



DEVELOPMENT ECONOMICS

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Chapter 3

Population Growth



When you have completed your study of this chapter, you will be able to

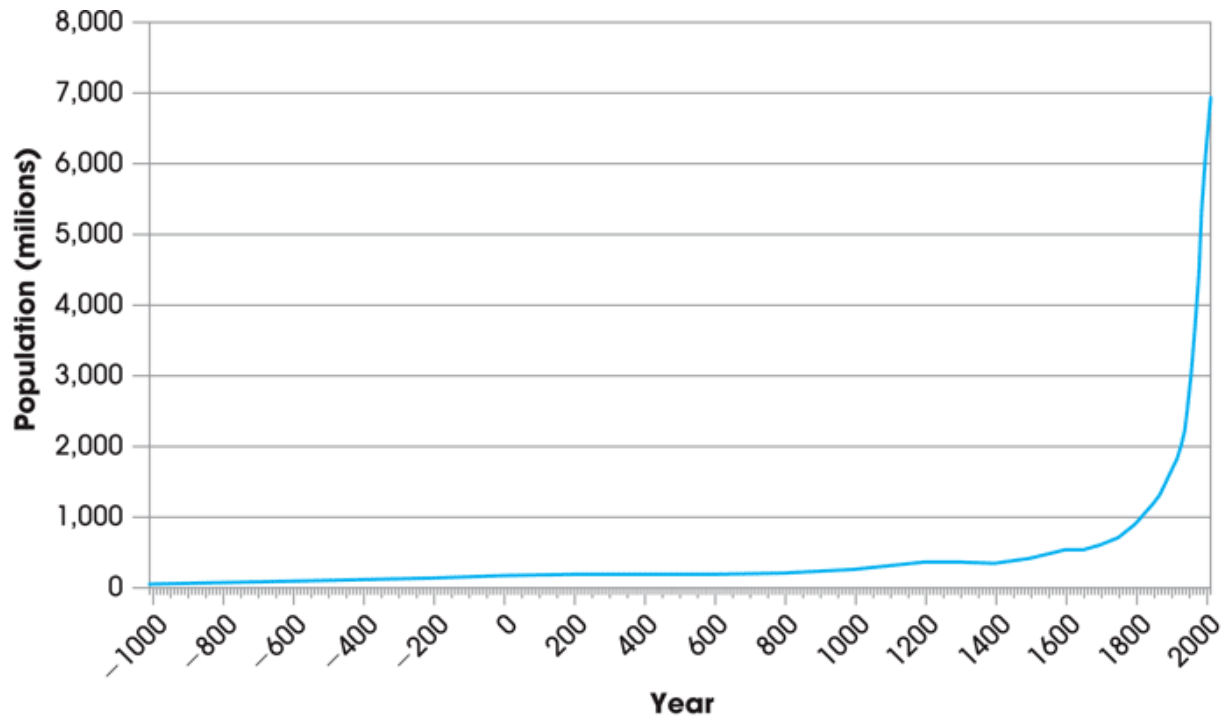
1. Explain trends in global population growth over time.
2. Explain the determinants of population growth and the demographic transition.
3. Explain how different determinants shape fertility decisions.
4. Explain why countries may use family planning to reduce population growth.

POPULATION OVER TIME AND THE DEMOGRAPHIC TRANSITION

- Thomas Malthus (1766-1834) noted that in absence of wars, famines and natural catastrophes, *population would grow exponentially* while food production would increase linearly.
- Since the 1800s we have experienced a *population "explosion,"* an increase associated with the events associated with the *industrial revolution* (e.g., increases in agricultural productivity, income, advances in hygiene, health science, etc.)
- The world population reached its first billion around the 1800s. Today it stands at roughly *7 billion people*.
- World population is now increasing by 1 million every 4 days.
- In the last 60 years, the *largest population increases* have been taking place in developing countries, especially in Asia and Africa.

POPULATION OVER TIME AND THE DEMOGRAPHIC TRANSITION

Figure 3.1. Evolution of the World Population since 1000 BCE.

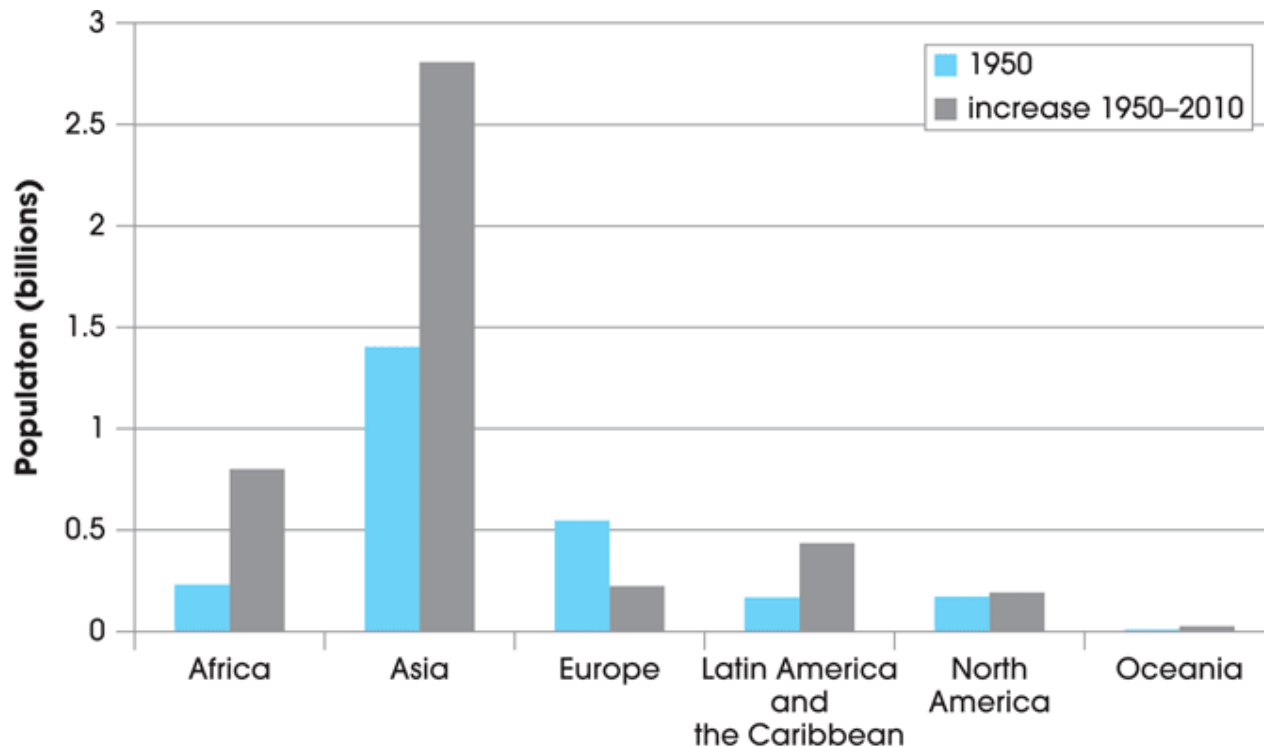


The world population has grown exponentially since the beginning of the Industrial Revolution at the end of the 18th century.

Source: For the years before 1920, Colin McEvedy and Richard Jones, *Atlas of World Population History* (New York: Penguin, 1978); after 1920, *United Nations Statistical Yearbook*, available online from 1950 onward, at <http://esa.un.org/wpp/Excel-Data/population.htm>.

POPULATION OVER TIME AND THE DEMOGRAPHIC TRANSITION

Figure 3.2. Population in 1950 and Population Increase (1950-2010) per Continent.



The population increase between 1950 and 2010 has been higher than the 1950 population levels in Africa, Asia, and Latin America. Population growth in the last 60 years has been the highest in developing countries.

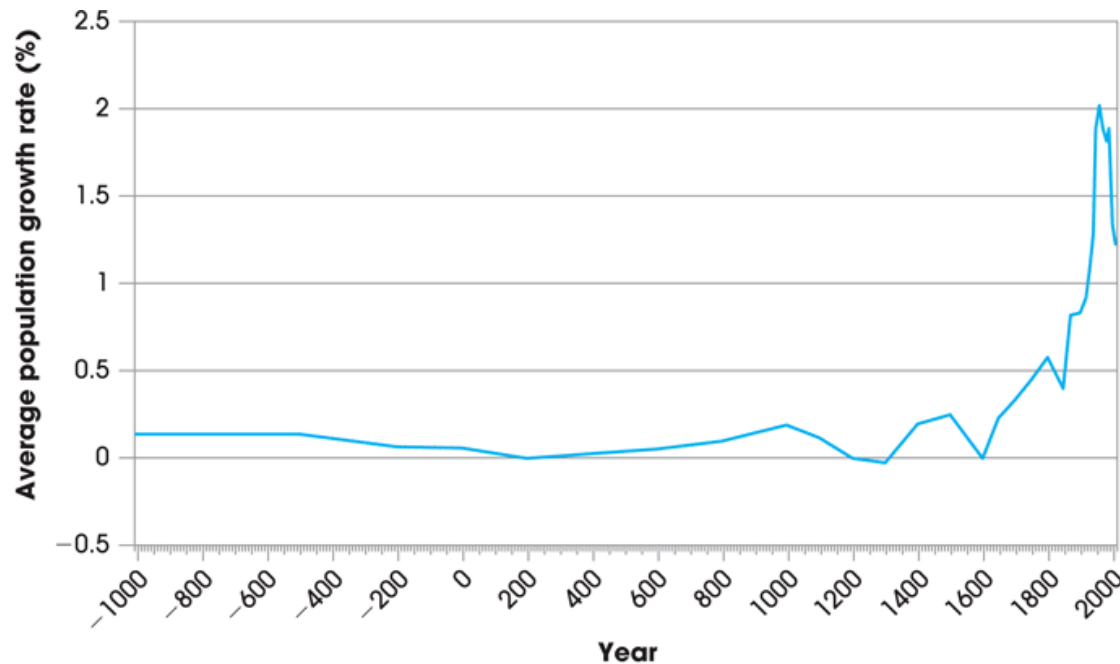
Source: United Nations, <http://esa.un.org/wpp/Excel-Data/population.htm>.

POPULATION OVER TIME AND THE DEMOGRAPHIC TRANSITION

- The *growth rate* of the population has increased dramatically since the Industrial Revolution.
- The global population growth rate increased steadily from 1800s to the 1960s, peaking at about 2%. Since then it has decreased, to around 1.5% now.
- A possible explanation is that the world, like individual countries, is undergoing a *demographic transition*:
A shift from a stabilized population with high birth and high mortality rates to a stabilized population characterized by low birth and low mortality rates.
- Demographers expect the world population to stabilize at around *8 billion*.

POPULATION OVER TIME AND THE DEMOGRAPHIC TRANSITION

Figure 3.3. Estimated Average Annual Population Growth Rates since 1000 BCE.

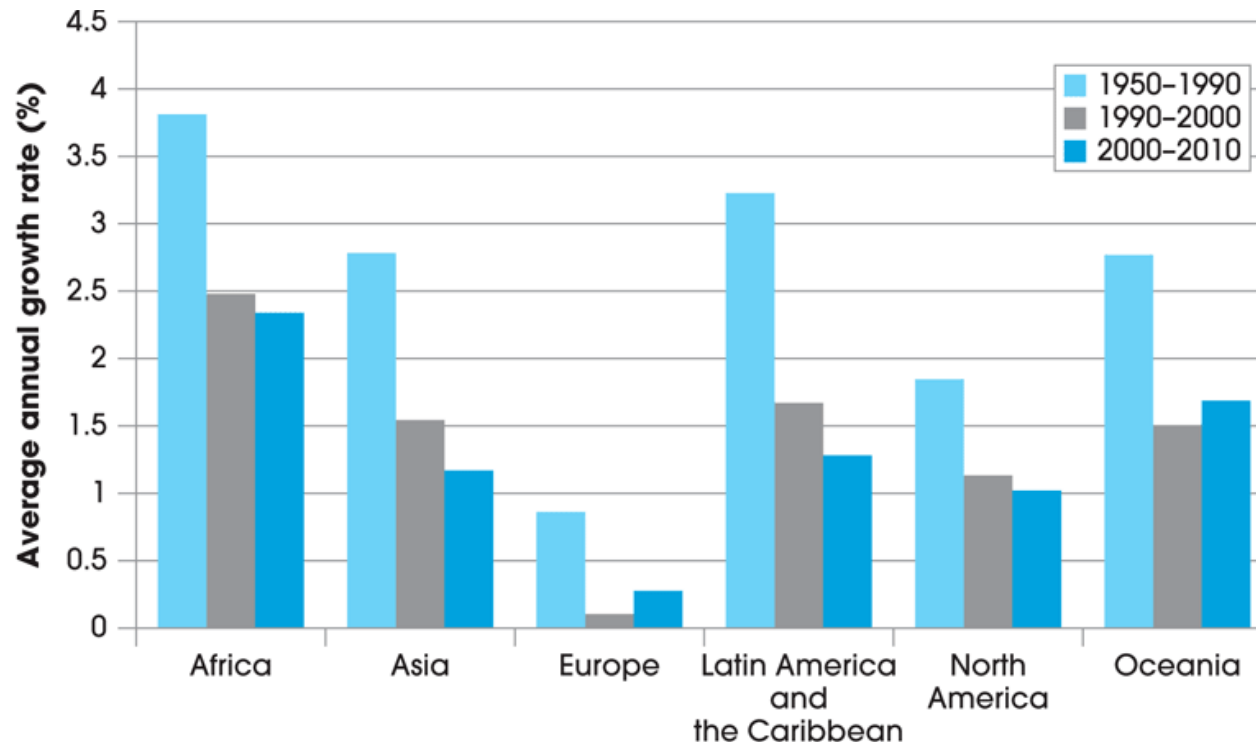


Population growth rates have been below 0.2% per year for most of human history, but they have grown enormously since the beginning of the Industrial Revolution at the end of the 18th century. Population growth rates started to decline in recent decades because of the demographic transition.

Source: McEvedy and Jones, *Atlas of World Population History*, 1978; United Nations Statistical Yearbook, <http://esa.un.org/wpp/Excel-Data/population.htm>.

POPULATION OVER TIME AND THE DEMOGRAPHIC TRANSITION

Figure 3.4. Average Annual Population Growth Rates per Continent during Recent Decades.



Population growth rates have declined worldwide since 1990.

Source: United Nations, <http://esa.un.org/wpp/Excel-Data/population.htm>.

THE DETERMINANTS OF POPULATION GROWTH

- The *total fertility rate* is the average number of children born to a woman of childbearing age (15-44).
- The *birth rate* is number of babies born each year per 1000 inhabitants.
- The *death rate* is number of deaths each year per 1000 inhabitants.
- Both the fertility and death rate can be computed age-specific.
- The *population growth rate* is the difference between the birth rate and the death rate (expressed per 1000 inhabitants, divided by 10 to get percentage growth rate).
- The *net migration rate* is the difference between the number of persons entering and leaving a country per 1000 inhabitants.
- The birth, death, and fertility rates depend on the *age distribution* defined as the percentage of the population belonging to different age groups.

THE DETERMINANTS OF POPULATION GROWTH

Age Distribution and Population Growth

There is usually a *high proportion of young people in developing countries*, while there is usually a *high proportion of elderly people in developed countries*. Even where mortality and fertility rates are the same the *age distribution significantly affects population growth*.

- Table 3.1. shows an example of the effect on population growth of differences in age distribution.
- Suppose country A has 70 young and 30 old and country B has 50 young and 50 old (50% male and 50% female in each).
- Today's young will become old in the next period and die. The mortality rate among the young is 10%. Fertility rate is 2.2.
- A's population in period 2 = $2.2 \cdot (70/2) + (70 \cdot 0.9) = 140$ population grows 40%
- B's population in period 2 = $2.2 \cdot (50/2) + (50 \cdot 0.9) = 100$ population grows 0%

THE DETERMINANTS OF POPULATION GROWTH

Table 3.1. The Effects of Age Distribution.

	Initial age distribution in A and B	Fertility rate	Mortality rate (%)	Population second period
Young in A	70	2.2	10	77
Old in A	30	0	100	63
Young in B	50	2.2	10	55
Old in B	50	0	100	45

Countries A and B have identical fertility and mortality rates but country A is younger than country B. The population in country A therefore grows by 40%, while the population in country B does not grow at all.

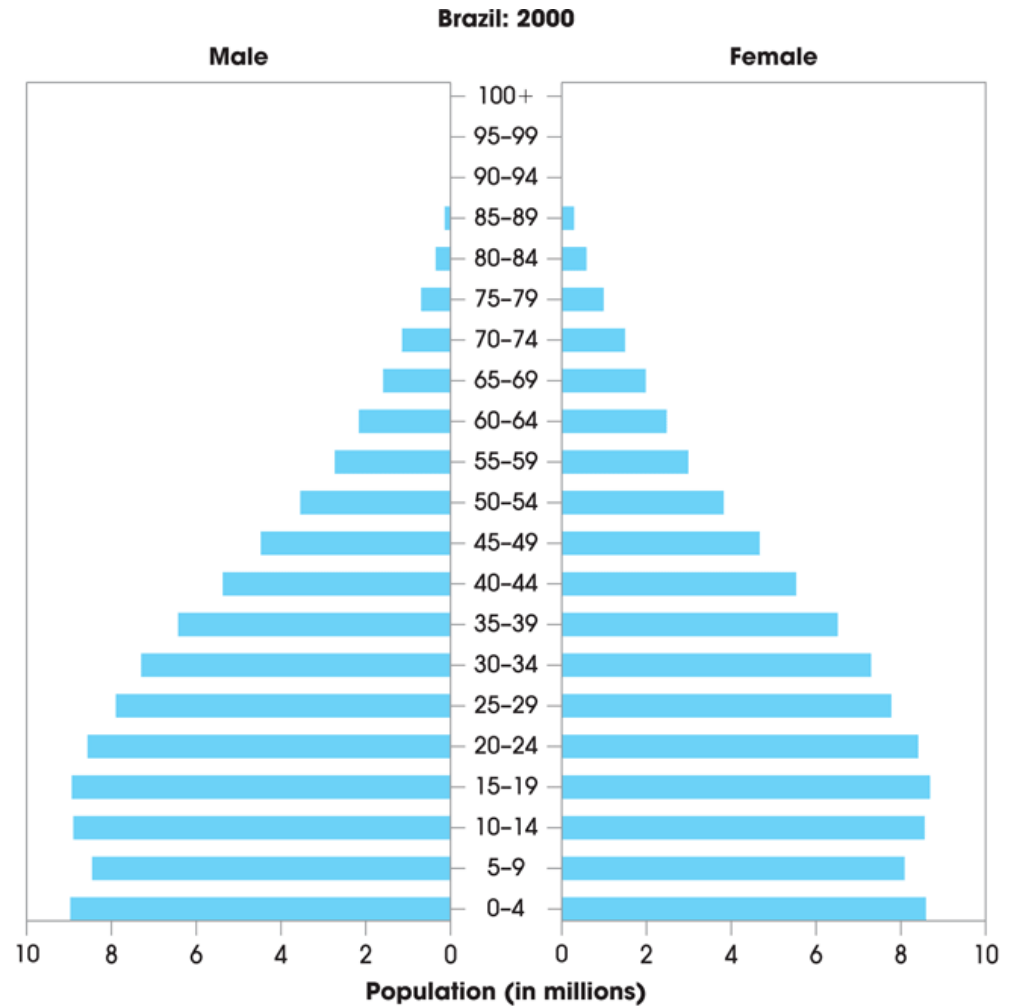
THE DETERMINANTS OF POPULATION GROWTH

Population pyramids are often used to show the *age distribution* within a country.

- *Demographic trends* tend to have considerable inertia.
- A *stationary population* is defined as having zero growth over time (i.e., stable fertility and mortality rates).
- Even *temporary fertility shocks* to a stationary population creates inertia, leading to growth long after the shock (e.g., U.S. baby boom and baby boom echo).
- Therefore, *family planning policies* tend to have a delayed effect. This must be taken into account when evaluating their effectiveness.

THE DETERMINANTS OF POPULATION GROWTH

Figure 3.5. Brazil's Age Pyramid in 2000.



The largest shares of Brazil's population are the young below the age of 25. This reflects a young population.

Source: Data from <http://www.census.gov/ipc/www/idb/pyramids.html>.

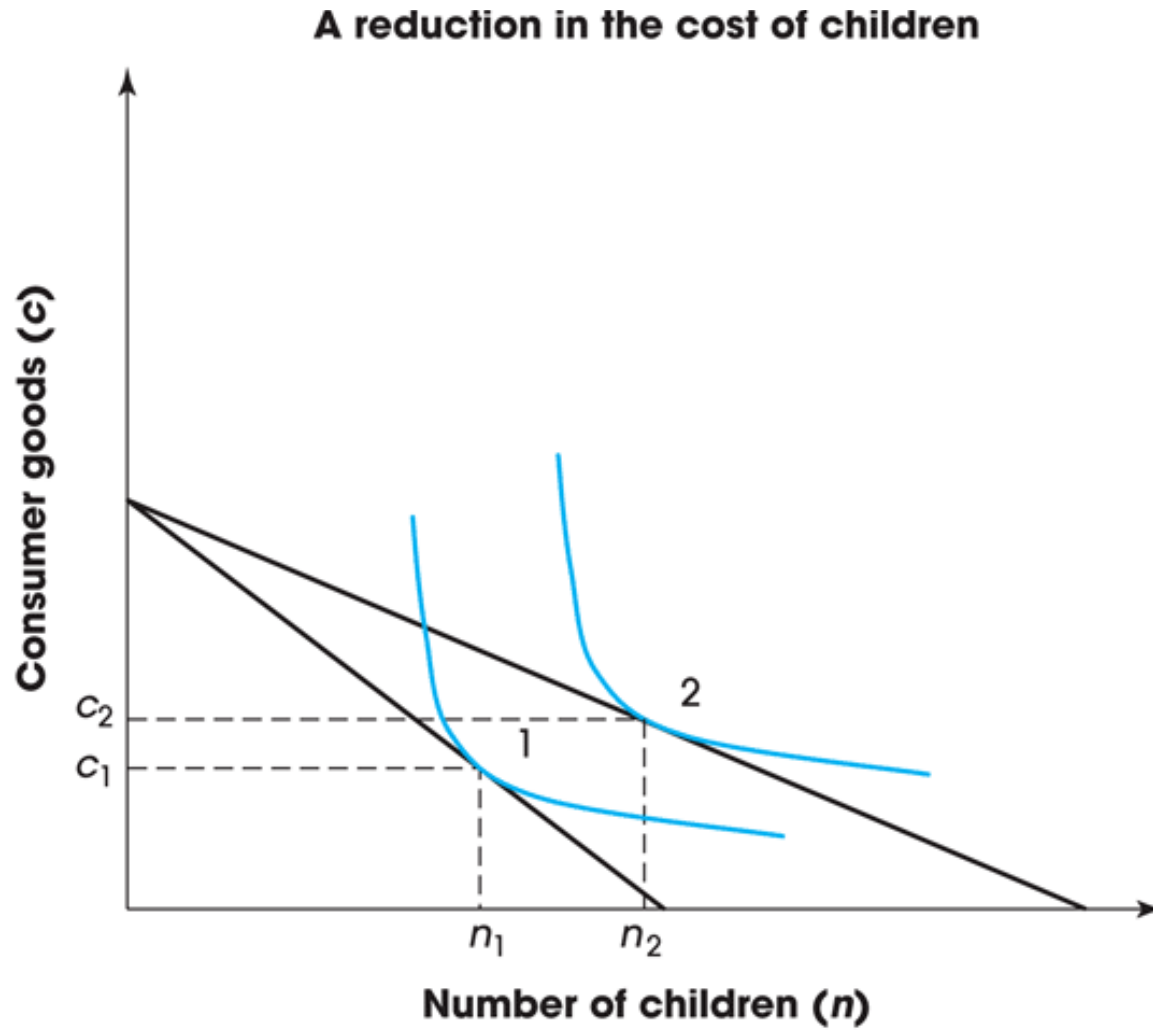
THE DETERMINANTS OF FERTILITY RATES

The Economics of Fertility Choices

How can we make economic sense of *fertility decisions*? Conventional consumer theory assumes a utility function bundling consumer goods and children subject to a budget constraint (Figure 3.6).

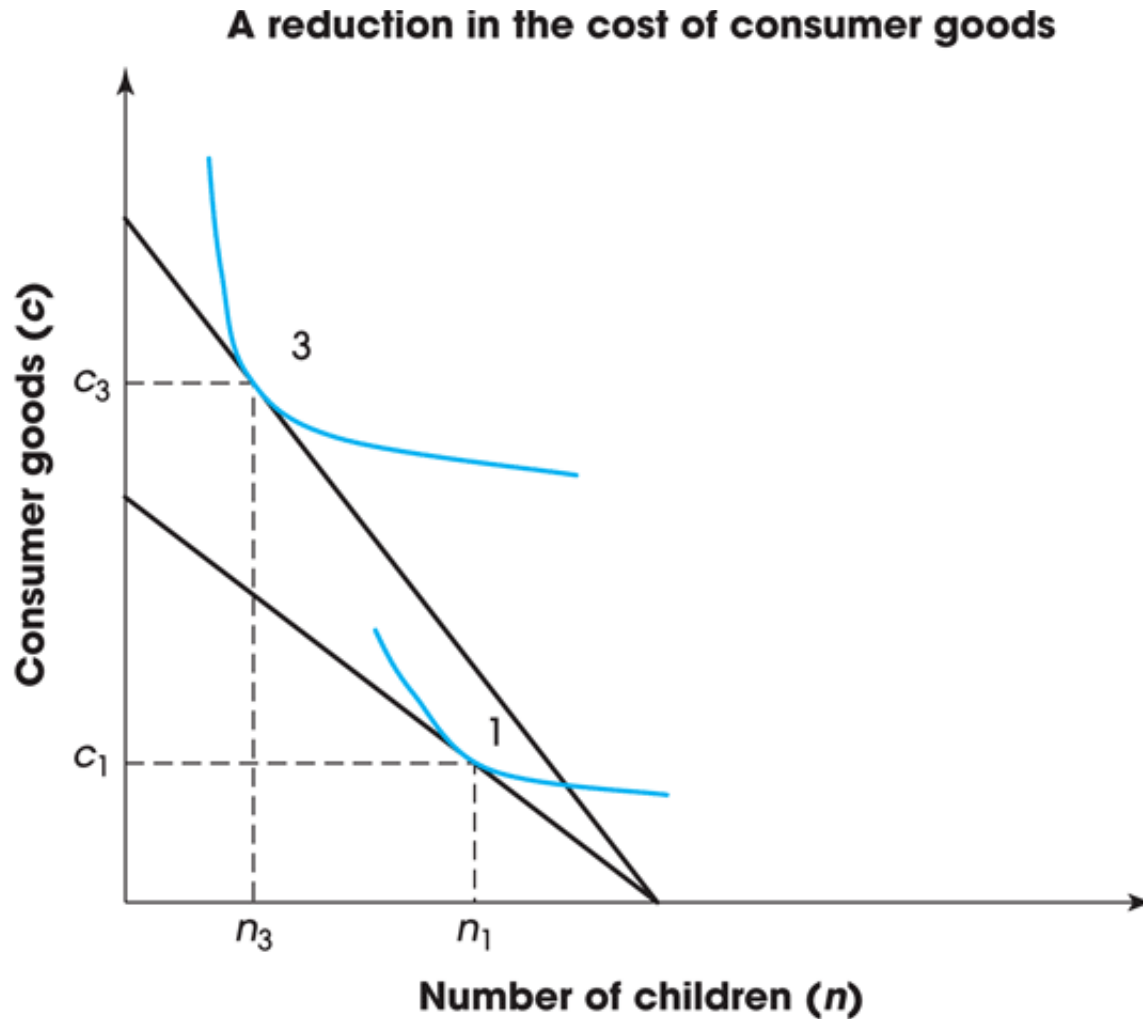
- *Shifts in relative price*: A reduction in cost of a good relative to other goods leads to an *income effect* and a *substitution effect*.
- If the income effect dominates, then it is possible to increase consumption of all goods (panel a).
- If the substitution effect dominates, people tend to increase consumption of cheaper good, and reduce consumption of more expensive goods (panel b).
- Evidence shows that the *income effect dominates when there is a decrease in the cost of children and the substitution effect dominates when there is a decrease in the price of other goods*.

THE DETERMINANTS OF FERTILITY RATES



With an initial choice of consumer goods and number of children at point 1, a reduction in the cost of children shifts the budget line on the horizontal axis and leads to an increase in the demand for consumer goods and number of children (point 2).

THE DETERMINANTS OF FERTILITY RATES



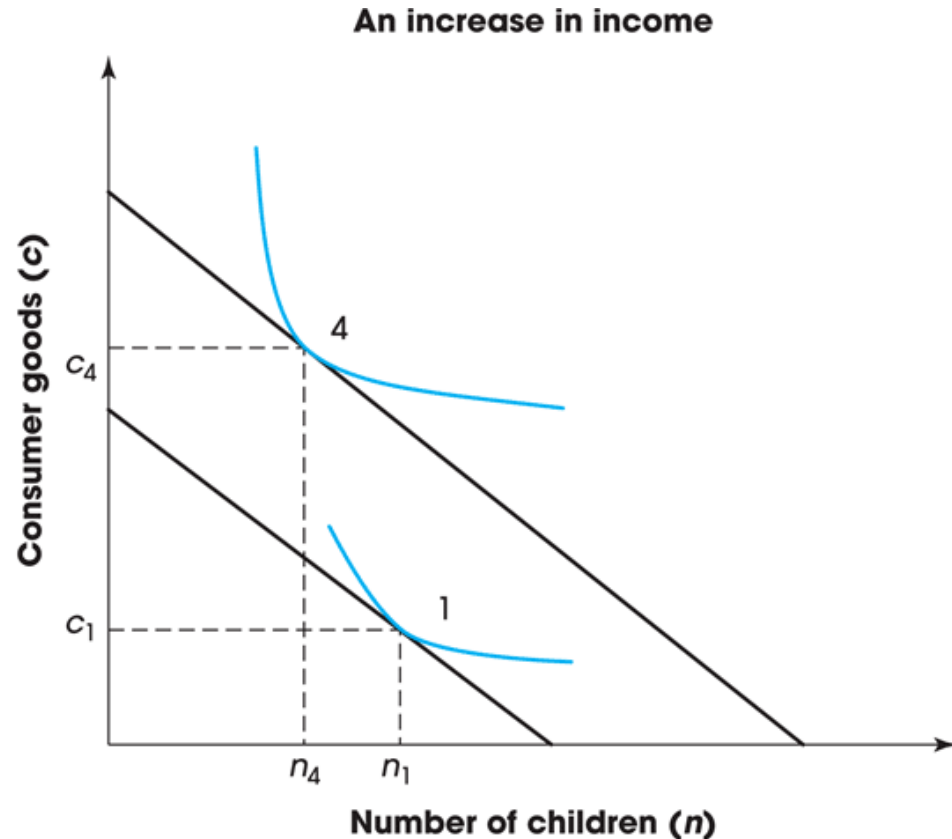
Starting from an initial choice of consumer goods and number of children at point 1, a reduction in the cost of consumer goods leads to an increase in the demand for those goods and a reduction in the demand for children (point 3).

THE DETERMINANTS OF FERTILITY RATES

- If there is an upward *shift in income*, it's possible to afford both more children and consumer goods (Figure 3.7).
 - *Inferior goods* are defined as goods for which demand decreases as income increases (potatoes, rice, millet).
 - A *normal good* is one for which consumption increases as income increases.
- Typically, poor families have more children than rich families.
Are children inferior goods?
- Or, is the cost of children *relatively* higher in rich countries?
Two possible explanations:
 - The *opportunity cost* of having children, especially for women, increases with economic development.
 - There is a *quantity-quality trade off*. At higher levels of development, parents choose to invest more time and money per child.

THE DETERMINANTS OF FERTILITY RATES

Figure 3.7.
Fertility
Choices and
Increases in
Income.



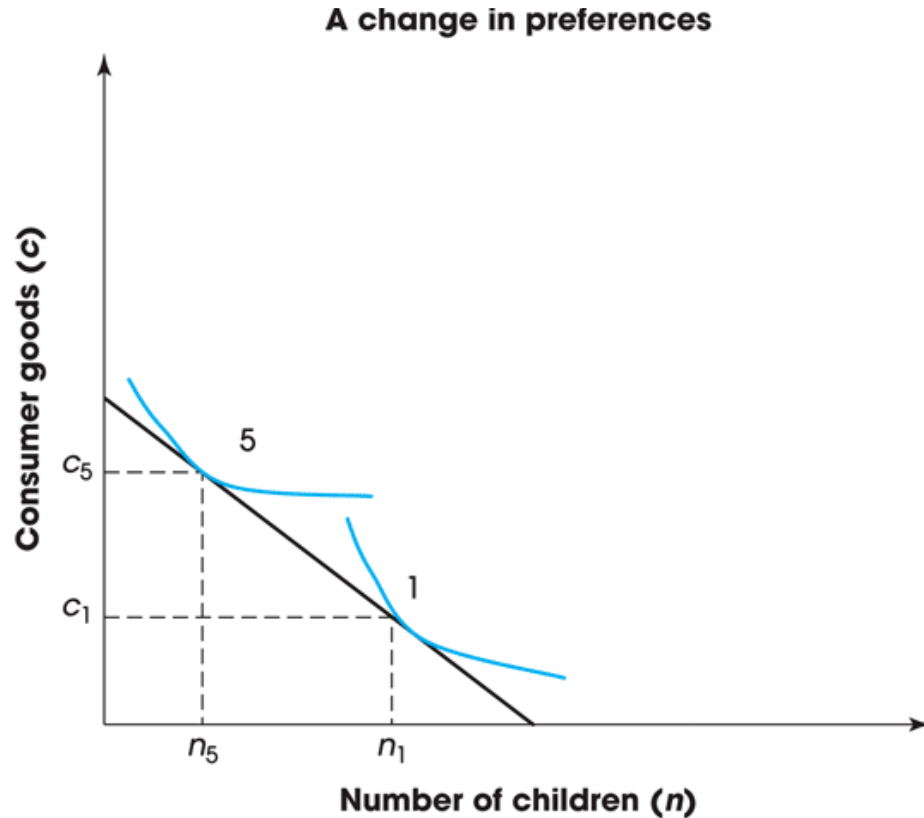
Starting from an initial choice of consumer goods and number of children at point 1, an increase in income leads to an increase in the demand for consumer goods and a reduction in the demand for children. The latter effect is due to a quantity-quality tradeoff in the choice of children. As incomes increase, the opportunity cost of time also increases and parents prefer to invest in child quality rather than in child quantity, spending more time and money on a smaller number of children.

THE DETERMINANTS OF FERTILITY RATES

- A *shift in preferences* is another possible explanation for fertility choices (Figure 3.8).
- The change in the relative benefits of having children translates into a change in the shape of *indifference curves* between consumption and children.
- Preference can change for noneconomic reasons, especially *social norms*.
- A reduction in benefits will result in fewer children and more consumption of goods and services.
- The benefits of having children are at least partly related to the differences in *institutions* across countries.

THE DETERMINANTS OF FERTILITY RATES

Figure 3.8.
Reduction in
the Benefits
of Having
Children.



Starting from an initial choice of consumer goods and children at point 1, changes in preferences lead to an increase in demand for consumer goods and a reduction in the demand for children. These changes in preferences are related to the development of pension programs and urbanization that eliminate the need to have children who will ultimately have to care for their aging parents, points that we discuss below.

THE DETERMINANTS OF FERTILITY RATES

Fertility Choices and Institutions

In societies with *no social security*, children may represent an investment for *retirement* and a source of *financial security*. Therefore, poor parents tend to have more offspring where:

- Infant and childhood mortality are high.
 - Children tend to be less educated, because they may potentially be less productive.
 - Because of extreme poverty children move away from their parents.
-
- In advanced economies, parents can use the promise of *inheritance as an incentive* to make sure their children take good care of them.
 - In the absence of economic incentives, however, you often find that poor countries *enforce parental support through cultural and social values*.

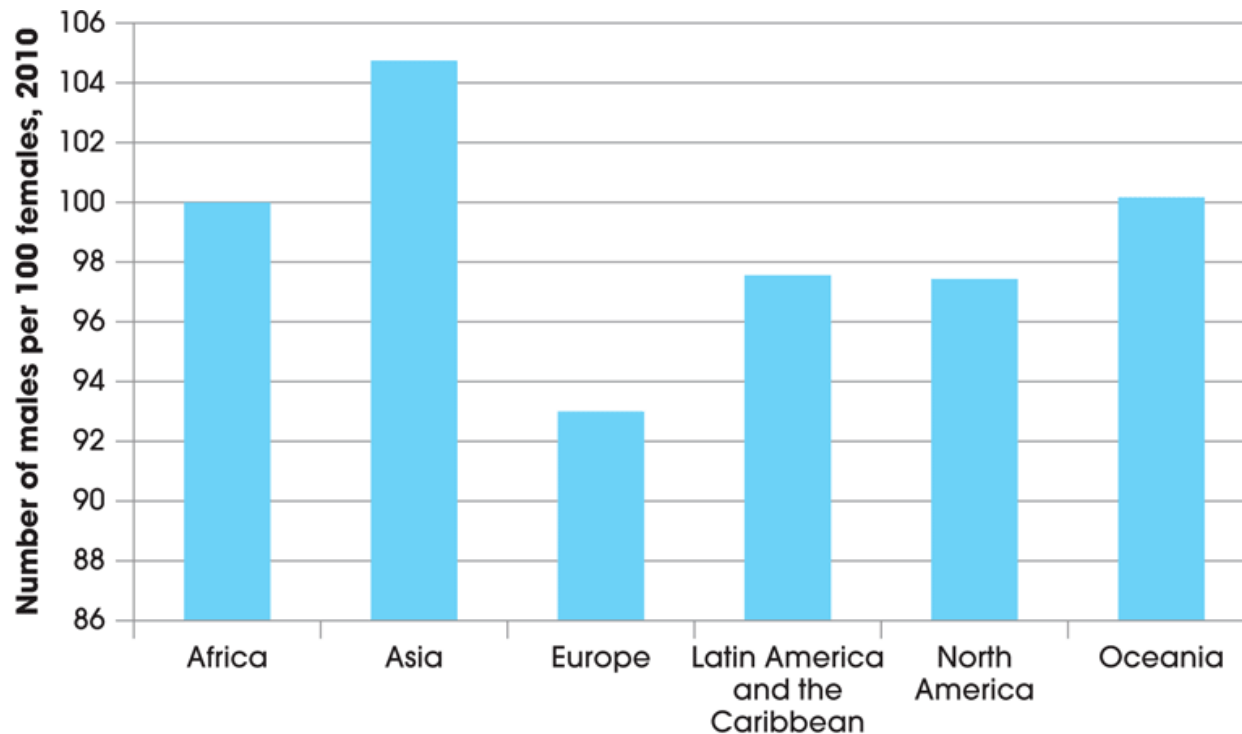
THE DETERMINANTS OF FERTILITY RATES

Gender bias also plays a key role in determining fertility decisions.

- In many societies boys are preferred to girls.
- This bias may go as far as inducing female infanticide.
- In general, from a biological perspective, there should be more females than males.
- However, gender bias for boys in some cases dramatically changes population sex ratios.

THE DETERMINANTS OF FERTILITY RATES

Figure 3.9. Population Sex Ratios in 2010.



The sex ratio (the number of males per 100 females) is the highest in Asia and the lowest in Europe. Among other factors, this reflects differences in preferences for boys over girls in various regions of the world.

Source: United Nations, <http://data.un.org/Data.aspx?q=world+population&d=PopDiv&f=variableID%3A13%3BcrID%3A900>.

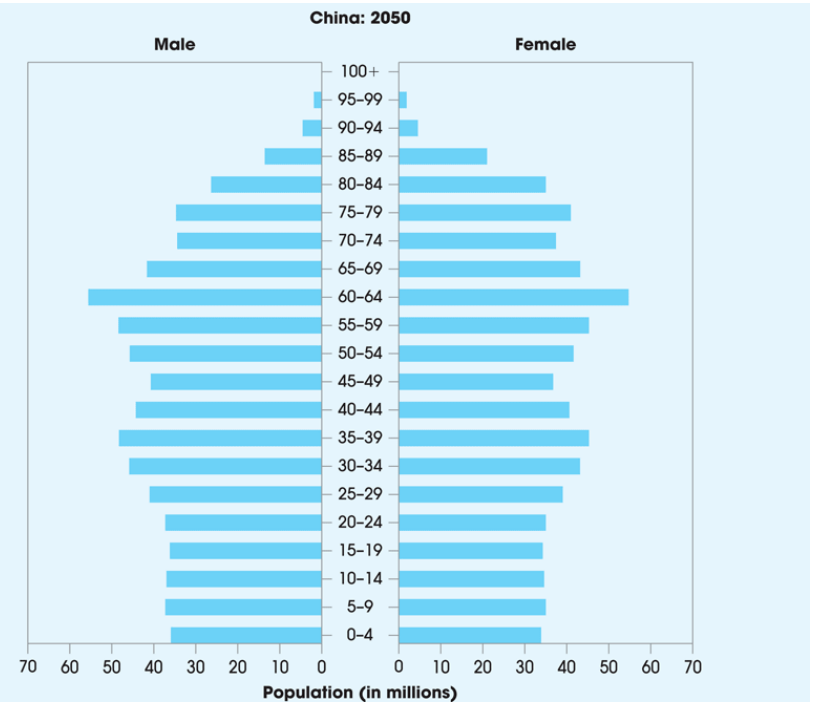
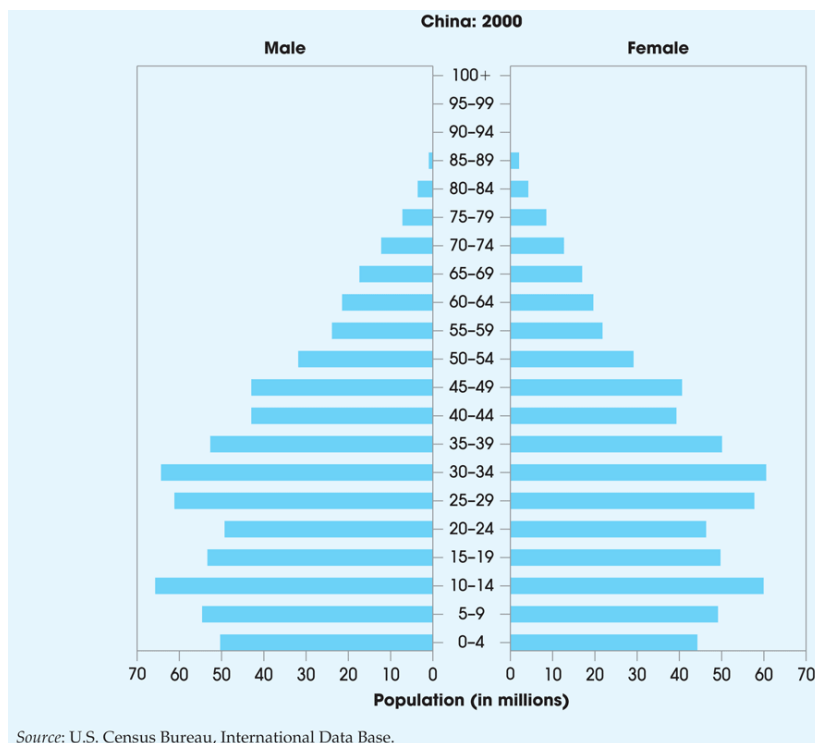
THE DETERMINANTS OF FERTILITY RATES

Fertility Choices and the Demographic Transition

- Changes in fertility usually *happen gradually* as people take time to adapt to the evolving economic and social trends.
- In the different *stages of the demographic transition* the costs and benefits of having children change.
- Improved income, medical technologies, education, urbanization, pension systems, and opportunities for women outside the home all have *pushed fertility rates down*.
- The *global population is likely to stabilize* as a result of declining fertility in developing countries, however, populations of developing nations are *aging*.
- The *old-age dependency ratio* is defined as the ratio of retired people (over 65) over the active population (16-64).

THE DETERMINANTS OF FERTILITY RATES

Figure 3.10. China's Population Pyramid in 2000, with Projections for 2050.



The one child policy will lead to a rapid aging of China's population. In 2000, the largest shares of the population were among those younger than 35. After 2050, they will be among those older than 60. The proportion of the old will increase and the proportion of the young will decrease, reflecting a drastic shift in the age distribution of the population.

FAMILY PLANNING AND POPULATION GROWTH

Family Planning Policies

To speed up the demographic transition, governments often intervene with policies directed at lowering fertility.

- The *"one child" policy* implemented in China in the late 1970s is an extreme example of population growth control.
- Recently, the *gender imbalance* has made it difficult for men to find wives.
- Similar extreme policies were enacted in India during the 1960s-1970s. These included, for example, *forced sterilization*.
- More recent policies aimed at reducing fertility include improving *education and increased access to contraceptives*.
- Does there exist an imperfect market for contraceptives?

FAMILY PLANNING AND POPULATION GROWTH

Externalities and the Economics of Family Planning

The economic justifications of family planning are often based on the existence of *externalities*. In this case, while it is *rational* for a family to have many children, this decision may impose negative impacts on others and society as a whole.

- Potential *congestion* for public services, especially education.

Population pressure in low-growing developing countries can induce people to *emigrate* to developed nations.

- However, an influx of *immigrants may be beneficial* for developed nations, especially in the case of an aging population (i.e., immigrants contribute to the workforce).