, in more technical terms, the difference between fertility and mortality. Population increases in developing countries therefore depend

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FIGURE 6.2   **World Population Distribution by Region, 2010 and 2050:
The Big Story: Africa's Steadily Growing Share of World Population**

Europe
11%

Africa
15%

Northern
America
5%

Latin
America
8%

Asia and
the Pacific
61%

(a) Total population 2010: 6.89 billion

Europe
8%

Africa
22%

Northern
America
5%

Latin
America
7%

Asia and
the Pacific
58%

(b) Total population 2050: 9.5 billion

Source: Data from Population Reference Bureau, *World Population DataSheet*, 2010.

FIGURE 6.3   **Map with Country Sizes Proportional to Their Fraction of World
Population**

Source: worldmapper.org:http://www.worldmapper.org/display.php?selected=2

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almost entirely on the difference between their **crude birth rates** (or simply **birth rates**) and **death rates**.

In many countries, fertility began falling by around 1970, when total world population growth reached its historic peak. From 1970 to 2017, births per woman fell in Bangladesh from 7 to 2.1; in Jamaica from 5.3 to 2; in Colombia from 5.3 to 1.8; and in Mexico from 4.9 to 2.2; note that all four of these once high-fertility countries are now close to or below replacement fertility. However,

Crude birth rate   The number of children born alive each year per 1,000 population (often shortened to *birth rate*).

Death rate   The number of deaths each year per 1,000 population.

in this century, births per woman has been falling less rapidly in Africa than once expected; according to a 2019 report, this results in part from disruptions in female education due to factors including international debt-related austerity and violent conflict.[4]

Table 6.2 reports the **total fertility rate** for selected countries in 1990 and 2017, dividing cases in this period between high and falling slowly, falling rapidly, close to replacement, and below replacement fertility.

Modern vaccination campaigns against malaria, smallpox, yellow fever, and cholera as well as the proliferation of public health facilities, clean water supplies, improved nutrition, and public education have all worked together over the past three decades to lower death rates by as much as 50% in parts of Asia and Latin America and by over 30% in much of Africa and the Middle East. Death rates have fallen for all age groups. Nevertheless, the average life span remains about 12 years greater in the developed countries. This gap has been

Total fertility Rate (TFR)   The number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with the prevailing age-specific fertility rates.

TABLE 6.2 Births Per Woman: Fertility Rate for Selected Countries, 1990 and 2017	1990	2017
Fertility High and Falling Relatively Slowly		
Niger	7.8	7.2
Somalia	7.4	6.2
Congo (DRC)	6.7	6
Mali	7.2	6
Chad	7.3	5.8
Angola	7.2	5.6
Burundi	7.5	5.6
Fertility Falling Relatively Rapidly		
Afghanistan	7.5	4.5
Ethiopia	7.2	4.1
Rwanda	7.2	3.8
Pakistan	6	3.4
Lao PDR	6.2	2.6
Saudi Arabia	5.9	2.5
Close to Replacement Fertility		
Bangladesh	4.5	2.1
Nepal	5.2	2.1
Turkey	3.1	2
Jamaica	2.9	2
Malaysia	3.6	2
Sri Lanka	2.5	2
Below Replacement Fertility		
China	2.4	1.6
Japan	1.5	1.4
Poland	2.1	1.4
Portugal	1.6	1.4
Moldova	2.4	1.2
South Korea	1.6	1.1
Country Group Averages		
World	3.3	2.4
Low income	6.3	4.6
LMC	4.2	2.7
UMC	2.6	1.8
High income	1.9	1.7

Source: World Development Indicators, Table 2.14, 2018, accessed 23 May 2019. Abbreviations: LMC—Lower-middle-income country; UMC—Upper-middle-income country.

sharply reduced in recent decades. By comparison, in 1950, **life expectancy at birth** for people in developing countries averaged 35 to 40 years, compared with 62 to 65 years in the developed world. According to the UN Population Division, in 2017, sub-Saharan Africa had the lowest life expectancy, 61 years, while in the high-income countries, life expectancy at birth averaged nearly 81 years. In East Asia and Latin America, life expectancies have now reached an impressive 76 and 75 years, respectively.

> **Life expectancy at birth**   The number of years a newborn child would live if subjected to the mortality risks prevailing for the population at the time of the child's birth.

Dramatic progress has also been made on reducing the **under-5 mortality rate**. For example, according to UNICEF median estimates, between 1990 and 2018, this rate fell from 130 per 1,000 to 42 per 1,000 in South Asia; from 57 to 15 per 1,000 in East Asia and the Pacific; and from 55 to 16 per 1,000 in Latin America and the Caribbean. Although the under-5 mortality rate declined substantially from 180 to 78 per 1,000 in sub-Saharan Africa in this period, progress in the region continued to lag. (Note that high-income countries generally have higher overall population mortality rates - even though most children live into adulthood - simply because a much larger fraction of their populations are elderly.)

> **Under-5 mortality rate**   Deaths among children between birth and 5 years of age per 1,000 live births.

Age Structure and Dependency Burdens   Population is relatively youthful in the developing world. As of 2018, children under the age of 15 constitute 42% of the total population of the low-income countries, 30% of the lower-middle income countries, but just 21% of high-income countries, and just 17% of high-income countries.[5] In countries with such an age structure, the **youth dependency ratio**—the proportion of youths (under age 15) to economically active adults (ages 15 to 64)—is very high. Thus, the workforce in developing countries must support almost twice as many children as it does in the wealthier countries. In the United Sates, the workforce age group (15 to 64) amounts to about 65% of the total population, with 19% under age 15 and 16% over age 65 as of 2018; the corresponding ratios in the United Kingdom are similar: 66%, 18%, and 18% respectively. In the euro area, some 20% of the population is over age 65; in Japan 28% are over 65. The main issues in developed countries relate more to their high share of old-age dependents. By contrast, in sub-Saharan Africa, as of 2018 the economically active workforce makes up about 54% of the total population; just 3% of the population is over age 65. In general, the more rapid the population growth rate, the greater the proportion of dependent children in the total population and the more difficult it is for people who are working to support those who are not. This phenomenon of youth dependency also leads to an important concept, the **hidden momentum of population growth**.

> **Youth dependency ratio**   The proportion of young people under age 15 to the working population aged 16 to 64 in a country.

> **Hidden momentum of population growth**   The phenomenon whereby population continues to increase even after a fall in birth rates because the large existing youthful population expands the population's base of potential parents.

6.2.3 Demographic Structure and the Hidden Momentum of Population Growth

Perhaps the least-understood aspect of population growth is its tendency to continue even after birth rates have declined substantially. Population growth has a built-in tendency to continue, a powerful momentum that, like a speeding automobile when the brakes are applied, tends to keep going for some time before coming to a stop. In the case of population growth, this momentum can persist for decades after birth rates drop. This is a significant reason – in addition to the still-high birth rates in many low-income countries – for UN projections for historically rapid global population growth through the middle of this century, summarized in Box 6.1.

BOX 6.1 Findings: The 2017 Revised United Nations Population Projections

Some of the main findings found in the UN's World Population Prospects 2017 Revision, published in June 2017:

- World population is now projected to reach 8.6 billion by 2030; 9.8 billion by 2050; and 11.2 billion by 2100. (Projected population sizes have actually been increasing in recent reports, although population growth has continued to slow.)
- Currently about 83 million people are added to world population each year.
- Most population growth will continue to occur in developing regions.
- "Give or take a billion": the projections depend on assumptions—even at 80% confidence, the 2050 world population could turn out to be as few as 9.5 billion or as many as 10 billion. In 2100, global population could be as low as 10 billion to as high as 12.4 billion (80% intervals).
- India will become the world's most populous country, passing China around 2024—sooner than previously projected—when each will have about 1.44 billion people.
- The population of Nigeria is projected to pass that of the United States shortly before 2050; by 2100, it could rival China as the second most populous country (after India).

- Population growth will be concentrated in Africa. Between 2017 and 2050, the populations of 26 African countries are projected to *at least* double in size.
- The 47 least-developed countries are projected to double in size from about one billion in 2013 to reach 1.9 billion in 2050. These countries had fertility rates of 4.3 births per woman (2010–2015 data).
- Projected total population is higher in this and the last major reports, particularly after 2075 primarily because fertility has been estimated to be higher in some countries, especially in high-fertility sub-Saharan African countries, increasing the estimated births per woman. In some cases, the actual level of fertility appears to have risen in recent years; in other cases, the previous estimate was too low.
- In contrast, during the 2010 to 2015 period, fertility was below the replacement level in 83 countries, comprising about 46% of global population.

Source: United Nations Population Division, *World Population Prospects: The 2017 Revision*. New York: United Nations, Department of Economic and Social Affairs, at https://population.un.org/wpp/Publications, and https://population.un.org/wpp/Publications/Files/WPP2017_KeyFindings.pdf; with information from earlier UN Population Division reports.

There are two basic reasons for this. First, high birth rates cannot be altered substantially overnight. The social, economic, and institutional forces that have influenced fertility rates over the course of centuries do not simply evaporate at the urging of national leaders. We know from the experience of European nations that such reductions in birth rates can take many decades. Consequently, even if developing countries assign top priority to the limitation of population growth, it will still take many years to lower national fertility to desired levels.

The second and less obvious reason for the hidden momentum of population growth relates to the population age structure of most low-income countries and

some middle income countries. The population age structure is typically presented graphically in the form of **population pyramids**, which plot age cohorts on the vertical axis and either population shares or population numbers of each cohort on the horizontal axis; often, shares or numbers of males and females are depicted on left and right sides of the center line.
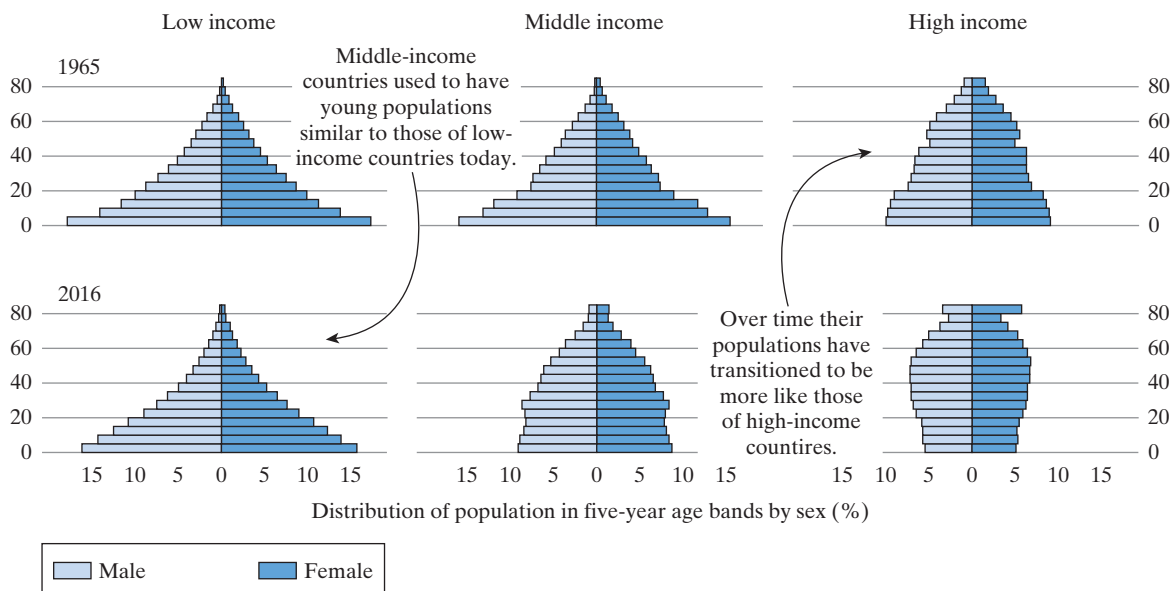
A "steep" pyramid means that cohorts are of similar size, predicting relative population stability. A wide pyramid base means that the youngest cohorts are large in comparison with older cohorts, indicating rises in population (the actual numbers depend upon the death rate of cohorts). The rise occurs because, when the large current cohorts of children reach adulthood, the number of potential parents will be much larger than at present. It follows that even if these new parents have only enough children to replace themselves (two per couple, as compared with their parents, who may have had four or more children), the fact that the total number of couples having two children is much greater than the number of couples who previously had more children means that the total population will still increase substantially before leveling off. In other words, as the larger, young cohorts grow older, they replace the smaller cohorts of their parents' generation - who in turn replace the even smaller generation of their grandparents.

Figure 6.4 presents six examples of population pyramids, illustrating the differences between age structures in low, middle, and high-income

Population pyramid
A graphic depiction of the age structure of the population, with age cohorts plotted on the vertical axis and either population shares or numbers of males and females in each cohort on the horizontal axis.

FIGURE 6.4 Population Pyramids: Low-, Middle-, and High-Income Countries, 1965; and 2016

Distribution of population in five-year age bands by sex (%)

☐ Male   ■ Female

Source: 2018 Atlas of SDGs (World Bank, 2018), section 3, p. 10. Available at: http://documents.worldbank.org/curated/en/590681527864542864/Atlas-of-Sustainable-Development-Goals-2018-World-Development-Indicators

countries, as observed in two years, 1965 and 2016. Each of the pyramids rise by five-year age intervals for both males and females, with the total population percentage share in each age cohort measured on the horizontal axis. The figures show changes over the last half century, as well as differences across income levels. In 1965, the base of the pyramid was very wide for the low-income countries, not quite as wide for middle income countries, and much steeper for the high-income countries, as seen in the top half of Figure 6.4.

Fertility has declined substantially in virtually all countries since 1965, as seen in the bottom half of Figure 6.4; by 2016, population pyramids for the low-income countries resembled more the 1965 pyramids for middle-income countries. The steeper bottom rungs for middle-income countries, in contrast to low income countries, reflect the large declines in fertility rates in middle income developing countries over the past half century. In turn, middle income countries in 2016 resembled more the high-income countries in 1965. By 2016, the youngest cohorts in high-income countries were actually smaller on average than those of prime working age adult cohorts, predicting long-term population declines (absent net immigration).[6]

Figure 6.4 also focuses attention on the fact that some age brackets are increasing in size in some countries, while they are decreasing in others. This reflects that in the demographic transition, the fraction of the population of working age first rises and then falls. On the one hand, countries where the fraction of prime working-age citizens is rising face a potential crisis if many remain unemployed, as this is associated with inequality and (especially among males) social unrest, not to mention the potential output loss. On the other hand, this rise is also an important window of opportunity for strong income and productivity gains, referred to as the **demographic dividend**—a period in which there are fewer children to support, a larger fraction of women join or remain in the workforce for longer periods of time, and there are more available resources to invest in human capital (see Chapter 8).

In contrast, where the fraction of people of working age is falling as a result of population ageing, the resources needed for old-age support are increasing. This is already a challenge for most high-income countries. Leading up to this period, a higher savings rate is required; but then allowing more immigration can also help. The transition is likely to pose an even greater challenge for some middle-income countries with big drops in fertility ahead of previous historical patterns, most notably China (see the case study at the end of Chapter 4), but also in several other Asian countries.[7]

China greatly benefited from the demographic dividend for close to three decades starting in the early 1980s. India is currently benefiting, but it is generally viewed that the benefits are much less than they could be; and there are concerns in India and abroad about whether the country will meet this challenge (see the India case study at the end of Chapter 5). With fertility in sub-Saharan Africa (SSA) now falling, albeit more slowly than occurred in any part of Asia, the question of whether SSA will benefit, or miss a unique opportunity, is at the fore of policy discussions.[8]

Demographic dividend   The high economic growth that can be achieved during the demographic transition when the working-age population share is significantly greater than the non-working-age population share, with much of the labour force in their prime productive years.

6.3 Demographic Structure and the Demographic Transition

The process by which fertility rates eventually decline to low and stable levels has been portrayed by a famous concept in economic demography called the **demographic transition**.

The demographic transition attempts to explain why all contemporary developed nations have more or less passed through the same three stages of modern population history. Before their economic modernisation, these countries for centuries had stable or very slow-growing populations as a result of a combination of high birth rates and almost equally high death rates. This was stage 1. Stage 2 began when modernisation, associated with better public health methods, healthier diets, higher incomes, and other improvements, led to a marked reduction in mortality that gradually raised life expectancy from under 40 years to over 60 years. However, the decline in death rates was not immediately accompanied by a decline in fertility. As a result, the growing divergence between high birth rates and falling death rates led to sharp increases in population growth compared to past centuries. Stage 2 thus marks the beginning of the demographic transition (the transition from stable or slow-growing populations first to rapidly increasing numbers and then to declining rates). Finally, stage 3 was entered when the forces and influences of modernisation and development caused the beginning of a decline in fertility; eventually, falling birth rates converged with lower death rates, leaving little or no population growth.
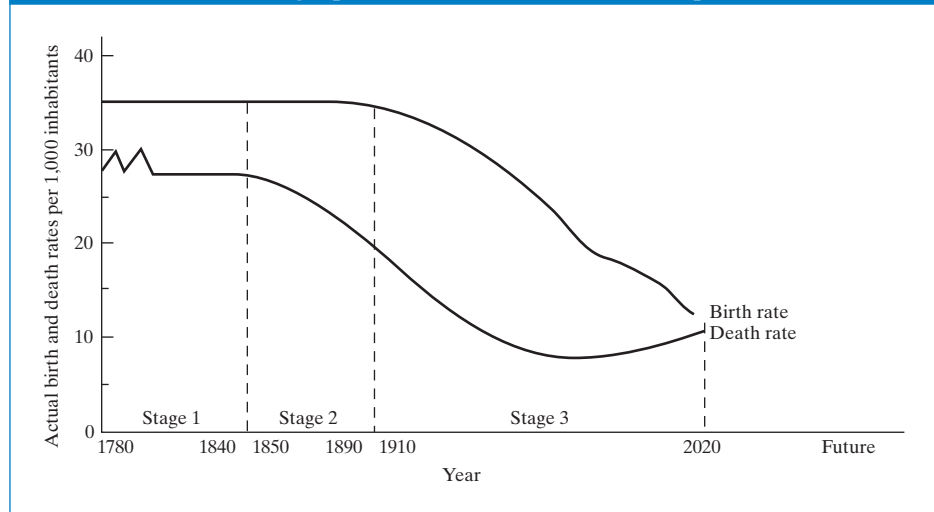
This process implies movement from a relatively high number of births per woman to a population **replacement fertility** level that can be calculated to reach about 2.05 to 2.1 births per woman when nearly all women survive to the mean age of childbearing, as they do in developed countries. In developing countries with much lower survival rates, replacement fertility can be well over 3 births per woman.[9]

Figure 6.5 depicts the three historical stages of the demographic transition in western Europe. Before the early nineteenth century, birth rates hovered around 35 per 1,000, while death rates fluctuated around 30 per 1,000. This resulted in population growth rates of around 5 per 1,000, or less than 0.5% per year. Stage 2, the beginning of western Europe's demographic transition, was initiated around the first quarter of the nineteenth century by slowly falling death rates as a result of improving economic conditions and the gradual development of disease and death control through modern medical and public health technologies. The decline in birth rates (stage 3) did not really begin until late in the nineteenth century, with most of the reduction occurring after modern economic growth had begun and long after death rates began their descent. But since the initial level of birth rates was generally low in western Europe as a result of either late marriage or celibacy, overall rates of population growth seldom exceeded the 1% level, even at their peak. By the end of western Europe's demographic transition in the second half of the twentieth century, the relationship between birth and death rates that marked the early 1800s had reversed, with birth rates

Demographic transition The phasing-out process of population growth rates from a virtually stagnant growth stage, characterised by high birth rates and death rates through a rapid-growth stage with high birth rates and low death rates to a stable, low-growth stage in which both birth and death rates are low.

Replacement fertility The number of births per woman that would result in stable population levels.

FIGURE 6.5   The Demographic Transition in Western Europe

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fluctuating and death rates remaining fairly stable or rising slightly. This latter phenomenon was simply due to the older age distributions of contemporary European populations. The patterns of the demographic transition in Europe are clear, though research continues to better identify the causal factors at work.[10]

Birth rates in many developing countries today are considerably higher than they were in pre-industrial western Europe. This is because women tend to marry at an earlier age. As a result, there are both more families for a given population size and more years in which to have children. In the 1950s and 1960s, stage 2 of the demographic transition occurred throughout most of the developing world. The application of highly effective imported modern medical and public health technologies caused death rates in developing countries to fall much more rapidly than in nineteenth-century Europe. Given their historically high birth rates (still over 35 per 1,000 in many countries), this has meant that stage 2 of the demographic transition has been characterised by peak population growth rates well in excess of 2.0% per annum in most developing countries.

In developing countries from about the 1960s, death rates fell much more quickly than they had in Europe during its initial period of economic development, largely because of the availability of medicine and public health knowledge that developing economies benefited from. The result was that the gap between the birth rate curve and the death rate curve was higher in developing countries, corresponding to higher population growth. As we have seen, some countries still have historically very high fertility rates, particularly in sub-Saharan Africa.

The important question, therefore, is this: when and under what conditions are developing nations likely to experience sufficiently rapid declines in birth rates to move towards a stabilised and sustainable population size? To answer this question, we need to ask a prior one. What are the principal determinants or causes of high fertility rates in developing countries, and can these determinants of the "demand" for children be influenced by government policy? To try to answer this critical question, we turn to a very old and famous classical macroeconomic and demographic model, the Malthusian "population trap," and a contemporary and highly influential neoclassical microeconomic model, the household theory of fertility.

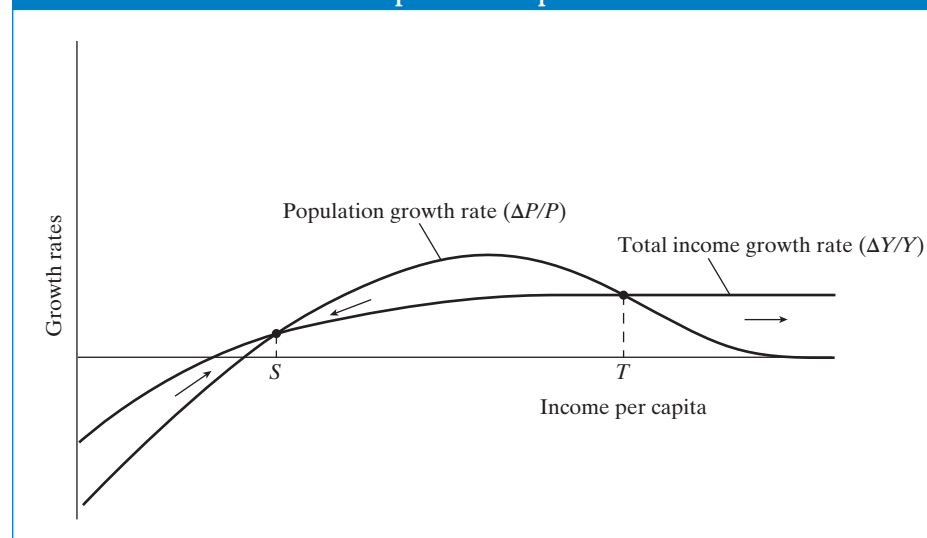# 6.4 The Causes of High Fertility in Developing Countries: The Malthusian and Household Models

6.4.1 The Malthusian Population Trap

More than two centuries ago, the Reverend Thomas Malthus put forward a theory of the relationship between population growth and economic development that is influential today. Writing in his 1798 *Essay on the Principle of Population* and drawing on the concept of diminishing returns, Malthus postulated a universal tendency for the population of a country, unless checked by dwindling food supplies, to grow at a geometric rate, doubling every 30 to 40 years.[11] At the same time, because of diminishing returns to the fixed factor, land, food supplies could expand only at a roughly arithmetic rate. In fact, as each member of the population would have less land to work, his or her marginal contribution to food production would actually start to decline. Because the growth in food supplies could not keep pace with the burgeoning population, per capita incomes (defined in an agrarian society simply as per capita food production) would have a tendency to fall so low as to lead to a stable population existing barely at or slightly above the subsistence level. Malthus therefore contended that the only way to avoid this condition of chronic low levels of living or absolute poverty was for people to engage in "moral restraint" and limit the number of their progeny. Hence, we might regard Malthus, indirectly and inadvertently, as the father of the modern birth control movement.

Modern economists have given a name to the Malthusian idea of a population inexorably forced to live at subsistence levels of income. They have called it the *low-level equilibrium population trap* or, more simply, the **Malthusian population trap**. Diagrammatically, the basic Malthusian model can be illustrated by comparing the shape and position of curves representing population growth rates and aggregate income growth rates when these two curves are each plotted against levels of per capita income. An example of this is presented in Figure 6.6.

Malthusian population trap The threshold population level anticipated by Thomas Malthus (1766–1834) at which population increase was bound to stop because life-sustaining resources, which increase at an arithmetic rate, would be insufficient to support human population, which would increase at a geometric rate.

FIGURE 6.6 The Malthusian Population Trap

On the vertical axis, we plot numerical percentage changes, both positive and negative, in the two principal variables under consideration (total population and aggregate income). On the horizontal axis are levels of per capita income. Figure 6.6 depicts the basic ideas. The x-axis shows the level of income per capita. The y-axis shows two rates—of population growth and of total income growth. Per capita income growth is, by definition, the difference between income growth and population growth—hence the vertical difference between these two curves. Thus, as we saw in Chapter 3 in our discussion of the Harrod-Domar (or AK) model, whenever the rate of total income growth is greater than the rate of population growth, income per capita is rising; this corresponds to moving to the right along the x-axis. Conversely, whenever the rate of total income growth is less than the rate of population growth, income per capita is falling, moving to the left along the x-axis. When these rates are equal, income per capita is unchanging. We can then explore the shapes of population growth and growth of income to understand potential implications of this relationship.

First consider population growth. When income is very low, say, below $250 per year at Purchasing Power Parity, nutrition is so poor that people become susceptible to fatal infectious diseases; pregnancy and nursing become problematic; and, ultimately, outright starvation may occur. This is shown on the left in Figure 6.6. But after this minimum level of income per capita is reached, population begins to grow, eventually reaching a peak rate (perhaps at 3% to 4% per year); and then the population growth rate begins to fall until at last a fairly stable population is reached (a growth rate close to zero). Note that this pattern of population growth first increasing and then decreasing as per capita income rises corresponds to the pattern of the demographic transition, explained in Section 6.3.

In Figure 6.6, total income growth becomes greater as the economy develops (and income per capita rises). An economic reason for this positive relationship is the assumption that savings vary positively with income per capita. Countries with higher per capita incomes are assumed to be capable of generating higher savings rates and thus more investment. Again, given a Harrod-Domar-type model of economic growth (see Chapter 3), higher savings rates mean higher rates of aggregate income growth. Eventually, however, growth levels off at a maximum. (Incomes of middle-income countries might grow fastest as they borrow technology to catch up—not shown in this diagram—but these higher rates cannot be continued once the technology frontier is reached.)

As drawn, the curves first cross at a low level of income, labelled S (for subsistence). This is a stable equilibrium: If per capita income levels become somewhat larger than (to the right of) S, it is assumed that population size will begin to increase in part because higher incomes improve nutrition and reduce death rates. But then, as shown in the figure, population is growing faster than income (the $\Delta P/P$ curve is vertically higher than the $\Delta Y/Y$ curve), so income per capita is falling, and we move to the left along the x-axis. The arrow pointing in the direction of S from the right therefore shows per capita income falling back to this very low level. On the other hand, if income per capita were a little less than S, the total income curve would be above the population growth curve and so income per capita would be rising. This corresponds to a move to the right along the x-axis. Thus, our conclusion is that point S represents a stable equilibrium (much as in our study of stable equilibria in Figure 4.1). This very low population growth rate along with a very low income per person is consistent with the experience of most of human history prior to the modern era.[12]
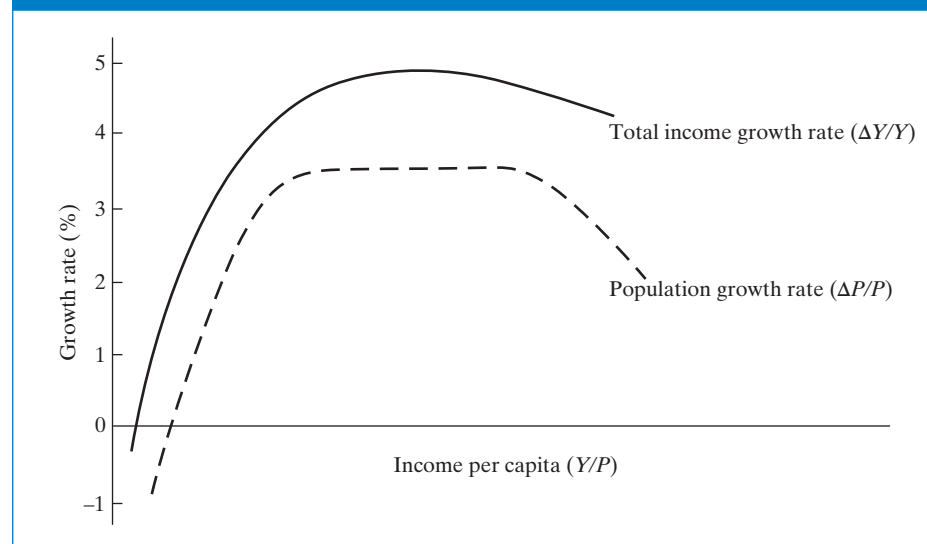
According to modern-day neo-Malthusians, poor nations will never be able to rise much above their subsistence levels of per capita income unless they initiate preventive checks (birth control) on their population growth. In the absence of such preventive checks, Malthusian positive checks (starvation, disease, wars) on population growth will inevitably provide the restraining force. However, if per capita income can somehow reach a threshold level, labelled T in Figure 6.6, from that point population growth is less than total income growth, and thus per capita income grows continually, at a rate such as 2% per year (the approximate US per capita growth rate from 1870 to 2010).

Countries or regions in such a population trap can also escape it by achieving technological progress that shifts the income growth rate curve up at any level of per capita income. And it may be able to achieve changes in economic institutions and culture ("social progress") that shifts the population growth curve down. In this way, the population trap equilibrium is eliminated altogether, and the economy is able to proceed with self-sustaining growth. An example of such a result is depicted in Figure 6.7. Total income growth is now greater than population growth at each level of per capita income. As a result, income per capita now grows steadily.

We have examined strategies for accelerating income growth in Chapters 3 (including its appendices) and 4, and we will examine specific growth policies further in Chapters 7, 9, 12, and 14. The main focus of the remainder of this chapter is on changes in economic institutions, economic power in households, and cultural norms, to reduce fertility to maintain population growth below income growth, and eventually to achieve population stability.

In addition to the classic Malthusian model, the multiple equilibrium analysis of Chapter 4, Figure 4.1, is also relevant to understanding high-fertility traps. In the diagram, we can take the x-axis to represent (expected) fertility and the y-axis, the family's own fertility decision. The upward-sloping response (along the S-shaped curve) of the individual family fertility decision to average fertility

FIGURE 6.7   How Technological and Social Progress Allows Nations to Avoid the Population Trap

may be caused by at least two important complementarities—a basis for possible multiple equilibria. First, if others have high fertility, this may increase the number of formal-sector job seekers without (proportionally) increasing the number of (higher-paying) formal-sector jobs. Each family may feel it needs a larger number of children to raise the probability that at least one child will get a modern job. In addition, families often follow local social norms about fertility and tend to model their own behaviour on the behaviour of others in their community.

It is plausible that the resulting positively sloped response curve also has an S-shape, similar to the one in Figure 4.1.[13] If the fertility response curve cuts the 45-degree line from above at least twice, then there are at least two stable equilibria (see Chapter 4, Section 4.2): one with high and another with low levels of average fertility.[14] Some findings on the effects of changing norms on fertility decisions is presented in Box 6.2.

BOX 6.2 Findings: Social Norms and the Changing Patterns of Fertility in Bangladesh

In this chapter, we describe an idea—presented in part by Partha Dasgupta—that social norms play a role in setting an equilibrium fertility rate. If families followed local customs about fertility—modelling their own behaviour on that of their neighbours—the community might be trapped at a higher fertility rate than would prevail if they could manage a change in social expectations. The idea was also a starting point for empirical research by Kaivan Munshi and Jacques Myaux on the uneven transition to lower fertility in rural developing areas.

Munshi and Myaux applied their research to the experience of the Matlab area of Bangladesh. Fertility reduction varied greatly across apparently similar villages. In addition, response to the same family-planning programme also varied greatly in the magnitude of their effects and time lags before these effects were realised. Data on fertility collected twice annually over an 11-year period offered a unique chance to learn about this process. (The data set included contraceptive use and demographic and socioeconomic characteristics for all women living in all 70 villages in the Matlab area who took part in the programme and were followed throughout the 11-year period.)

Munshi and Myaux offered an explanation for widely varying local patterns: "Most societies have traditionally put norms into place to regulate fertility. When the economic environment changes, individuals gradually learn through their social interactions about the new reproductive equilibrium that will emerge in their community." In this case, the change was in the availability of modern contraception. There is likely some proportion of people who will be perpetually resistant to contraception; the remainder will be open-minded about it but may not want to behave too differently from what local norms dictate. Until this process plays out, people will not know how many of their neighbours will be firmly resistant to change and thus whether contraceptive use will ultimately be socially acceptable overall. Munshi and Myaux propose that families' uncertainty about what potential new equilibrium (what level of contraceptive prevalence) in their villages will emerge leads to caution, giving rise to slow and different rates of fertility transition in otherwise apparently similar villages. They developed a model to demonstrate the underlying logic of this explanation and concluded that social norms do make a difference; the process of moving to a better equilibrium can be slow. In some cases, movement out of the high-fertility equilibrium (too high for many who are stuck there) can be prevented indefinitely.

In rural Bangladesh, which has a large majority Muslim population but also a minority Hindu population, social norms correspond to religious groups. Women are secluded generally (through purdah) and almost never interact with anyone (including women) from another religious group.

In this context, the researchers studied an "exogenous economic intervention"—a thorough, long-term family-planning programme introduced throughout the village areas, studied and promoted door to door to each religious group with equal intensity. This is the kind of quasi experiment needed to understand the effects of social interactions, a process of wide importance in development economics and one that presents great challenges for econometrics (statistical analysis). The authors examined the data and showed that a woman's contraception use "respond[s] strongly to contraceptive prevalence within their own religious group in the village, cross-religion effects are entirely absent in the data." This held despite the fact that "all individuals in the village have access to the same family-planning inputs" and even when the people are otherwise very similar. Thus, the findings are "consistent with the view that changing social norms are driving changes in reproductive behaviour in these communities." As in the model, uncertainty about the ultimate prevalence of contraception use "is slowly resolved over time as women in the village interact sequentially with each other from one period to the next, which explains the gradual change in contraceptive prevalence that we see in the data, as well as the convergence to different levels of contraceptive use across communities."

As societies gain the possibility of modern economic development, advantages of smaller family sizes grow both for families and for the societies of which they are a part. But multiple equilibria are possible. Many in communities with full knowledge of and access to contraception may still perpetuate high fertility rates when social norms and sanctions to contrary behaviour prevail. Addressing situations like these requires attention to social aspects of the development process.

Source: Munshi, K. and Myaux, J. (2006), 'Social norms and the fertility transition,' *Journal of Development Economics*, 80: 1–38. For further background on the issues involved, see also Dasgupta, P. (1993), *An Inquiry into Well-Being and Destitution*, New York: Oxford University Press.

6.4.2 Criticisms of the Malthusian Model

The Malthusian population trap provides a theory of the relationship between population growth and economic development. Unfortunately, it is based on a number of simplistic assumptions and hypotheses that do not stand the test of empirical verification. We can criticise the population trap on two major grounds.

First, the model ignores the enormous impact of technological progress in offsetting the growth-inhibiting forces of rapid population increases. As we saw in Chapter 2, the history of modern economic growth has been closely associated with rapid technological progress in the form of a continuous series of scientific, technological, and social inventions and innovations. Increasing rather than decreasing returns to scale have been a distinguishing feature of the modern growth epoch. While Malthus was basically correct in assuming a limited supply of land, he did not—and in fairness could not at that time—anticipate the manner in which technological progress could augment the availability of land by raising its quality (its productivity) even though its quantity might remain roughly the same.

In terms of the population trap, rapid and continuing technological progress can be represented by an upward shift of the income growth (total product) curve so that at *all* levels of per capita income, it is vertically higher than the population growth curve. This is shown in Figure 6.7. As a result, per capita income will continue to grow over time. All countries therefore have the potential of escaping the Malthusian population trap.

The second basic criticism of the trap focuses on its assumption that national rates of population increase are directly (positively) related to the level of national per capita income. According to this assumption, at relatively low levels of per capita income we should expect to find population growth rates increasing with increasing per capita income. But research indicates that there appears to be no clear correlation between population growth rates and levels of per capita income. As a result of modern medicine and public health programmes, death rates have fallen rapidly and have become less dependent on the level of per capita income. Moreover, birth rates seem to show no rigid relationship with per capita income levels. Fertility rates vary widely for countries with the same per capita income, especially below $1,000. It is not so much the aggregate level of per capita income that matters for population growth but rather how that income is distributed. It is the level of household income, not the level of per capita income, that seems to matter most.

In summary, Malthusian and neo-Malthusian theories as applied to contemporary developing nations have severely limited relevance for the following reasons:

1. They do not take adequate account of the role and impact of technological progress.

2. They are based on a hypothesis about a macro relationship between population growth and levels of per capita income that does not stand up to empirical testing of the modern period.

3. They focus on the wrong variable, per capita income, as the principal determinant of population growth rates. A much better and more valid approach to the question of population and development centres on the microeconomics of family size decision making in which individual, and not aggregate, levels of living become the principal determinant of a family's decision to have more or fewer children.

What we can learn from the Malthusian model   We continue to study the Malthusian trap, even though evidence shows that it is not currently relevant, for four main reasons:

- First, many people still believe the Malthus trap holds in poor countries today, despite the recent evidence; and people working in the development economics field should understand the model and the elements of it that do not currently apply so that they can engage the debate effectively.

- Second, the evidence indicates that such traps have occurred in the historical past and may have been factors in population collapses, including in the pre-Columbian Americas.

- Third, appreciating that the Malthus model more generally prevailed between the agricultural revolution until the industrial revolution highlights the essential roles of scientific and technological progress in modern economic growth, with its ongoing effects on raising productivity.

- Relatedly—as we will explore in the remainder of this chapter—the fact that this model does not currently apply underlines the importance of factors that can prevent its re-emergence. These include efforts to continue steady and sustainable rises in agricultural productivity; and encompass social dimensions, including increases in women's empowerment and freedom to choose, along with their incomes, reducing the old-age security motive while increasing the opportunity costs of high fertility.

6.4.3 The Microeconomic Household Theory of Fertility

In recent years, economists have begun to look more closely at the microeconomic determinants of family fertility in an attempt to provide a better theoretical and empirical explanation for the observed falling birth rates associated with stage 3 of the demographic transition. In doing this, they have drawn on the traditional neoclassical theory of household and consumer behaviour for their basic analytical model and have used the principles of economics and optimisation to explain family size decisions.

The conventional theory of consumer behaviour assumes that an individual with a given set of tastes or preferences for a range of goods (a "utility function") tries to maximise the satisfaction derived from consuming these goods subject to his or her own income constraint and the relative prices of all goods. In the application of this theory to fertility analysis, children are considered as a special kind of consumption (and in developing countries, particularly low-income countries, investment) good so that fertility becomes a rational economic response to the consumer's (family's) demand for children relative to other goods. The usual income and substitution effects are assumed to apply. That is, if other factors are held constant, the desired number of children can be expected to vary directly with household income (this direct relationship may not hold for poor societies; it depends on the strength of demand for children relative to other consumer goods and to the sources of increased income, such as female employment), inversely with the price (cost) of children, and inversely with the strength of tastes for other goods relative to children. Mathematically, these relationships can be expressed as follows:

$$C_d = f(Y, P_c, P_x, t_x), x = 1, \cdots, n \tag{6.1}$$

where C_d, the demand for surviving children (an important consideration in low-income societies where infant mortality rates are high), is a function of the given level of household income (Y), the "net" price of children (the difference between anticipated costs, mostly the opportunity cost of a mother's time, and benefits, potential child income and old-age support, P_c), the prices of all other goods (P_x), and the tastes for goods relative to children (t_x). Under standard

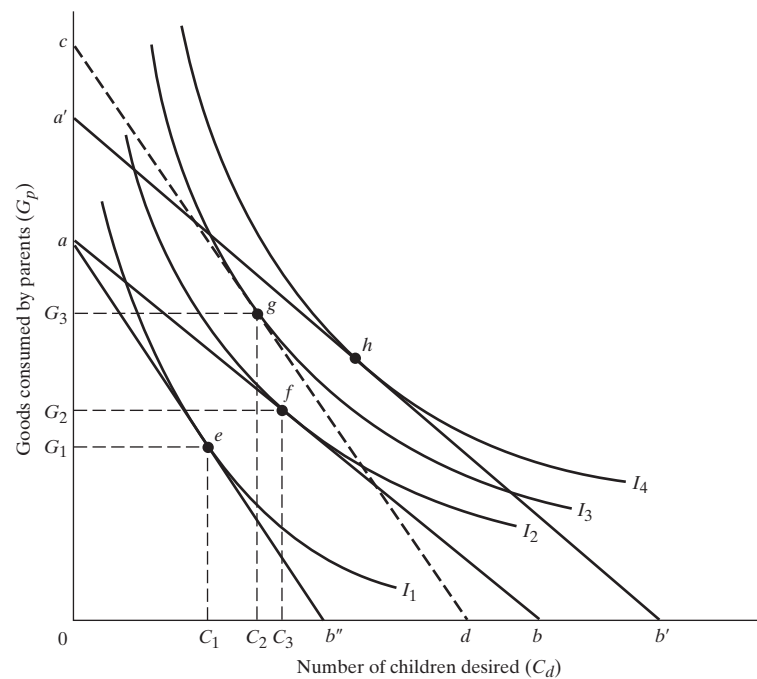neoclassical conditions, we would expect the following (expressed both mathematically and in words):

$\partial C_d/\partial Y > 0$ The higher the household income, the greater the demand for children.

$\partial C_d/\partial P_c < 0$ The higher the net price of children, the lower the quantity demanded.

$\partial C_d/\partial P_x > 0$ The higher the prices of all other goods relative to children, the greater the quantity of children demanded.

$\partial C_d/\partial t_x < 0$ The greater the strength of tastes for goods relative to children, the fewer children demanded.

Microeconomic theory of fertility   The theory that family formation has costs and benefits that determine the size of families formed.

Figure 6.8 provides a simplified diagrammatic presentation of the **microeconomic theory of fertility**. The number of desired (surviving) children, C_d, is measured along the horizontal axis, and the total quantity of goods consumed by the parents, G_p, is measured on the vertical axis.

Household desires for children are expressed in terms of an indifference map representing the subjective degree of satisfaction derived by the parents for all possible combinations of commodities and children. Each individual indifference curve portrays a locus of commodity–child combinations that

FIGURE 6.8   Microeconomic Theory of Fertility: An Illustration

yield the same amount of satisfaction. Any point (or combination of goods and children) on a "higher" indifference curve—that is, on a curve farther out from the origin—represents a higher level of satisfaction than any point on a lower indifference curve. But each indifference curve is a "constant satisfaction" locus.

In Figure 6.8, only four indifference curves, I_1 to I_4, are shown; in theory, there is an infinite set of such curves, filling the whole quadrant and covering all possible commodity–child combinations. The household's ability to "purchase" alternative combinations of goods and children is shown by the budget constraint line, ab. Thus, all combinations on or below line ab (within the triangular area $0ab$) are financially attainable by the household on the basis of its perceived income prospects and the relative prices of children and goods, as represented by the slope of the ab budget constraint. The steeper the slope of the budget line, the higher the price of children relative to goods.

According to the demand-based theory of fertility, the household chooses from among all attainable combinations the one combination of goods and children that maximises family satisfaction on the basis of its subjectively determined preferences. Diagrammatically, this optimal combination is represented by point f, the tangency point between the budget constraint, ab, and indifference curve, I_2. Therefore, C_3 children and G_2 goods will be demanded.

A rise in family income, represented in Figure 6.8 by the parallel outward shift of the budget line from ab to $a'b'$, enables the household to attain a higher level of satisfaction (point h on curve I_4) by consuming more of *both* commodities and children—that is, if children, like most commodities, are assumed to be normal goods (demand for them rises with income), an important if in low-income countries where children are often in demand primarily as a source of future financial security. Note that as income rises, parents may spend more on each child, preferring a smaller number of children—each of higher "quality," for example, healthier and better educated.

Similarly, an increase in the price (opportunity cost) of children relative to other goods will cause households to substitute commodities for children. Other factors (namely, income and tastes) being constant, a rise in the relative price of children causes the household utility-maximising consumption combination to occur on a lower indifference curve, as shown by the movement of the equilibrium point from f to e when the budget line rotates around point a to ab''.

Note, finally, that if there is a simultaneous increase in household income and net child price as a result of, say, expanding female employment opportunities and a rise in wages, coupled with a tax on children beyond a certain number per family, there will be *both* an outward shift and downward rotation of the budget constraint line of Figure 6.8 to, say, dashed line cd. The result is a new utility-maximising combination that includes fewer children per family (point g compared with point f). In other words, higher levels of living for low-income families in combination with a relative increase in the price of children (whether brought about directly by fiscal measures or indirectly by expanded female employment opportunities) will motivate households to have fewer children while still improving their welfare. This is just one example of how the economic theory of fertility can shed light on the relationship between economic development and population growth, as well as suggest possible lines of policy.

6.4.4 The Demand for Children in Developing Countries

The economic theory of fertility assumes that the household demand for children is determined by family preferences for a certain number of surviving (usually male) children (i.e., in regions of high mortality, parents may produce more children than they actually desire in the expectation that some will not survive), by the price or "opportunity cost" of rearing these children, and by levels of family income. Children in poor societies are seen partly as economic investment goods in that there is an expected return in the form of both child labour and the provision of financial support for parents in old age.[15] However, in many developing countries, there is a strong intrinsic psychological and cultural determinant of family size, so the first two or three children may be viewed as "consumer" goods for which demand may not be very responsive to relative price changes.

The choice mechanism in the economic theory of fertility as applied to developing countries is assumed, therefore, to exist primarily with regard to the additional ("marginal") children who are considered as investments. In deciding whether or not to have *additional* children, parents are assumed to weigh private economic benefits against private costs, where the principal benefits are the expected income from child labour, usually on the farm, and eventual financial support for elderly parents. Balanced against these benefits are the two principal elements of cost: the opportunity cost of the mother's time (the income she could earn if she were not at home caring for her children) and the cost of educating children—the financial trade-off between having fewer "high-quality," high-cost, educated children with high-income-earning potential versus more "low-quality," low-cost, uneducated children with much lower earning prospects.

Using the same thought processes as in the traditional theory of consumer behaviour, the theory of family fertility concludes that when the price or cost of children rises as a result of, say, increased educational and employment opportunities for women or a rise in school fees or the establishment of minimum-age child labour laws or the provision of publicly financed old-age social security schemes, parents will demand fewer additional children, substituting, perhaps, quality for quantity or a mother's employment income for her child-rearing activities. It follows that one way to induce families to desire fewer children is to raise the price of child rearing by, say, providing greater educational opportunities and a wider range of higher-paying jobs for young women.

Recent research on household behaviour has led to a major improvement of this theory. Households in developing countries generally do not act in a "unitary" manner, depicted with this traditional model. Instead, men and women have different objective functions; for example, husbands may prefer to have more children than wives. Household behaviour is then explained as a result of *bargaining* between husbands and wives. Although the broad impacts we have just described continue to hold, the process includes increased bargaining power of women. Nonunitary, bargaining-based models of household behaviour also improve our understanding of otherwise puzzlingly inefficient household behaviours, such as higher investment in husbands' farm plots than wives' farm plots even when a more even investment could lead to higher family incomes.[16]

Son Preference   The preference for sons over daughters is particularly prevalent in South Asia and East Asia. One implication of son preference is a higher overall birth rate if gender at birth is random (as some families "try again" for a boy). Alternatively, son preference may lead to sex-selective abortion when the technology is available; or even to female infanticide. There are three main economic explanations for son preference. First, in some areas there are social expectations for daughters to marry outside their village, after which they become primarily responsible for the husband's parents, rather than their biological parents; parents with old-age security motivation for having more children would focus on having sons. Second, even if daughters and sons are considered equally responsible for care of their ageing parents, sons are viewed as having higher lifetime earnings potential, and so may be more financially able to help. Relatedly, sons may be considered more suitable for heavy labour, typically on the family farm. Third, in many societies, and in South Asia in particular, there are social expectations of substantial dowry payments by the parents of the bride to the groom's family, substantially increasing the expected costs of raising a daughter, while increasing the expected benefits of raising a son. Indeed, all newly forming families might be better off if they could agree to abolish dowry and other conditions for son preference: if the chance of having a daughter were 50%, then "behind the veil of ignorance" risk-averse parents would be better off without artificially higher costs for raising either a son or a daughter. Son preference harms girls, who may get less education and health care. But it would be risky to be one of the few parents to refuse to pay a dowry.[17] Finally, economic motivations may be insufficient to explain the intensity of son preference seen in many families, suggesting that some son preference may result from a self-sustaining social equilibrium that may be very difficult to change. (Implications of gender bias for well-being of women and girls are examined in more detail in Chapter 8.)

Some Empirical Evidence   Statistical studies in a broad spectrum of developing countries have provided support for the economic theory of fertility.[18] For example, it has been found that high female employment opportunities outside the home and greater female school attendance, especially at the primary and secondary levels, are associated with significantly lower levels of fertility. As women become better educated, they tend to earn a larger share of household income and to produce fewer children. Moreover, these studies have confirmed the strong association between declines in child mortality and the subsequent decline in fertility. Assuming that households desire a target number of surviving children, increased female education and higher levels of income can decrease child mortality and therefore increase the chances that the firstborn will survive. As a result, fewer births may be necessary to attain the same number of surviving children. This fact alone underlines the importance of educating women and improving public health and child nutrition programmes in reducing fertility levels.

6.4.5 Implications for Development and Fertility

All of the foregoing can be summarised by saying that the effect of social and economic progress in lowering fertility in developing countries will be the greatest when the majority of the population and especially the very poor share in its

benefits. Specifically, birth rates among the very poor are likely to fall where the following socioeconomic changes come to pass:

1. An increase in the education of women and a consequent improvement in their role and status.

2. An increase in female nonagricultural wage employment opportunities, which raises the price or cost of their traditional child-rearing activities.

3. A rise in family income levels through the increased direct employment and earnings of a husband and wife or through the redistribution of income and assets from rich to poor.

4. A reduction in infant mortality through expanded public health programmes and better nutritional status for both mother and child, and better medical care.

5. The development of old-age and other social security systems outside the extended family network to lessen the economic dependence of parents, especially women, on their offspring.

6. Expanded schooling opportunities so that parents can better substitute child "quality" for large numbers of children.

Family-planning programmes Public programmes designed to help parents plan and regulate their family size.

In short, expanded efforts to make jobs, education, and health more broadly available to poverty groups in general and women in particular will not only contribute to their economic and psychic well-being (i.e., to their development) but also contribute substantially to their motivation for smaller families (i.e., their freedom to choose), which is vital to reducing population growth rates. Where such motivation exists, well-executed **family-planning programmes** can then be an effective tool.[19] But before discussing policy issues and what government might or might not do, we should point out that while there seems to be considerable agreement regarding the determinants or causes of population growth, substantial disagreement and controversy remain regarding its consequences.

6.5 The Consequences of High Fertility: Some Conflicting Perspectives

For many years, development economists and other social scientists have debated the seriousness of the consequences of rapid population growth.[20] On the one hand, we must recognise that population growth is not the only, or even the primary, source of low levels of living, eroding self-esteem, and limited freedom in developing nations. On the other hand, it would be equally naive to think that rapid population growth in many countries and regions is not a serious intensifier and multiplier of those integral components of underdevelopment, especially the first and third. The following discussion summarises some of the main arguments for and against the idea that the consequences of rapid population growth lead to serious development problems. It then considers whether some consensus can be reached so that specific policy goals and objectives can be postulated.[21]

6.5.1 It's Not a Real Problem

We can identify three general lines of argument on the part of people who assert that population growth is not a cause for concern:

- The problem is not population growth but other issues.

- Population growth is a false issue deliberately created by dominant rich-country agencies and institutions to keep developing countries in their dependent condition.

- For many developing countries and regions, population growth is in fact desirable.

Other Issues   Many observers from both rich and poor nations argue that the real problem is not population growth *per se* but one or all of the following four issues:

1. *Underdevelopment.* If correct strategies are pursued and lead to higher levels of living, greater self-esteem, and expanded freedom, population will take care of itself. Eventually, it will disappear as a problem, as it has in all of the present economically advanced nations. According to this argument, underdevelopment is the real problem, and development should be the only goal. With it will come economic progress and social mechanisms that will more or less automatically regulate population growth and distribution. As long as people in developing countries remain impoverished, uneducated, and unhealthy and the social safety net remains weak, the large family will constitute the only real source of social security (i.e., parents will continue to be denied the freedom to choose a small family if they so desire). Some proponents of the underdevelopment argument then conclude that birth control programmes will surely fail, as they have in the past, when there is no motivation on the part of poor families to limit their size.

2. *World Resource Depletion and Environmental Destruction.* Population can only be an economic problem in relation to the availability and utilisation of scarce natural and material resources. The fact is that developed countries, with less than one-quarter of the world's population, consume almost 80% of the world's resources. In terms of the depletion of the world's limited resources, therefore, the addition of another child in the developed countries is as significant as the birth of many times as many additional children in the underdeveloped countries. According to this argument, developed nations should curtail their excessively high consumption standards instead of asking less-developed nations to restrict their population growth. The latter's high fertility is really due to their low levels of living, which are in turn largely the result of the overconsumption of the world's scarce resources by rich nations. This combination of rising affluence and extravagant consumption habits in rich countries and among rich people in poor countries, and not population growth, should be the major world concern. (We will analyse issues of the environment and development in Chapter 10.)

3. *Population Distribution.* According to this third argument, it is not the number of people *per se* that is causing population problems but their distribution in space. Many regions of the world (e.g., parts of sub-Saharan Africa) and many regions within countries (e.g., the northeastern and Amazon regions of Brazil) are viewed as underpopulated in terms of available or potential resources. Others simply have too many people concentrated in too small an area (e.g., central Java or most urban concentrations). Governments should therefore strive not to moderate the rate of population growth but rather to bring about a more natural spatial distribution of the population in terms of available land and other productive resources.

4. *Subordination of Women.* Perhaps most important, as noted previously, women often bear the disproportionate burdens of poverty, poor education, and limited social mobility. In many cases, their inferior roles, low status, and restricted access to birth control are manifested in their high fertility. According to this argument, population growth is a natural outcome of women's lack of economic opportunity. If women's health, education, and economic well-being are improved along with their role and status in both the family and the community, this empowerment of women will inevitably lead to smaller families and lower population growth.

6.5.2 It's a Deliberately Contrived False Issue

The second main line of argument denying the significance of population growth as a major development problem is closely allied to the neocolonial dependence theory of underdevelopment discussed in Chapter 3. Basically, it is argued that the overconcern in the rich nations with the population growth of poor nations is really an attempt by the former to hold down the development of the latter in order to maintain an international status quo that is favorable to the rich nations' self-interests. Rich nations are pressuring poor nations to adopt aggressive population control programmes, even though they themselves went through a period of sizeable population increase that accelerated their own development processes.

A radical neo-Marxist version of this argument views population control efforts by rich countries and their allied international agencies as racist or genocidal attempts to reduce the relative or absolute size of the poor, largely nonwhite populations of the world who may some day pose a serious threat to the welfare of the rich, predominantly white societies. Worldwide birth control campaigns are seen as manifestations of the fears of the developed world in the face of a possible radical challenge to the international order by the people who are its first victims.

6.5.3 It's a Desirable Phenomenon

A more conventional economic argument is that of population growth as an essential ingredient to stimulate economic development. Larger populations provide the needed consumer demand to generate favourable economies of scale in production, to lower production costs, and to provide a sufficient and low-cost labour supply to achieve higher output levels. Population "revisionist" economists of the neoclassical counterrevolution school argue, for example, that free

markets will always adjust to any scarcities created by population pressures.[22] Such scarcities will drive up prices and signal the need for new cost-saving production technologies. In the end, free markets and human ingenuity (Julian Simon's "genius" as the "ultimate resource") will solve any and all problems arising from population growth. This revisionist viewpoint was clearly in contrast with the traditional "orthodox" argument that rapid population growth had serious economic consequences that, if left uncorrected, would slow economic development.

At the other end of the political spectrum, it has been argued by some developing-world neo-Marxist pronatalists that many rural regions in developing countries are in reality underpopulated in the sense that much unused but arable land could yield large increases in agricultural output if only more people were available to cultivate it. Many regions of tropical Africa and Latin America and even parts of Asia are said to be in this situation. With respect to Africa, for example, some observers have noted that many regions had larger populations in the remote past than after independence.[23] Their rural depopulation resulted not only from the slave trade but also from compulsory military service, confinement to reservations, and the forced-labour policies of former colonial governments. For example, the sixteenth-century Kongo kingdom is said to have had a population of approximately 2 million. But by the time of the colonial conquest, which followed 300 years of slave trade, the population of the region had fallen to less than one-third of that figure. After independence, parts of the Democratic Republic of Congo (formerly known as the Belgian Congo and later as Zaire) had barely caught up to the sixteenth-century numbers.[24] Other regions of western and eastern Africa provide similar examples—at least in the eyes of advocates of rapid population growth in Africa.

In terms of ratios of population to arable land (land under cultivation, fallow land, pastures, and forests), Africa south of the Sahara is said by these supporters of population expansion to have a total of 1.4 billion arable hectares. Land actually being cultivated amounts to only a fraction of this potential. Thus, only 12% of all potential arable land is under cultivation, and this low rural population density is viewed as a serious drawback to raising agricultural output.[25] Similar arguments have been expounded with regard to such Latin American countries as Brazil and Argentina.

Three other noneconomic arguments, each found to some degree in a wide range of developing countries, complete the "population growth is desirable" viewpoint. First, many countries claim a need for population growth to protect currently underpopulated border regions against the expansionist intentions of neighbouring nations. Second, there are many ethnic, racial, and religious groups in less-developed countries whose attitudes favouring large family size have to be protected for both moral and political reasons. Finally, military and political power are often seen as dependent on a large and youthful population.

Many of these arguments have a certain realism about them—if not in fact, then at least in the perceptions of vocal and influential individuals in both the developed and developing worlds. The important point is that they represent a considerable range of opinions and viewpoints and therefore need to be seriously weighed against the counterarguments of theorists who believe that rapid population growth is indeed a real and important problem for underdeveloped countries. Let us now look at some of these counterarguments.

6.5.4 It *Is* a Real Problem

Positions supporting the need to curtail population growth because of the negative economic, social, and environmental consequences are typically based on one of the following three arguments.

The Extremist Argument: Population and Global Crisis   The extreme version of the population-as-problem position attempts to attribute almost all of the world's economic and social evils to excessive population growth. Unrestrained population increase is seen as the major crisis facing humankind today. It is regarded as the principal cause of poverty, low levels of living, malnutrition, ill health, environmental degradation, and a wide array of other social problems. Value-laden and incendiary terms such as *population bomb* and *population explosion* are tossed around. Indeed, dire predictions of world food catastrophes and ecological disaster are often attributed almost entirely to the growth in population numbers.[26] Such an extreme position leads some of its advocates to assert that "world" (i.e., developing country) population stabilisation or even decline is the most urgent contemporary task, even if it requires severe and coercive measures such as compulsory sterilisation to control family size in some of the most densely populated developing countries, such as India and Bangladesh.

The Theoretical Argument: Population–Poverty Cycles and the Need for Family-Planning Programmes   The **population–poverty cycle** theory is the main argument advanced by economists who hold that too rapid population growth yields negative economic consequences and thus should be a real concern for developing countries. Advocates start from the basic proposition that population growth intensifies and exacerbates the economic, social, and psychological problems associated with the condition of underdevelopment. Population growth is believed to retard the prospects for a better life for the already born by reducing savings rates at the household and national levels. It also severely draws down limited government revenues simply to provide the most rudimentary economic, health, and social services to the additional people. This, in turn, further reduces the prospects for any improvement in the levels of living of the existing generation and helps transmit poverty to future generations of low-income families.

Because widespread absolute poverty and low levels of living are thus seen as a major cause of large family size, and large families retard economic growth, it follows that economic and social development is a necessary condition for bringing about an eventual slowing or cessation of population growth at low levels of fertility and mortality. But, according to this argument, it is not a sufficient condition—that is, development provides people with the incentives and motivations to limit their family size, but family-planning programmes are needed to provide them with the technological means to avoid unwanted pregnancies. Even though countries such as France, Japan, the United States, Great Britain, and, more recently, Taiwan and South Korea were able to reduce their population growth rates without widespread family-planning clinics, it is argued that the provision of these services will enable other countries desiring to control excessive population growth to do so more rapidly than if these family-planning services were not available.

Population-poverty cycle   A theory to explain how poverty and high population growth become reinforcing.

BOX 6.3 Development Policy: Population Policy in China

China is well-known for its one-child policy, implemented in 1980. It probably had some effect on reducing fertility at an earlier stage of development.

China has been the world's most populous nation for centuries. After the Communist takeover in 1949, Chinese leaders led by Mao Zedong took a broadly pronatalist (births-encouraging) stance, believing that a communist society could solve any population problems and that a larger population would mean a more powerful country. Mao went so far as to send advocates of population control to jail. However, in the face of famine in the late 1950s, these pronatalist policies moderated.

Then, in 1980, China initiated a tough new drive to deter births. Stringent and often draconian measures to achieve that goal were introduced in 1982 and 1983 as the Chinese Government adopted a policy of one child per family. Social and political pressures to limit family size to one child included requiring women to appeal to the neighbourhood committee or council for formal permission to become pregnant. Although first births were routinely approved, second births were usually approved only if the first child had a serious birth defect or if the woman had remarried. Economic incentives included giving priority to one-child families in housing, medical care, and education. Mothers of two or more children were often denied promotions, and steep fines, sometimes in excess of 10 times China's per capita income, were levied for second and third children.

Given such rigid national policies and a strong cultural preference for boys, it is not surprising that there were many reports of girls receiving less medical attention and even female infanticide ("gendercide"). Male-to-female ratios are higher than the normal level in many Asian countries, and gender bias is at least partly to blame. Amartya Sen's pioneering 1992 research estimated that 44 to 50 million women were already "missing" in China, depending on whether the comparison is to Western countries or to Africa. More recent data confirm that these trends have continued, with Stephan Klasen and Claudia Wink calculating that well over 6% of women are "missing" in China. It was estimated that, in 2010, there were 106 males for every 100 females in China overall; and close to 118 boys were born for every 100 girls. Cultural preferences may change with further economic development. In fact, this ratio is now falling, albeit slightly, from a recent peak ratio of 120 boys to 100 girls, according to official government data. Similar patterns are found in other Asian countries (the situation in India is addressed in the case study at the end of Chapter 5).

The full impact of China's population-control programmes remains uncertain. Critics doubted that the benefits of reduced population growth achieved through severe social and economic pressures for one-child families was worth the cost of a harsh break with traditional family norms. In 1988, when the Chinese Government discovered that the population had already passed the 1 billion mark, it decided to increase its enforcement of the one-child norm in rural as well as urban areas. However, strong popular opposition caused it to relax its stringent controls slightly and to focus more on elevating the status of women and providing greater old-age security. By the mid-1990s, China's fertility rate reached 1.9 births per woman, and it fell further to about 1.6 by 2017. Because of population momentum, China's population has continued to grow as larger, younger cohorts replace smaller, older ones. However, the country's largest cohorts are now passing out of their childbearing years. In fact, by 2018, the workforce had begun to contract each year, as the number of retirements exceeded the number of younger people joining the workforce. The total population is expected to reach its peak and begin to decline at least by the late 2020s. (One controversial study concluded that China's population already declined in 2018 for the first time since the late-1950s famine.)

In practice, even in the peak years of the policy, significant numbers of families had two children rather than one, and others in rural areas, including ethnic minorities who were exempted from the one-child policy, have more than two children. But fertility rates are extremely low in the urban areas, to which an increasing share of the rural population is moving. Typical estimates suggest that upward of 250 million fewer people were born in China than would have been born without the one-child policy—an enormous impact.

The one-child policy in China came with risks and unintended consequences as well as rewards. While fertility has fallen, preference for boys over girls intensified, as did China's "missing women" problem. An influential study by economists Shang-Jin Wei and Xiaobo Zhang, published in 2011, provided evidence that China's surge in savings was caused in large part by competitive investments in housing by parents of sons as a "visible" signal of wealth accumulation by families seeking to attract prospective brides for them with larger houses. (Again, this reflects the fact that sons now greatly outnumber daughters due to China's growing sex-ratio imbalance.) Some other explanations of China's historically high savings rates also relate to demographic challenges, including "life-cycle" saving for retirement by an ageing population that lacks social security, and precautionary savings due to increased income uncertainty (notably fears about catastrophic family events such as major illnesses or layoffs). High savings may be associated with the apparent property bubble that some economists in China believe has created a risk of financial crisis.

But the high fraction of the population of working age in the late twentieth and early twenty-first century provided a "demographic dividend." This is a period in which children have become a much smaller share of the population while retired persons are not yet a significantly larger share of the population; at this stage, the fraction of younger persons in the workforce is high, opening the way for rapid growth of productivity. China's one-child policy likely led to highly favourable timing for receiving the demographic dividend, given the unusually open trade environment in these years.

Over time, a growing number of exceptions were introduced to the one-child policy, notably allowing a second child if the first child is a girl, and allowing a second child if both parents are themselves only children. In 2013, the policy was relaxed further, with a second child permitted if either parent was an only child; and then allowing urban families for which husband or wife is an only child to have a second child (previously this was allowed only if each was an only child). In 2016, the policy was subsequently relaxed to allow a second child more generally.

In 2019, the prospect of eliminating all remaining fertility restrictions, and even incentivising births, was discussed publicly. This was, in part, because the "two-child policy" introduced between 2013 and 2016 did not lead to a noticeable increase in the birth rate (except for a one-year spike in 2017). But even full relaxation may have very limited impact on fertility because the change in norms seems strongly established, and perhaps more importantly because of the high cost of raising children in China's cities. Moreover, other countries in the region that reached high-income status in the twentieth century including Japan and South Korea, as well as Taiwan and Hong Kong, have birth rates well below replacement levels. But China differs in its significantly lower income. The very high ratio of males to females remains another serious demographic challenge.

Sources:
Shenggen Fan, Ravi Kanbur, Shang-Jin Wei and Xiaobo Zhang, eds, *The Oxford Companion to the Economics of China*, Oxford University Press, 2014.
Stephan Klasen and Claudia Wink, "Missing women: Revisiting the debate," Feminist Economics, 9 (2–3), 2003, 263–99.
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Shang-Jin Wei, and Xiaobo Zhang, 2011, "The competitive saving motive: Evidence from rising sex ratios and savings rates in China," *Journal of Political Economy*, volume 119, number 3.
Xiaodong Zhu, 2012, "Understanding China's growth: Past, present and future," *Journal of Economic Perspectives* (Fall).

A Simple Model   A basic model that economists use to demonstrate these adverse consequences of rapid population growth is a simplification of the standard Solow-type neoclassical growth equation.[27] Using the standard production function, $Y = f(K,L,R,T)$—that is, output is a function of capital, labour, resources, and technology—and holding the resource base fixed, we can derive the result that

$$y - l = \alpha(k - 1) + t \tag{6.2}$$

where y = rate of GNI growth $\Delta Y/Y$, l = rate of labour force (population) growth $\Delta L/L$, k = rate of growth of the capital stock $\Delta K/K$, α = capital elasticity of output (usually found to be constant), and t = the effect of technological change (the Solow residual in empirical studies of sources of economic growth).

Assuming constant returns to scale, Equation 6.2 simply states that the rate of per capita income growth $(y - l)$ is directly proportional to the rate of growth of the capital–labour ratio $(k - l)$ plus the residual effects of technological progress (including improved human and physical capital). Therefore, in the absence of technological change, the higher the rate of population growth (l), the more rapid the rate of capital stock growth (k) must be and thus the greater the concomitant savings and investment rate just to maintain constant levels of per capita income. Moreover, because k may not be independent of l, as is traditionally assumed in neoclassical growth models, but may in fact be inversely related due to the reduced savings impact implied by the higher dependency burden effects of rapid population growth, it follows that the negative economic impact of population growth may even be greater than these models imply. Finally, if low incomes induce poor families to have more children as a source of cheap labour and old-age security, then we have another vicious circle in progress—poor people have large families partly to compensate for their poverty, but large families mean greater population growth, higher dependency burdens, lower savings, less investment, slower economic growth, and ultimately greater poverty. In an extreme case, a neo-Malthusian population trap can emerge. Population growth is thus seen as both a cause and a consequence of underdevelopment!

However, keep in mind that, as you saw in Chapters 3 and 4, population growth can tell only part of the story of economic growth. In this regard, William Easterly argued that "even if population growth lowered per capita growth one for one (the general view of the population alarmists), this would explain only about one-third of the variation in per capita growth."[28] Growth in productivity, especially as spurred by structural transformation of the economy (Chapter 3), is usually more important in economic development outcomes.

Other Empirical Arguments: Seven Negative Consequences of Population Growth   According to empirical research, the potential negative consequences of population growth for economic development can be divided into seven categories: its impact on economic growth, poverty and inequality, education, health, food, the environment, and international migration.[29]

1. *Economic Growth.* Evidence shows that although it is not the culprit behind economic stagnation, rapid population growth lowers per capita income growth in most developing countries, especially those that are already poor, dependent on agriculture, and experiencing pressures on land and natural resources.

2. *Poverty and Inequality.* Even though aggregate statistical correlations between measures of poverty and population growth at the national level are often inconclusive, at the household level the evidence is strong and compelling. The negative consequences of rapid population growth fall most heavily on the poor because they are the ones who are made landless, suffer first from cuts in government health and education programmes, and bear the brunt of environmental damage. Poor women once again bear the greatest burden of government austerity programmes, and another vicious circle ensues. To the extent that large families perpetuate poverty, they also exacerbate inequality.

3. *Education.* Although the data are sometimes ambiguous on this point, it is generally agreed that large family size and low incomes restrict the opportunities of parents to educate all their children. At the national level, rapid population growth causes educational expenditures to be spread more thinly, lowering quality for the sake of quantity. This in turn feeds back on economic growth because the stock of human capital is reduced by rapid population growth.

4. *Health.* High fertility harms the health of mothers and children. It increases the health risks of pregnancy, and closely spaced births have been shown to reduce birth weight and increase child mortality rates.

5. *Food.* Feeding the world's population is made more difficult by rapid population growth—a large fraction of developing-country food requirements are the result of population increases. New technologies of production must be introduced more rapidly, as the best lands have already been cultivated. International food relief programmes become more widespread.

6. *Environment.* Rapid population growth contributes to environmental degradation in the form of forest encroachment, deforestation, fuelwood depletion, soil erosion, declining fish and animal stocks, inadequate and unsafe water, air pollution, and urban congestion (see Chapter 10).

7. *International Migration.* Many observers consider the increase in international migration, both legal and illegal, to be one of the major consequences of developing countries' population growth. Though many factors spur migration (see Chapter 7), an excess of job seekers (caused by rapid population growth) over job opportunities is surely one of them. However, unlike the first six consequences listed here, some of the economic and social costs of international migration fall on recipient countries, increasingly in the developed world. It is not surprising, therefore, that this issue has recently taken on political importance in North America and Europe (see Chapter 2).

6.5.5 Goals and Objectives: Toward a Consensus

In spite of what may appear to be seriously conflicting arguments about the positive and negative consequences of population growth, a common ground has emerged on which many people on both sides of the debate can agree. This position is characterised succinctly by Robert Cassen.

The consequences of rapid population growth should be neither exaggerated nor minimised. Some past expressions of alarm have been counterproductive, alienating the very audiences they were intended to persuade; at the same time,

claims that population growth was not all that important have had the effect of diminishing a proper concern for the subject.[30]

The following three propositions constitute the essential components of this intermediate or consensus opinion:

1. Population growth is not the primary cause of low levels of living, extreme inequalities, or the limited freedom of choice that characterise much of the developing world. The fundamental causes of these problems must be sought, rather, in the plight of poor families, especially women, and the failure of other aspects of domestic and international development policy.

2. The problem of population is not simply one of numbers but involves the quality of life and material well-being. Thus, developing-country population size must be viewed in conjunction with developed-country affluence in relation to the quantity, distribution, and utilisation of world resources, not just in relation to developing countries' indigenous resources.

3. Rapid population growth does serve to intensify problems of underdevelopment and to make prospects for development that much more remote. As noted, the momentum of growth means that, barring catastrophe, the population of developing countries will increase dramatically over the coming decades, no matter what fertility control measures are adopted now. It follows that high population growth rates, though not the principal cause of underdevelopment, are nevertheless important contributing factors in specific countries and regions of the world.

In view of these three propositions, we may conclude that the following three policy goals and objectives might be included in any realistic approach to the issue of population growth in developing countries:

1. In countries or regions where population size, distribution, and growth are viewed as an existing or potential problem, the primary objective of any strategy to limit further growth must deal not only with the population variable *per se* but also with the underlying social and economic conditions of underdevelopment. Problems such as absolute poverty, gross inequality, widespread unemployment (especially among women), limited female access to education, malnutrition, and poor health facilities must be given high priority. Their amelioration is both a necessary concomitant of development and a fundamental motivational basis for the expanded freedom of the individual to choose an optimal—and in many cases, smaller—family size.

2. To bring about smaller families through development-induced motivations, family-planning programmes providing both the education and the technological means to regulate fertility for people who wish to regulate it should be established.

3. Developed countries should help developing countries achieve their lowered fertility and mortality objectives, not only by providing contraceptives and funding family-planning clinics, but also, even more importantly, by curtailing their own excessive depletion of nonrenewable world resources through programmes designed to cut back on the unnecessary consumption

of products that intensively use such resources; by making genuine commitments to eradicating poverty, illiteracy, disease, and malnutrition in developing countries as well as their own; and by recognising in both their rhetoric and their international economic and social dealings that development is the real issue, not simply population control.

6.6 Some Policy Approaches

In view of these broad goals and objectives, what kinds of economic and social policies might developing- and developed-country governments and international assistance agencies consider to bring about long-term reductions in the overall rate of world population growth? Three areas of policy can have important direct and indirect influences on the well-being of present and future world populations:

1. General and specific policies that developing-country governments can initiate to influence and perhaps even control their population growth and distribution.

2. General and specific policies that developed-country governments can initiate in their own countries to lessen their disproportionate consumption of limited world resources and promote a more equitable distribution of the benefits of global economic progress.

3. General and specific policies that developed-country governments and international assistance agencies can initiate to help developing countries achieve their population objectives.

Let us deal with each of these areas in turn.

6.6.1 What Developing Countries Can Do

Earlier discussions have led to the conclusion that the principal variables influencing the demand for children at the family level are the ones most closely associated with the concept of development as we have defined it in Chapter 1. Thus, certain development policies are particularly crucial in the transition from a high-growth to a low-growth population. These policies aim at: eliminating absolute poverty; lessening income inequalities; expanding educational opportunities, especially for women; providing increased job opportunities for both men and women; bringing the benefits of modern preventive medicine and public health programmes, especially the provision of clean water and sanitation, to the rural and urban poor; improving maternal and child health through more food, better diets, and improved nutrition so as to lower infant mortality; and creating a more equitable provision of other social services to wide segments of the population. Again, it is not numbers *per se* or parental irrationality that is at the root of the "population problem." Rather, it is the pervasiveness of absolute poverty and low levels of living that provide the economic rationale for large families and burgeoning populations. And it is the spillover effects or negative social externalities of these private parental decisions (e.g., for education, health

care, food supplies, environment and resource degradation, job creation, overall growth, and income distribution) that provide the strictly economic efficiency justification (in terms of "market failure" arguments) for government intervention in population matters. Clearly, there are noneconomic justifications as well.

Although long-run development policies of the kind just outlined are essential to ultimate population stabilisation, there are five more specific policies that developing-country governments might try to adopt to lower birth rates in the short run.[31]

First, they can try to *persuade people* through the media and the educational process, both formal (school system) and informal (adult education), to have smaller families.

Second, they can *enhance family-planning programmes* to provide health and contraceptive services to encourage the desired behaviour. Such publicly sponsored or officially supported programmes now exist in most developing countries. Today, only a few countries do not have such publicly sponsored or officially endorsed family-planning programmes. However, there remains substantial unmet demand for contraceptives, as seen in Box 6.4.

Third, they can deliberately *manipulate economic incentives and disincentives* for having children—for example: through the elimination or reduction of maternity leave and benefits, the reduction or elimination of financial incentives, or the imposition of financial penalties for having children beyond a certain number; through the establishment of old-age social security provisions and minimum-age child

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BOX 6.4 Findings: Contraceptives Need and Use in Developing Countries, 2003 to 2012

Jacqueline Darroch and Susheela Singh analysed the use and need for contraceptives in developing countries, using data from comparable national surveys for married and unmarried women aged 15 to 49 in 2003, 2008, and 2012. Darroch and Singh estimated numbers and percentages of women wanting to avoid pregnancy, according to whether they were using modern contraceptives, or using either no method or only a traditional method. They found that "the number of women wanting to avoid pregnancy and therefore needing effective contraception increased substantially," from 716 million in 2003 to 867 million in 2012. Most of the increase corresponded to population growth. The percentage of women wishing to avoid pregnancy also rose, from 54% in 2003 to 57% in 2012. At the same time, the "use of modern contraceptive methods also increased, and the overall proportion" of all women aged 15-49 with "unmet need

for modern methods among those wanting to avoid pregnancy decreased," from 29% in 2003, to 26% in 2012 (although the number rose from 210 million to 222 million). However, the unmet need for modern contraceptives among those wanting to avoid pregnancy remained very high, "especially in sub-Saharan Africa (53 million [60%] of 89 million), south Asia (83 million [34%] of 246 million), and western Asia (14 million [50%] of 27 million)." The authors maintained that, "to meet the unmet need for modern contraception, countries need to increase resources, improve access to contraceptive services and supplies, and provide high-quality services and large-scale public education interventions to reduce social barriers."

Source: Jacqueline Darroch and Susheela Singh. "Trends in contraceptive need and use in developing countries in 2003, 2008, and 2012: An analysis of national surveys." *The Lancet* 381 (May 18, 2013): 1756–1762.

labour laws; through the raising of fees and elimination of heavy public subsidies for higher education; and through the subsidisation of smaller families through direct money payments. Although some form of population-related *incentive or disincentive schemes* now exist in over 30 developing countries, Singapore, India, Bangladesh, South Korea, and China have been especially prominent in experimenting with policies to reduce family size. For example, Singapore allocated scarce public housing without giving consideration to family size. It also limited paid maternity leave to a maximum of two children, scaling the delivery fee according to number of children and reducing income tax relief from five to three children. In 1984, it even went so far as to give special priority in school admission to all children born to women with university degrees while penalising non-degree-holding women with more than two children. The presumed but dubious rationale was that educated women have brighter children whose births should be encouraged while discouraging the less-educated (and presumably less-intelligent) women from bearing more children. But fertility fell so dramatically that by 2004 the city-state had introduced incentives to *increase* fertility (as with Japan and Europe, relaxed controls on immigration would be more cost-effective). China has by far the most comprehensive set of state-enforced incentives and disincentives; they are described in the case study at the end of Chapter 4.

Fourth, governments can attempt to *coerce people* into having smaller families through the power of state legislation and penalties. For obvious reasons, few governments would attempt to engage in such coercion; not only is it often morally repugnant and politically unacceptable, but it is also almost always extremely difficult to administer. The defeat of Indian Prime Minister Indira Gandhi's government in 1977 was largely due to popular resentment of the government's forced-sterilisation programmes.

Finally, no policy measures will be successful in controlling fertility unless efforts are made to *raise the social and economic status of women* and hence create conditions favourable to delayed marriage and lower marital fertility.[32] A crucial ingredient in any programme designed to lower fertility rates is the increased education of women, followed by the creation of jobs for them outside the home. The availability of income-earning opportunities can lead young women to delay marriage by enabling them to become economically self-sufficient and therefore in a better position to exercise control over their choice of partner and the timing of marriage. It can also reduce family pressures for early marriage by allowing women to make a contribution to parental household income. An independent source of income also secures a stronger position for married women in the household, reducing their dependence on other family members, particularly male offspring, for economic security. Furthermore, it enables women to consider the opportunity costs of additional children when childbearing competes with income-generating activities. In general, the availability of outside sources of income offers women genuine alternatives to early marriage and frequent childbearing, which are often motivated by their lack of resources. An additional benefit of employment outside the home is that it reduces women's isolation, which is often an impediment to the provision of family-planning services, and can increase their household bargaining power.[33]

The importance of these policies to improve the role and status of women was underlined at the 1994 Cairo International Conference on Population and Development, where emphasis was placed on the general empowerment of

women, especially in the area of **reproductive choice**. The Cairo Programme of Action summarised this position in the following manner:

> The empowerment and autonomy of women and the improvement of their political, social, economic and health status . . . [are] essential for the achievement of sustainable development and . . . for the long-term success of population programmes. Experience shows that population and development programmes are most effective when steps have simultaneously been taken to improve the status of women.[34]

Reproductive choice The concept that women should be able to determine on an equal status with their husbands and for themselves how many children they want and what methods to use to achieve their desired family size.

6.6.2 What the Developed Countries Can Do

When we view the problems of population from the perspective of global resources and the environment, as we should, the question of the relationship between population size and distribution and the depletion of many nonrenewable resources in developed and underdeveloped countries assumes major importance. In a world where 4.5% of the population, located in one country, the United States, accounts for nearly one-fifth of the annual world total energy use, we are clearly not dealing only or even primarily with a problem of population numbers when it comes to environment and resources. We must also be concerned with the impact of rising affluence and the very unequal worldwide distribution of incomes on the depletion of many nonrenewable resources such as petroleum, certain basic metals, and other raw materials essential for economic growth. The use of fossil fuel energy to power private automobiles, operate home and office air conditioners, and so on in the developed nations remains the major contributor of carbon dioxide (CO_2) gases into the atmosphere and to the phenomenon of greenhouse global warming (see Chapter 10).[35] It also means that there is potentially that much less to fertilise small family farms in the less-developed nations. Alternatively, it means that poor families will have to pay more to obtain these valuable resource inputs.

Many similar examples could be given of the gross inequalities in global resource use. Perhaps more important, one could cite innumerable instances of the unnecessary and costly waste of many scarce and nonrenewable resources by the affluent developed nations. The point, therefore, is that any worldwide programme designed to engender a better balance between resources and people by limiting developing-country population growth through social intervention and family planning must also include the responsibility of rich nations to simplify their own consumption demands and lifestyles. Such changes would free resources that could then be used by poor nations to generate the social and economic development essential to slowing population growth.

In addition to simplifying lifestyles and consumption habits, one other positive (if unlikely) internal policy that rich nations could adopt to mitigate current world population problems would be to liberalise the legal conditions for the international immigration of poor, unskilled workers and their families from Africa, Asia, and Latin America to North America, Europe, Japan, and Australia. The international migration of peasants from Europe to North America, Australia, and New Zealand in the nineteenth and early twentieth centuries was a major factor in moderating the problems of underdevelopment and population pressure in European countries. No such safety valve or outlet exists today for developing countries. In fact, what few outlets existed have, over the past two decades, been progressively closed. Yet, clearly, many labour-scarce societies

could benefit economically from international migration, and the benefits to developing countries would be enormous. For example, the United Nations has estimated that legal barriers to international migration from the developing to the developed world cost developing nations at least $250 billion a year.[36]

6.6.3 How Developed Countries Can Help Developing Countries with Their Population Programmes

There are a number of ways in which the governments of rich countries and multilateral donor agencies can help the governments of developing countries achieve their population policy objectives sooner. The most important of these concerns the willingness of rich countries to be of genuine assistance to poor countries in their development efforts, particularly in sub-Saharan Africa. Such genuine support would consist not only of expanded public and private financial assistance but also of improved trade relations, such as tariff- and quota-free access to developed-country markets, more appropriate technology transfers, assistance in developing indigenous scientific research capacities, better international commodity-pricing policies, and a more equitable sharing of the world's scarce natural resources. (These and other areas of international economic relations between rich and poor countries will be examined in Part Three.)

There are two other activities more directly related to fertility moderation in which rich-country governments, international donor agencies, and private nongovernmental organisations (NGOs) can play an important assisting role. The first is the area of research into the technology of fertility control, the contraceptive pill, modern intrauterine devices (IUDs), voluntary sterilisation procedures, and, particularly in the age of AIDS, effective barrier contraception. Research has been going on in this area for a number of years, almost all of it financed by international donor organisations, private foundations, and aid agencies of developed countries. Further efforts to improve the effectiveness of this low-cost contraceptive technology while minimising the health risks should be encouraged.

The second area includes financial assistance from developed countries for family-planning programmes, public education, and national population policy research activities in the developing countries. This has traditionally been the primary area of developed-country assistance in the field of population. Total resources devoted to these activities have risen dramatically. It remains an open question, however, whether such resources (especially those allocated to premature family-planning programmes) might not have been more effectively used to achieve their fertility goals had they instead been devoted directly to helping low-income countries to raise the levels of living of their poorest people. As pointed out earlier, it is of little value to have sophisticated family-planning programmes when people are not motivated to reduce family size.

6.6.4 Policy for Still-Developing Countries Facing Population Declines

By 2019, a little over half of the world's population had below-replacement fertility rates. In recent years, a new population policy challenge has emerged, as a few middle-income countries have begun finding that their populations will begin declining before they reach a high level of national income.

The best-known example is China, whose working-age population has already begun to fall (see Box 6.3). Many examples are post-Soviet or other transition

countries including Albania, Armenia, Bulgaria, Moldova, Romania, Russia, Serbia, and Ukraine. Other countries likely to be in this category comprise a diverse group including Brazil, Cuba, Iran, Lebanon, Mauritius, St Lucia, and Thailand.[37]

These countries face special challenges known as the problem of "getting old before getting rich." In this case, there is a high dependency burden in reverse: a large portion of the population has retired, but the incomes of the working-age population are not high enough to support them, or to leave enough savings for the country to invest sufficiently in its productive activities.

Note that for countries with below-replacement fertility, a reverse demographic momentum effect holds. If there have been falling size cohorts for some time, then even if there were an increase in births per woman to reach replacement fertility today, there still will be an ongoing process of population decline for some time, while smaller cohorts replace larger ones over the life cycle.

Five policies are considered in cases of population declines. Several of these work together as complements.

First, perhaps the most obvious strategy is to allow *immigration*. To attract the best workers and align incentives, immigration will preferably come with a path to citizenship, but at least with a well-regulated guest worker system. However, for many countries, allowing significant immigration has proved politically difficult if not impossible. When ordinary citizens lack financial and other security, national citizenship is likely perceived as one of their few secure assets. Resistance to diluting the value of their "citizenship asset" is readily understandable when there is reason to expect that, besides the immigrants themselves, the rich will be the primary beneficiaries of immigration.

Second, provide generous *retraining* of workers so that they can work productively later in life as the economy modernises and is in need of more advanced skills.

Third, "*move up the value chain*" to make it profitable to do more of the advanced parts of the production process in the domestic economy, noting that higher productivity becomes more important than ever to be able to support a larger nonworking population.

Fourth, to complement the previous points, create conditions to *attract foreign investment* of the type that will lead to increased worker productivity and incomes.

Fifth, as a last resort, consider implementing *incentives for families* to have more children, such as income tax breaks. Such pro-natal policies introduce distortions, are expensive, and may be less sustainable than the other four approaches. But policies to promote low-cost quality daycare and early childhood education options have pro-natal effects while at the same time offer benefits of human development and social equity.

A Final Note   We conclude with a note of optimism. Fertility rates in many of the poorest countries, such as Bangladesh and most of the countries in sub-Saharan Africa, have experienced an impressive decline. Population experts have lowered their estimates of world population growth for coming decades. In no small part, this decline is the result of more widespread availability of family planning. This change helps set the stage for an opportunity for successful development efforts in the coming years, but developed countries need to do their part in providing expanded development assistance, especially efforts focused on the need and opportunity to greatly reduce the incidence of poverty, which remains the biggest cause of high rates of fertility.

"Twins" Growing Apart: Burundi and Rwanda

Burundi and Rwanda are sometimes considered "country twins." Sharing a common border, they have a number of striking similarities. They have nearly identical population sizes (11 million and 12 million, respectively), and land areas (27,830 and 26,340 square kilometres). Rwanda has the highest population density in Africa, and Burundi the second-highest. The countries also have similar geographies (hilly, landlocked), ethnic compositions (about 84% Hutu and 15% Tutsi), and colonial histories (German, followed by Belgian). Basic comparisons are found in Table 6.3 below.

What are now Burundi and Rwanda were formally colonised in the "scramble for Africa," when they were assigned to the "sphere" of Germany at the conclusion of the Berlin conference of 1884. After World War I, colonial control shifted to Belgium. The colonial powers exaggerated and exploited minor ethnic differences as a divide-and-rule strategy. Ethnic tensions in these countries can be largely traced to colonial institutions. Both Burundi and Rwanda became independent in 1962, following political struggle and ethnic conflict. Both were desperately poor countries when they achieved independence.

People in both countries suffered horrific genocidal campaigns. Approximately 150,000 Hutu were killed in Burundi in 1972. The exact numbers of deaths will probably never be known. Most notoriously, an estimated 800,000 Tutsi were murdered in a genocidal campaign in Rwanda in 1993. About 300,000 people were killed in Burundi in a civil war that began in 1993 and continued for two decades; then, after a decade of relative peace, violence erupted in the lead up to the 2015 elections and tensions continue to simmer in the country. Both countries have undemocratic institutions; differences in freedoms are a matter of degree.

But, over a quarter century after the 1993 atrocities, the two countries are on quite different development trajectories. By 2018, Rwanda's Human Development Index was .524; while still low, it was far above that of Burundi, which at .417 is the fifth-lowest HDI in the world.

The first focus of this case study is on population policy. But as economic policy also played an important role, the case will also briefly examine Rwanda as an example of a "developmental state."

Burundi remains mired in poverty, with almost three-quarters of its people living below the $1.90 poverty line. The economic growth rate was nearly zero in the five years from 2014 to 2018. The 2015 Burundi elections were preceded by considerable unrest. The opposition was dubiously tabulated as receiving little more than a quarter of the vote, and President Obama declared the results "not credible." Since then, Burundi has had ongoing, if low-level, conflict. The 2018 UN Special Envoy report on Burundi documented human rights violations and worsening humanitarian conditions. Currently, Burundi requires 60% Hutu and 40% Tutsi representation in the legislative National Assembly; this may have played a role in keeping conflict in check, although longer term it could also reinforce divisions thereby acting as a negative influence on development. A counterargument made by Will Paxton is that Burundi's structurally multicultural policy may work better in the long run than Rwanda's post-genocide melting-pot policy. An answer possibly depends on the degree to which the ethnic divisions are deep and lasting, or were largely a more superficial colonial construct. This may be more a matter of ideology than of development economics, as Rwanda continues to outshine Burundi in all other dimensions of economic development.

Economic growth has been much faster in Rwanda; poverty has declined more rapidly and health standards have improved markedly. So far, government effectiveness has improved despite the lack of democratic process—although maintaining democratic integrity can be seen as integral to government performance. Rwanda has systematically pursued a state-led economic development strategy that has been compared to earlier successes such as South Korea—though adapted for local context. For example, promoting systematic crop diversification and then agricultural exports. Both countries have experienced a short boom driven by high coffee prices followed by bust, but Rwanda moved toward higher-value beans and other commodities to diversify its exports.

Rwandan President Kagame has been the country's leader continuously since 2000; and, in 2015, a referendum changed the constitution to enable him to remain in power through reelections until 2034. In the 2017 elections, Kagame claimed to have won almost 99% of the popular vote. The ruling Rwandan Patriotic Front has also controlled and drawn financial benefits from substantial portions of the economy. While criticised for undemocratic behaviour, Kagame has also been widely praised for his role in facilitating economic progress as well as keeping the country together. Authoritarian regimes can lead to development disasters; under some circumstances they have apparently spurred development success.

The control of Rwanda by Kagame and his party has been described by several observers, including Maxime Mianzokouna, as an example of an authoritarian government implementing systematic "developmental state" leadership—one in which, while corruption is kept within limits, its complete elimination is not prioritised over other goals, notably growth, export diversification, and poverty reduction. (For other apparent examples of "developmental states," see the case studies of China, South Korea and Taiwan in Chapters 4 and 12.) While the Rwandan economy has diversified out of agriculture to the extent that it now represents 37% of GDP, and 73% of labour, much of the shift is to the domestic service sector. The agriculture contribution to national income remains high despite a doubling of income largely because of productivity increases. The share of labour in agriculture is lower than in Burundi. With its ability to implement growth-enhancing and

poverty-reducing structural change with a smaller political backlash, the government has acted more like a developmental state. One factor in the success of developmental states is pragmatism, rather than insistence on adherence to a single approach; this applies to Rwanda, with its emphasis on the growth opportunities from specialised, high-value-added agricultural exports, in comparison with the East Asian emphasis on exports of manufactures. Rather than showing that Rwanda's economic development strategy is incoherent, the special focus on agriculture—at least for this stage of development—more likely shows considerable insight.

One of the salient differences is in fertility and population growth. On the eve of independence in 1960, Rwanda had the highest fertility rate in the world: an extraordinary 8.2 births per woman. By 2016, this rate fell by more than one-half, to 3.9 births per woman—still high, but lower than 42 countries. In contrast, Burundi had 7.5 births per woman in 1960; but by 2016, the fertility rate there had fallen to 5.7, a drop of only one-quarter. Expressed differently, six decades ago Rwanda's fertility rate was 9% higher than that of Burundi; but today, Burundi has a fertility rate 46% higher than that of Rwanda. From 2000 to 2017, population growth was 3.1% in Burundi, compared with 2.5% in Rwanda. The long-term implication of this gap is larger than it may appear: population momentum is a factor, and the period includes some years before Rwanda's population policy was implemented, to say nothing of the compounding effects of exponential growth.

Traditional pro-natal views about fertility were widespread in Rwanda until recently. Household survey data estimates are that, in 1992, contraception prevalence was just 13%, and then fell to about 4% in the years after the genocide—apparently due in part to damage to the healthcare system, as well as to a wish to increase family sizes in the aftermath of the genocide. The population in Rwanda dropped from over 7 million before the genocide to about 5.6 million in 1995, including many who fled the country. But high population growth and the return of many refugees brought the population to an estimated 8 million people by 2000.

As always, it is difficult to disentangle cause from effect. As explained in Chapter 6, improved expectations of child survival and economic growth predicts lower fertility. But some years after the country

achieved a significant recovery from the genocide disaster, the President, Paul Kagame, declared that family planning would be a "national priority," as part of a general emphasis on improved healthcare, but also expressed as a basic prerequisite for economic development. Family planning was already beginning to grow as a feature of public healthcare in Rwanda when a national population strategy was promulgated in 2003. Specific average fertility rate targets were established. Observers have argued that government policy mattered substantially in Rwanda. It is important to note that contraceptive services are offered free of charge in government-run public medical facilities in Rwanda, where most citizens obtain healthcare.

The programme was unusually comprehensive in scope, increasing the presence of trained medical professionals, leveraging relationships with international NGOs, notably partners in health and universities. Observers cite a balanced effort to improve both supply and quality of contraceptive services. It sought to provide a wide range of options so that contraceptives preference didn't determine whether contraceptives were used at all. In practice, injectable contraceptive was the most widely used method. It is estimated that the percentage of married women using modern contraceptives in Rwanda rose from 17% in 2005 when the programme was being implemented, to 52% in 2010, according to data from the Rwanda Demographic and Health Surveys (DHS); this was an extraordinary increase over just five years.

Dieudonne Muhoza, Pierre Rutayisire, and Aline Umubyeyi used 2005 and 2010 Rwanda DHS household data to attribute the sources of the rise in contraception prevalence. They utilised the Blinder-Oaxaca decomposition analysis method to determine the amount of this increase that was attributable to the family planning programme *per se*, in relation to that resulting from more general economic and social progress. Their research indicated that exposure to family planning messages and a husband's desire for children compared to that of his wife's were important. They found that use of contraceptives increased primarily among lower-income, rural and less-educated people. They argue that their findings suggest that "a strong family planning programme supported by political leaders can remove persistent socio-economic and cultural barriers and enable a massive popular contraceptive uptake."

At the same time, the number of children seen as most desirable has fallen significantly for both men and women; likely this is in part a response to development, and in part a result of the use of advertising and other influence in the attempt to shift social norms toward smaller families. It may be that several things have to work simultaneously to achieve high success.

Emile Sempabwa attributes Rwanda's success to several distinct factors, including "strong political commitment and leadership," plus "mechanisms to foster advocacy," and "widespread availability of

TABLE 6.3 Basic Comparisons between Burundi and Rwanda		
	Burundi	**Rwanda**
Area	27.8 km^2	26.3 km^2
Population	10.9 million	12.2 million
Population density	423 per km^2	495 per km^2
Geography	Landlocked, hilly, lake	Landlocked, hilly, lake
Population growth rate, 2000–17	3.1%	2.5%
Crude birth rate	42 per 1,000 population	30 per 1,000 population
Income per capita	$280 ($730 PPP)	$720 ($2,000 PPP)
Poverty headcount ratio	74.7%	38.1%
MPI	.530 (2005)	.350 (2010)
HDI	.417 (#185)	.524 (#158)
Rural share of population (2011)	89%	81%
Life expectancy (2012)	53	63
Share of budget spent on health	8%	24%
Child malnutrition prevalence	57.5	44.3
Literacy	67%	71%
Agriculture VA per worker (2011)	123 (in $2,000)	294 (in $2,000)
Economist democracy index	125 (authoritarian)	132 (authoritarian)

high-quality family planning services" in which the full range of modern methods were made available.

Traditionally, both Burundi and Rwanda have been male-dominated. As we have seen, a central issue in economic development is empowerment of women. One of the effects—both direct and indirect—is a lower birth rate. For example, when wives prefer fewer children than husbands, as is often the case, empowerment leads to slower population growth. Empowerment also leads to opportunities for girls to stay in school longer, and for women to have more earnings opportunities outside the home, indirectly lowering fertility as examined in this chapter. Rwanda reforms let women own property. Women empowered can work effectively to prevent outbreaks of conflict. In Rwanda, women representatives in the legislature played an important leadership role in promoting family planning and designating it as a top policy priority.

What is the prescription for widespread family planning? It remains unclear where the political commitment comes from. Is it because of one individual, such as Paul Kagame, responding to different constraints? Or is it a general trend that leaders have little to do with? Or requires significant doses of both?

Family planning progress in Rwanda really stands out. But significant gains have been made in Burundi also. There has been a notable decline in births per woman in Burundi from 2010 to 2017, from an average of 6.4 to 5.5 births per woman.

Although the change is smaller than in Rwanda, it is striking in that this has occurred in a period of essentially no economic growth, and is indeed one of the few bright spots in the economic development picture in Burundi. These gains have been attributed to general, albeit slower, improvements in health and the healthcare system, and in family planning education and services. The development economics framework predicts that growth benefits should follow if other conditions are in place.

On current trends, Rwanda would reach lower-middle-income status by 2026; from there, the country plans an ambitious drive to achieve high income and human development status. To the extent it continues its success, a share of the credit will go to an effective population policy embedded in an effective public health and economic growth strategy.

Going forward, Burundi can learn from Rwanda—from any of its errors as well as the sources of its success, a kind of mini-scale advantage of backwardness. What Rwanda has achieved, Burundi can achieve also if it can escape from being mired in a conflict trap. Burundi has much potential, including entrepreneurial energy that can be unleashed, and a popular desire for development and freedom. Eventually, both countries may benefit from a demographic dividend. The twins, having drifted apart, may cooperate and learn from each other. As those who wrote off the prospects for economic development in Rwanda were mistaken, over the coming two decades the same may yet be said for Burundi.

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Concepts for Review

Crude birth rate	Life expectancy at birth	Replacement fertility
Death rate	Malthusian population trap	Reproductive choice
Demographic dividend	Microeconomic theory of fertility	Total fertility Rate (TFR)
Demographic transition	Natural increase	Under-5 mortality rate
Doubling time	Net international migration	Youth dependency ratio
Family-planning programmes	Population–poverty cycle	
Hidden momentum of population growth	Population pyramid	
	Rate of population increase	

Questions for Discussion

1. Population growth in developing nations has proceeded at unprecedented rates over the past few decades. Compare and contrast the present rate of population growth in less-developed countries with that of the modern developed nations during their early growth years. What has been the major factor contributing to rapid developing-country population growth since the Second World War? Explain your answer.

2. What is the relationship between the age structure of a population and its dependency burden? Is the dependency burden higher or lower in developing countries? Why?

3. Explain the notion of the hidden momentum of population growth. Why is this an important concept for projecting future population trends in different developing nations?

4. Describe briefly the theory of the demographic transition. At what stage in this transition do most developing countries seem to be? Explain your answer.

5. How does the microeconomic theory of fertility relate to the theory of consumer choice? Do you think that economic incentives and disincentives influence family size decisions? Explain your answer, giving some specific examples of such incentives and disincentives.

6. "The world population problem is not just a matter of expanding numbers but also one of rising affluence and limited resources. It is as much a problem caused by developed nations as it is one deriving from developing countries." Comment on this statement.

7. List and briefly describe the principal causes of high population growth in developing countries and the major consequences.

8. Explain why fertility rates are falling much more rapidly in some developing countries than in others.

9. Outline and comment briefly on some of the arguments *against* the idea that population growth is a serious problem in developing nations.

10. Outline and comment briefly on some of the arguments *in support of* the idea that population growth is a serious problem in developing nations.

11. Outline and comment briefly on the various policy options available to developing countries' governments in their attempt to modify or limit the rate of population growth.

12. Suppose that a study finds that there is complementarity in fertility decisions. What would this mean? What are the possible implications?

13. What aspects of population policy alternatives—including their strengths and weaknesses—are illustrated by the cases of China and India? (To answer, it is helpful to review the case studies for Chapters 4 and 5.)

14. In microeconomics, goods for which demand falls when income increases are known as "inferior goods." In development economics, evidence shows that when income increases, fertility (births per woman) falls. Why does this *not* imply that (in effect) children are "inferior goods"? (Hint: to answer, briefly outline a microeconomic framework consistent with the data from developing countries.)

15. What are the strengths and weaknesses of policy options for nations whose populations begin declining before they become a high-income country?

Notes

1. These estimates have increased slightly in recent years. See World Population Prospects: The 2017 Revision, available at: https://www.un.org/development/desa/publications/world-population-prospects-the-2017-revision.html.

2. The 1970s marked the apogee in the history of world population growth. By the end of the decade, rates had begun to decline in a large number of developing countries, and it became clear that the pace of world population growth had peaked. For some evidence of this turning point, see Bernard Berelson, W. Parker Mauldin, and Sheldon Segal, "Population: Current status and policy options," *Social Science and Medicine* 14c (1980): 71–97, and World Bank, *World Development Report, 1984* (New York: Oxford University Press, 1984), ch. 4.

3. A convenient shorthand method of calculating doubling time is simply to divide any growth rate into the number 70. For example, something (an asset, population, GNI, etc.) growing at 2% per year will double its value in approximately 35 years. You may recall from algebra that the doubling time of a value (such as the real GNI of an economy) growing at rate p% per year may be found with the formula $[1 + p/100]^T = 2$. Taking natural logs of each side, $T \ln[1 + p/100] \ln 2$. The natural log of 2 is approximately 0.7. On the left-hand side, for small p, $\ln[1 + p/100]$ is approximately equal to $p/100$. Substituting, $Tp/100 = 0.7$, or $T = 70/p$. For example, for reasonably small values of growth such as 4%, simply divide 70 by the percentage growth: after about $70/4 = 17.5$ years, national income would double. As an additional approximation, to find the growth of income per capita, simply subtract the rate of population growth. So if population is growing at 2% per year, in this example, income per capita would be growing at $4\% - 2\% = 2\%$ per year, and income per capita would double in approximately $70/2 = 35$ years.

4. Endale Kebede, Anne Goujon, and Wolfgang Lutz Stalls in "Africa's fertility decline partly result from disruptions in female education PNAS," published ahead of print February 4, 2019, available at: https://doi.org/10.1073/pnas.1717288116.

5. The World Bank, *World Bank World Development Indicators 2018* (Washington, D.C.: The World Bank), Table 2.1.

6. For more discussion, see John Bongaarts, "Population policy options in the developing world," *Science* 263 (1994): 771–776.

7. For an interesting reverse-population-alarmist perspective, see Philip Longman, "Think again: Global aging," *Foreign Policy* (2012).

8. See, for example, Canning, D. Sangeeta R., and Yazbeck, A.S., 2015, *Africa's Demographic Transition:*

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9. Replacement fertility may be approximated by the value of TFRR $\approx (1 + SRB)/p(A_M)$, where TFRR represents the replacement value for the total fertility rate, SRB represents the ratio of male to female births, and $p(A_M)$ represents the probability of surviving to the mean age of the fertility schedule. See Samuel Preston, Patrick Heuveline, and Michel Guillo, *Demography: Measuring and Modeling Population Processes* (Oxford: Blackwell, 2001). Note that with gender balance and high female survival to mean fertility schedule (close to 30 years of age), the TFRR is close to 2.1. But when survival proportions are very low, such as 0.60 as was the case not long ago in Burundi and Sierra Leone – replacement total fertility rates above 3.3 are implied. Under these conditions, a fertility rate of 2.1 would actually result in population decline. See Thomas J. Espenshade, Juan Carlos Guzman, and Charles F. Westoff, "The surprising global variation in replacement fertility," *Population Research and Policy Review* 22, No. 5-6 (2003): 575–583, who calculate that the replacement rate across countries ranges from 2.05 to 3.43.

10. See Timothy W. Guinnane, "The historical fertility transition: A guide for economists," *Journal of Economic Literature* 49, No. 3 (2011): 589–614.

11. A geometric progression is simply a doubling (or some other multiple) of each previous number, as in 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1,024, and so on. Like compound interest, geometric progressions have a way of reaching large numbers very rapidly.

12. Recent supporting evidence is found in Quamrul Ashraf and Oded Galor, "Dynamics and stagnation in the Malthusian epoch,"*American Economic Review* 101, No. 5 (2011): 2003–2041. The authors find that "technological superiority and higher land productivity had significant positive effects on population density but insignificant effects on the standard of living, during the time period 1–1500 CE."

13. At lower levels of expected fertility, the slope of the S-shaped curve may increase at an *increasing* rate due to the presence of older children who can take care of younger siblings, together with a stronger family response to the negative impact of average fertility on wages and/or the decreased probability that any one child will gain formal-sector employment. But at higher levels of expected fertility, the slope of the S-shaped curve may increase at a *decreasing* rate due to worsening availability of education and health and increasing costs of raising additional children in relation to the benefits of doing so.

14. This interpretation is from Partha Dasgupta, *An Inquiry into Well-Being and Destitution* (New York: Oxford University Press, 1993), and is discussed in Pranab Bardhan and Chris Udry, *Development Microeconomics* (New York: Oxford University Press, 1999), p. 25.

15. The classic contribution is Simon Kuznets, *Fertility Differentials between Less Developed and Developed Regions: Components and Implications* (New Haven, Conn.: Economic Growth Center, Yale University, 1974).

16. See Chapter 9, and see Christopher Udry, "Gender, agricultural production, and the theory of the household," *Journal of Political Economy* 104 (1996): 1010–1046.

17. Formally, this is analogous to the model of FGM/C as a bad equilibrium, discussed in Chapter 8.

18. See, for example, Nancy Birdsall, "Economic approaches to population growth," in *Handbook of Development Economics*, vol. 1, eds. Hollis B. Chenery and T. N. Srinwasan (Amsterdam: Elsevier, 1988), pp. 478–542; Jean Drèze, Anne-Catherine Guio, and Mamta Murthi, "Mortality, fertility, and gender bias in India: A district-level analysis," *Population and Development Review* 21 (1995): 745–782; and Partha Dasgupta, "The population problem: Theory and evidence," *Journal of Economic Literature* 33 (1995): 1879–1902.

19. For empirical evidence that low fertility results mostly from economic, social, cultural, and educational improvements in a population and only slightly from the availability of family-planning programmes, see Lant H. Pritchett, "Desired fertility and the impact of population policies," *Population and Development Review* 20 (1994): 1–55.

20. For an analysis of this conflict, see Jason L. Finkle and Barbara Crane, "The politics of Bucharest: Population, development, and the new international economic order," *Population and Development Review* 1 (1975): 87–114. Although this conflict was less visible in the Second World Population Conference held in Mexico City in August 1984 and was a minor issue beneath that of reproductive choice and the empowerment of women at the Third Conference held in Cairo in 1994, it remained prominent in the discussions of many developing-world delegates.

21. For a more detailed discussion of these divergent opinions, see Michael S. Teitelbaum, "Population and development: Is a consensus possible?" *Foreign Affairs 52* (1974): 749–757. See also Timothy King and Allen Kelley, *The New Population Debate: Two Views on Population Growth and Economic Development* (Washington, D.C.: Population Reference Bureau, 1985), and Robert H. Cassen, *Population Policy: A New Consensus* (Washington, D.C.: Overseas Development Council, 1994).

22. See, for example, Colin Clark, "The 'population explosion' myth," *Bulletin of the Institute of Development Studies* 1 (1969); Julian Simon, *The Ultimate Resource* (Princeton, N.J.: Princeton University Press, 1981); Nick Eberstadt, "Population and economic growth," *Wilson Quarterly* (Winter 1986), pp. 95–129; and National Research Council, *Population Growth and Economic Development: Policy Questions* (Washington, D.C.: National Academy Press, 1986).

23. Samir Amin, "Underpopulated Africa," paper presented at the African Population Conference, Accra, Ghana, December 1971.

24. Ibid., fn. 2.

25. Ibid., p. 3. Of course, in the decades after these arguments were promulgated, population did dramatically increase in these regions. For another perspective on long-term benefits of greater population density via faster technological progress, see Michael Kremer, "Population growth and technological change: One million B.C. to 1990," *Quarterly Journal of Economics* 108 (1993): 681–716.

26. For example, see Paul R. Ehrlich and Anne H. Ehrlich, *Population, Resources, and Environment: Issues in Human Ecology*, 2nd ed. (New York: Freeman, 1972); Lester R. Brown, *In the Human Interest: A Strategy to Stabilize World Population* (New York: Norton, 1974); and Paul R. Ehrlich and Anne H. Ehrlich, *The Population Explosion* (New York: Simon & Schuster, 1990).

27. We are grateful to Professor Harold Votey for suggesting this illustration. Details on the Solow model are found in Chapter 3 and Appendix 3.2.

28. William Easterly made the very basic argument in 1999 that "population growth does not vary enough across countries to explain variations in per capita growth. GDP per capita growth varies between −2 and +7 percent for all countries between 1960 and 1992. Population growth varies only between 1 and 4 percent." Easterly, *The Elusive Quest for Growth* (Cambridge, Mass.: MIT Press, 1999), p. 92.

29. For a detailed review of this evidence, see Cassen, *Population Policy*, pp. 14–22; Dennis A. Ahlburg et al., *Population and Economic Development: A Report to the Government of the Commonwealth of Australia* (Canberra: Australian International Development Assistance Bureau, 1994); and Geoffrey McNicoll, "Effects of population growth: Visions and revisions," *Population and Development Review* 21 (1995): 307–340. As the Ahlburg report demonstrates, not all of these consequences are unambiguously negative. Much depends on the particular country and its demographic situation.

30. Robert Cassen, *Population Policy*, p. 12.

31. See Birdsall, "Economic approaches to population growth," pp. 523–529.

32. Sousan Abadian, "Women's autonomy and its impact on fertility," *World Development* 24 (1996): 1793–1809. See also Shireen J. Jeejeebhoy, *Women's Education, Autonomy, and Reproductive Behavior: Experiences from Developing Countries* (Oxford: Clarendon Press, 1995).

33. See Fenohasina Maret-Rakotondrazaka, "The effect of working outside the home on women's empowerment in Nigeria," Working Paper, George Washington University, 2014.

34. United Nations, *International Conference*, para. 4.1. See also Nancy Folbre, "Engendering economics: New perspectives on women, work, and demographic change," in *Proceedings of the World Bank Annual Conference on Development Economics, 1995*, eds. Michael Bruno and Boris Pleskovic (Washington, D.C.: World Bank, 1996).

35. The United Nations Population Fund's *State of the World's Population* 2009 edition (New York: United Nations, 2009) examines relationships between population and climate change. Cited energy data are from World Resources Institute, *World Resources, 2005* (New York: Oxford University Press, 2005), tab. 7.

36. More detail on the scale and benefits of remittances from international migration is provided in Chapter 14.

37. In addition, several countries that have crossed the official line from UMC to UIC have incomes well below those of advanced economies and their continued rapid development is in doubt.