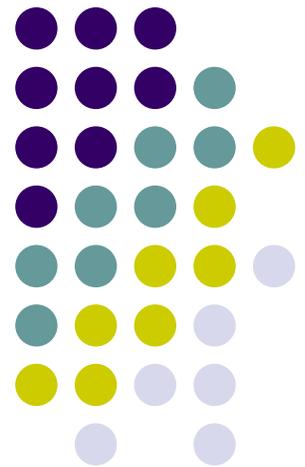


Introduction to Economics of Development

Population Theory and
The Role of Labor





Outline

- Some basic facts
- Malthus' prediction
- Population & economic growth
- Endogenous population theory



Some Basic Facts

History of population growth

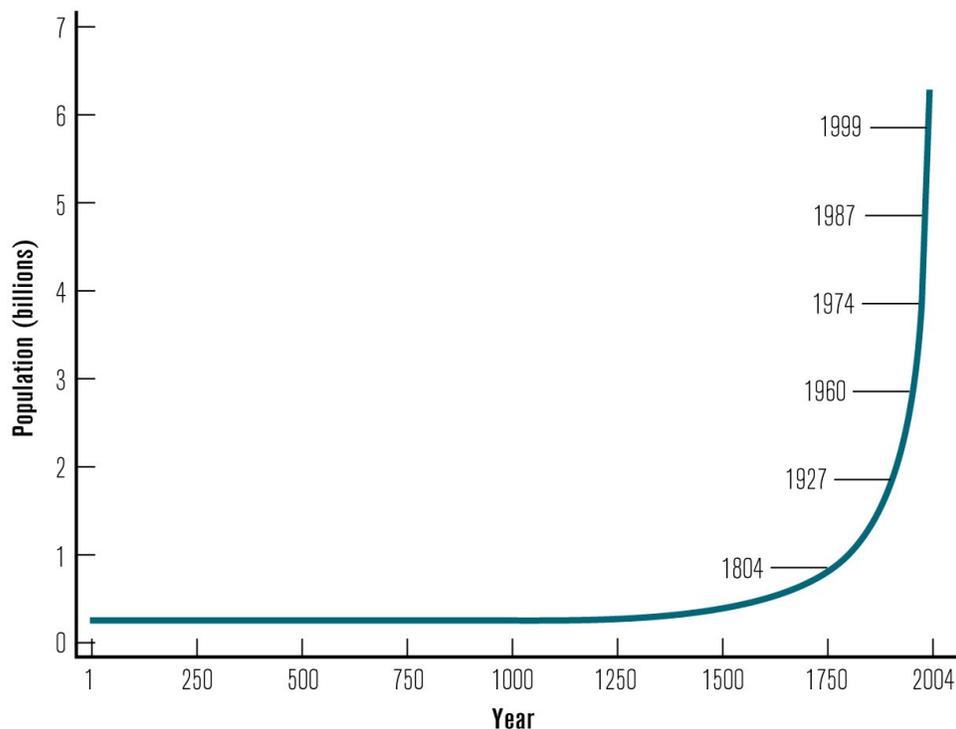


FIGURE 7.1 World Population Growth through History: Years Needed to Add 1 Billion More People

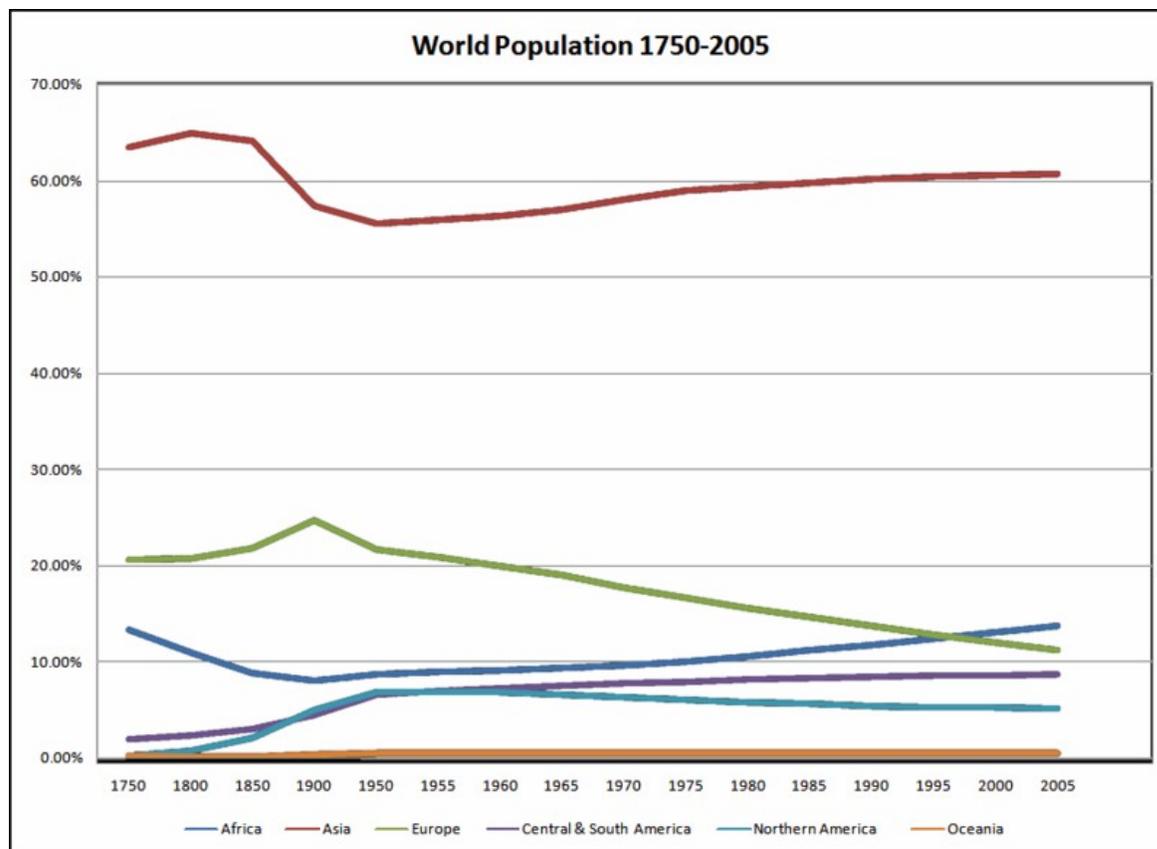
Economics of Development, 6th Edition
Copyright © 2006 W. W. Norton & Company

- 1-1800 AD, population growth was almost flat. In early 1800s, world population reached 1 billion for the first time.
- Then for the next 200 years, world population growth rose sharply, with the total reaching **6.5 billion today**.
- During the same time periods, world average income level, instead of falling, also rose sharply. **Why?**



Some Basic Facts

World population by continent

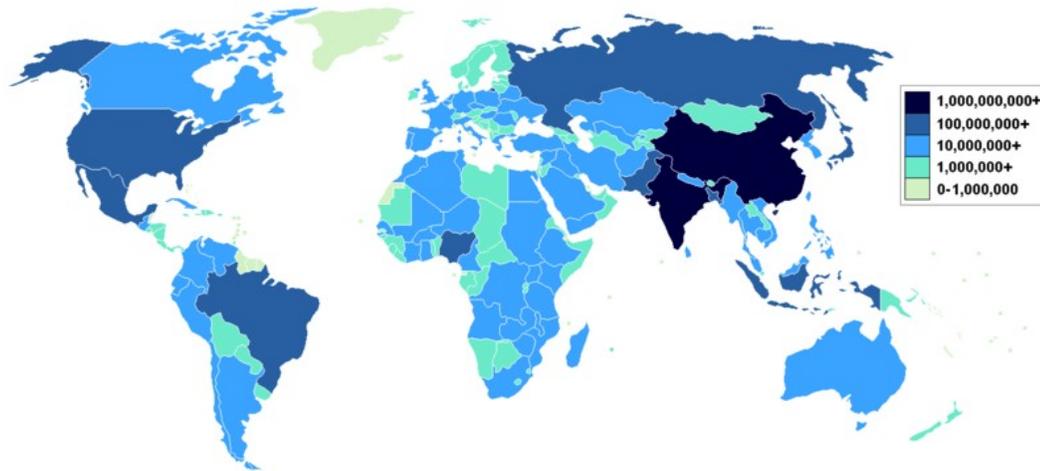


- Rising population: Asia, Africa, Latin America (slightly)
- Falling population: Europe (a lot) and North America (slightly)



Some Basic Facts

World population today

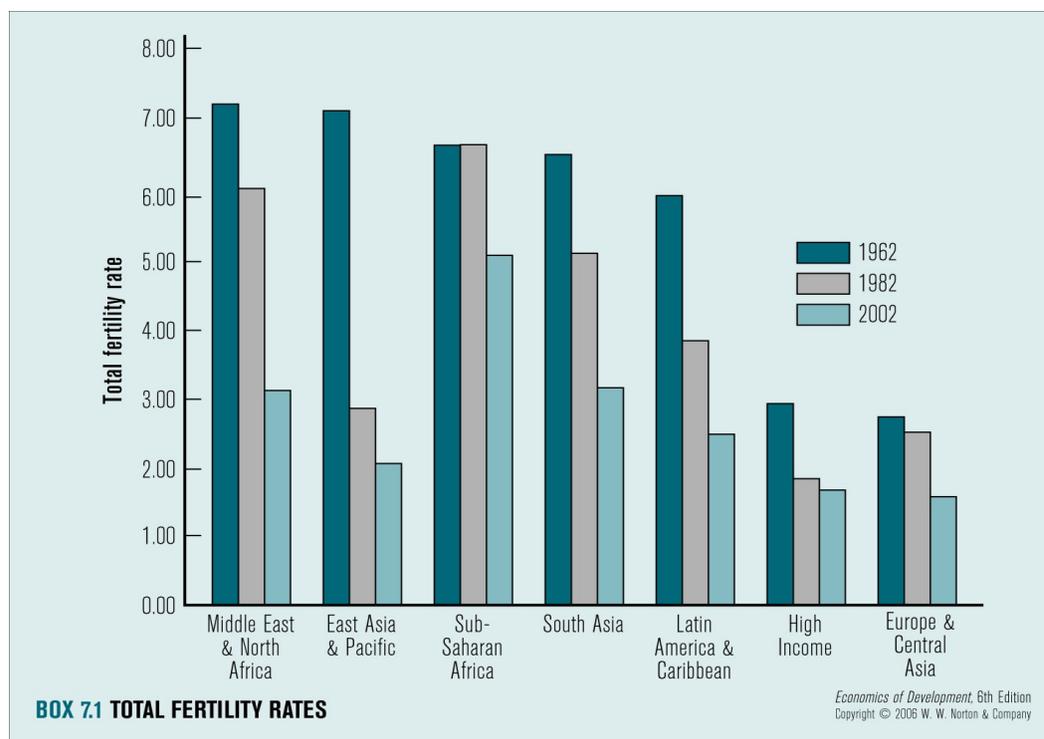


Rank	Country/territory/entity	Population
—	World	6,671,226,000
1	People's Republic of China ^[3]	1,322,380,000
2	India	1,128,971,014
3	United States	303,430,511
4	Indonesia	231,627,000
5	Brazil	186,186,773
6	Pakistan	162,499,500
7	Bangladesh	158,665,000
8	Nigeria	148,093,000
9	Russia	141,947,000
10	Japan	127,790,000



Some Basic Facts

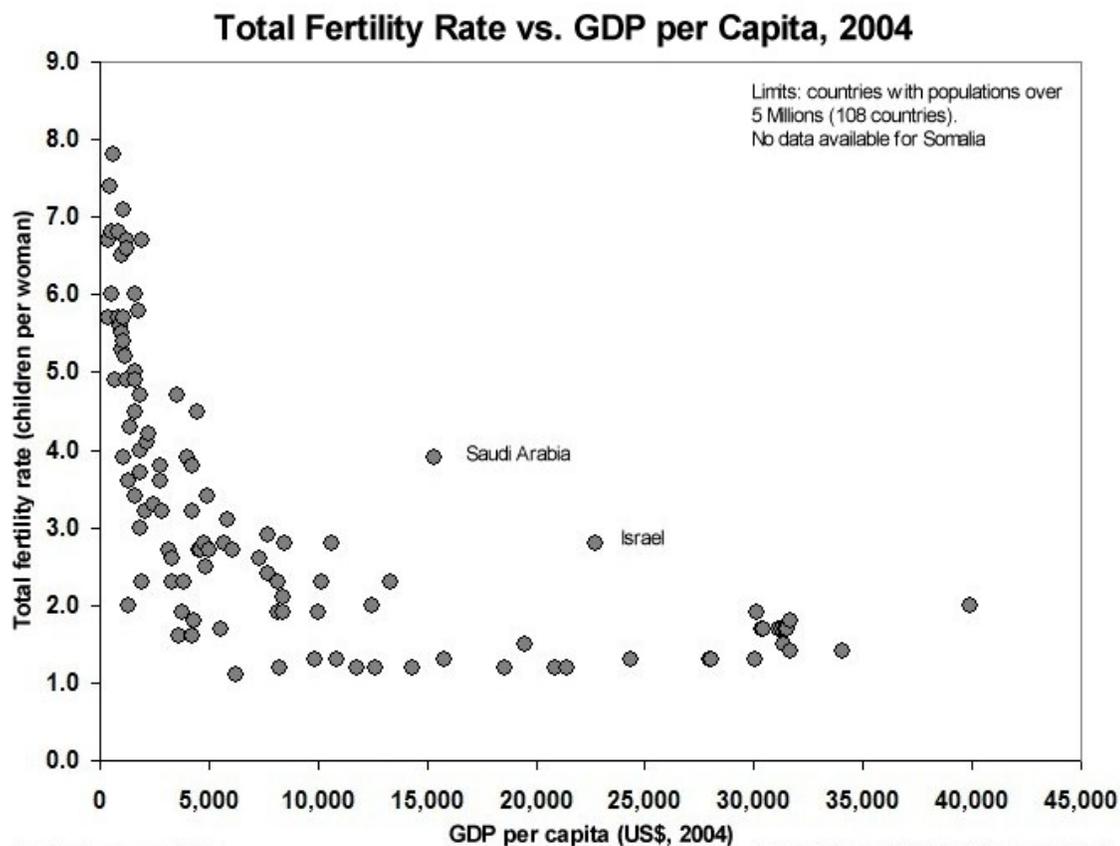
Fertility rate has been declining in every continent





Some Basic Facts

Fertility rate declines with rising income

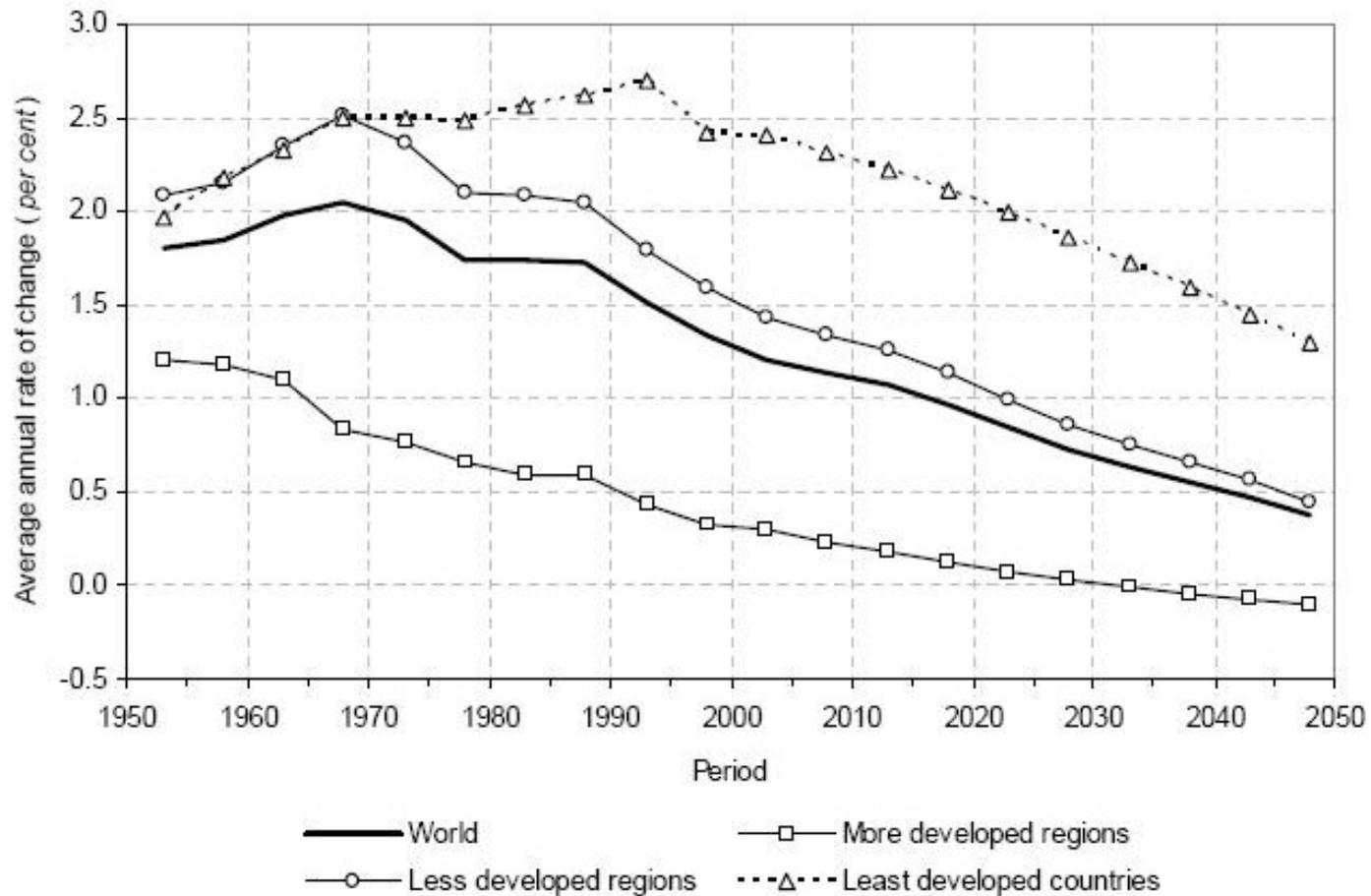


[Play fertility and income dynamics at Gapminder.com.](http://Gapminder.com)



Population growth trend

Figure 3. Average annual rate of change of the population of the world and major development groups, 1950-2050 (medium variant)

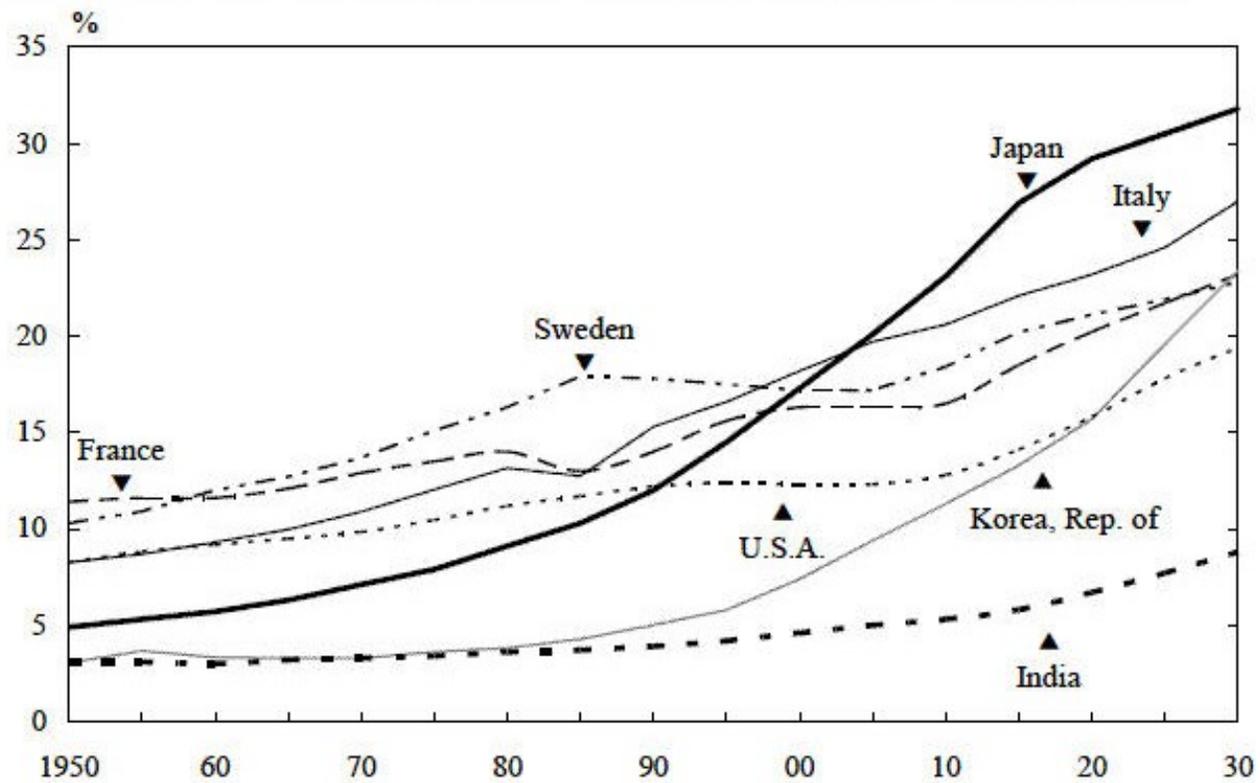




Some Basic Facts

The consequence of falling fertility: Ageing in developed countries

Proportion of Elderly Population by Country (Aged 65 years and over)

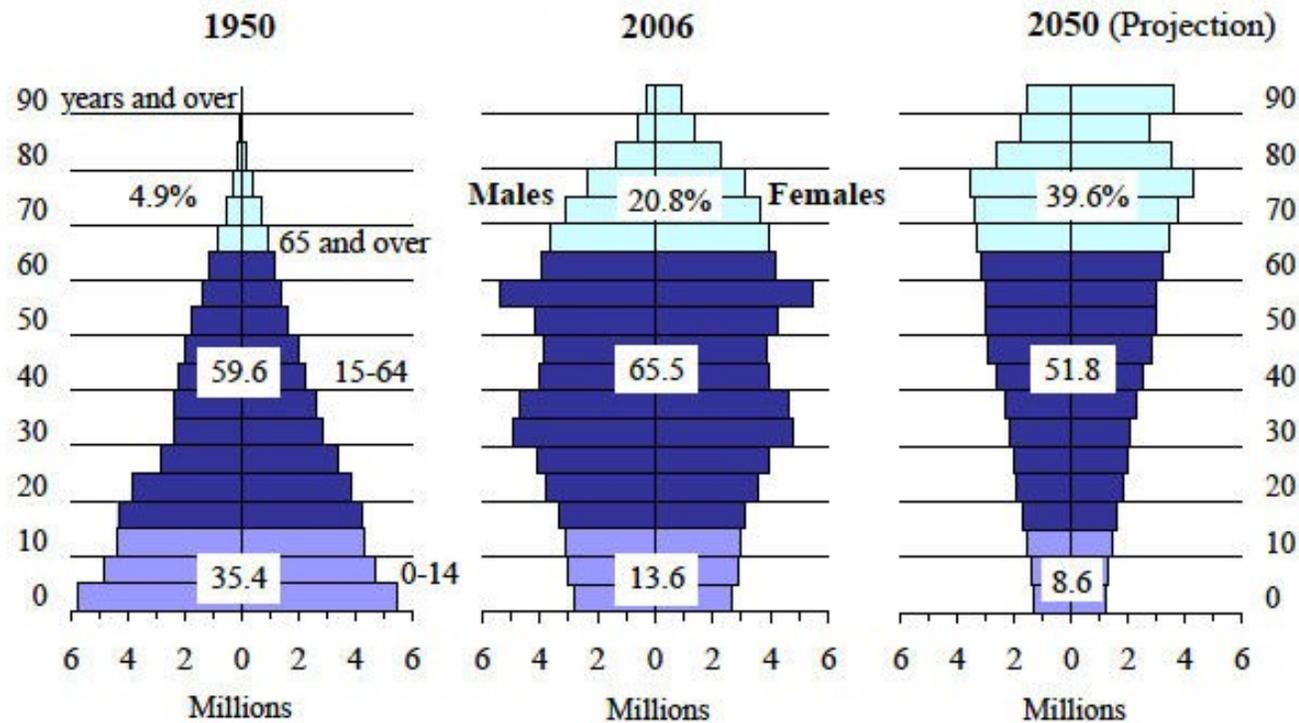




Some Basic Facts

Ageing Problem in Japan:

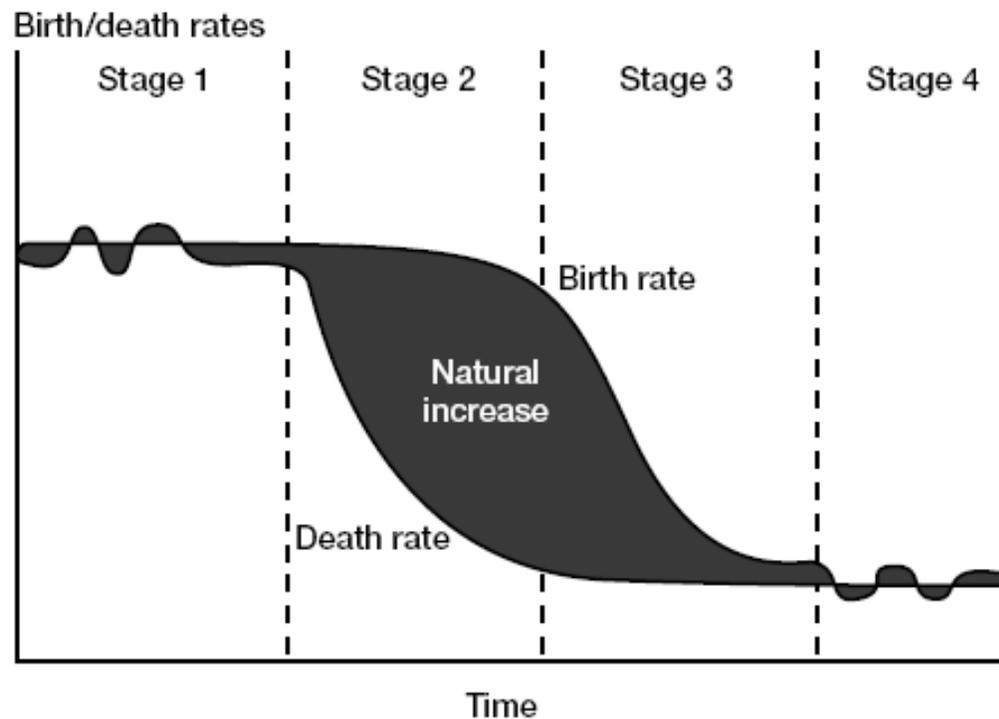
Changes in the Population Pyramid





Population in Transition

The Classic Stages of Demographic Transition

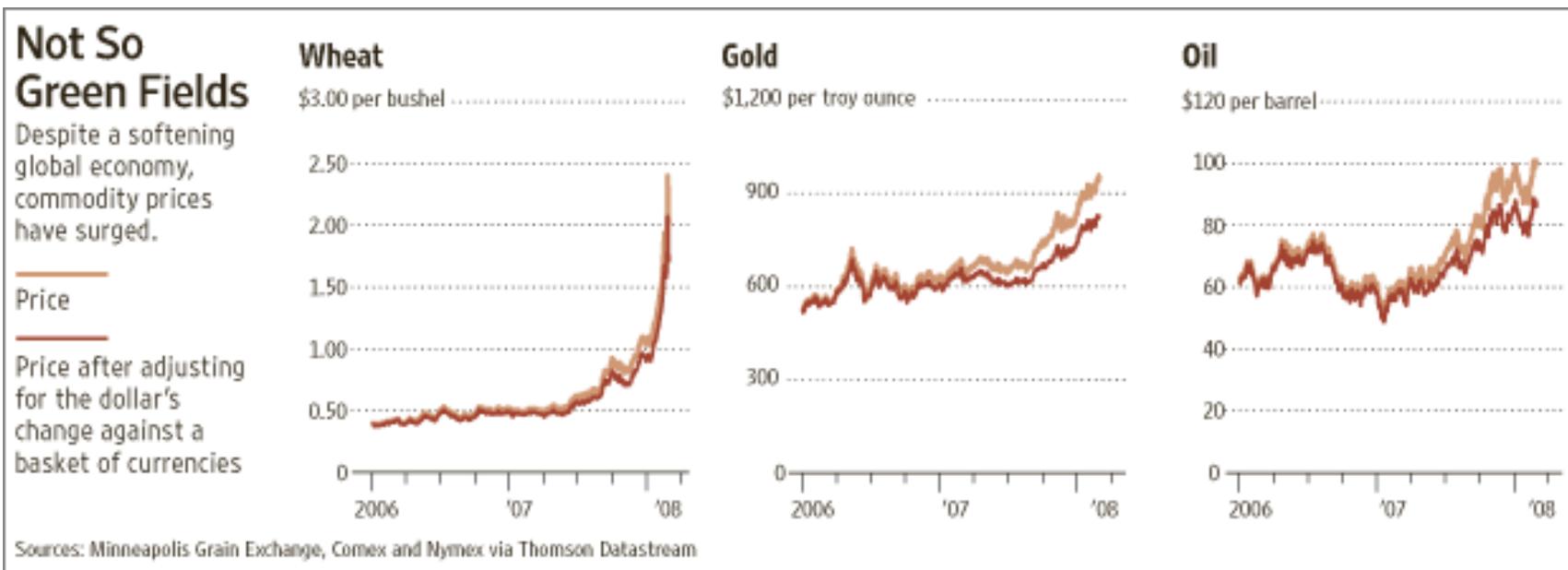


Note: Natural increase or decrease is produced from the difference between the number of births and deaths.

- Stage 1 Death rate and birth rate are about the same, resulting in population growth oscillating around zero and stagnant population .
- Stage 2 Mortality rate falls sharply and birth rate remains about the same as before, resulting in large increase in population.
- Stage 3 Birth (fertility) rate falls gradually, resulting in much slowed population growth.
- Stage 4 Fertility falls to the same level as mortality rate, population become stagnant again.



What's Happening 03/04/2008





Malthus' Pessimistic Prediction



- Malthus (1766-1834) believed that “passion between the sexes” would cause population to expand as long and far as food supplies permitted.
- Wage equilibrium around subsistence level: when wages somehow rise above subsistence level, people will have more children. This increases labor supply and puts constraint on fixed resources, land. When land input is fixed, labor input is rising, labor productivity will suffer diminishing returns (similar to diminishing returns of capital). With more population, and food production not increasing much, food prices will go up and drive down real wages back to the subsistence level.
- Malthus thinks food supply cannot surpass population growth. In his words, food supplies grow according to an arithmetic progression, while population follows an explosive geometric progression.
- In Malthusian world, wage remains low at subsistence level, and population growth is checked:
 - “Positive Check”: epidemics, famines, and wars.
 - “Preventive Check”: self-restraint and superior “reasoning faculties”.
- **Malthusian framework accurately characterized** the evolution of population and output per capita for the most of human history, up until early 19th century.



Malthus' Pessimistic Prediction

- **Limitations of Malthus' Population Theory**

- In a world dominated by agricultural, Malthus only considered two types of factors of production: labor and land. Since land is fixed in supply, and all labor work on the land, it suffers diminishing returns of labor, thus real income remains stagnant.
- However, industrial revolution moved labor out of land, from farms to cities, from agricultural into industrial sector, in which land's constraint is relaxed.
- More important, Malthus didn't consider the possibility of technology improvement and rising productivity. When productivity rose and with a smaller proportion of population working on the land, real wages (after discounting food price) increased.
- Technology is the key to relax the land constraint. Consider US farmers, only 1% of total population, however, they not only supply food to the whole nation but have plenty left to export worldwide.



Population and Economic Growth

- Theoretical discussions

- Positives

- In the world before industrial revolution, population was often the indicator of economic growth. This is still true in LDCs today, especially in Africa.
 - Labor in production function: more labor, capital is less likely to suffer diminishing return, or at least postpone it → so ceteris paribus, more population, longer and faster economic growth.
 - More population → more competition → to get ahead, people have more incentives to invest more in human capital → more people with college degrees → more specialized and skilled labor force → higher productivity growth. For example, US northeast coast.
 - An often neglected effect (quite against intuition): more population puts much greater pressure on technological breakthrough to relax the resources constraints. For example: new technology to extract oil from deeper earth, and the prospect of alternative energy replacing oil.



Population and Economic Growth

- Theoretical discussions

- Negatives

- Income level is measured by GDP per capita.

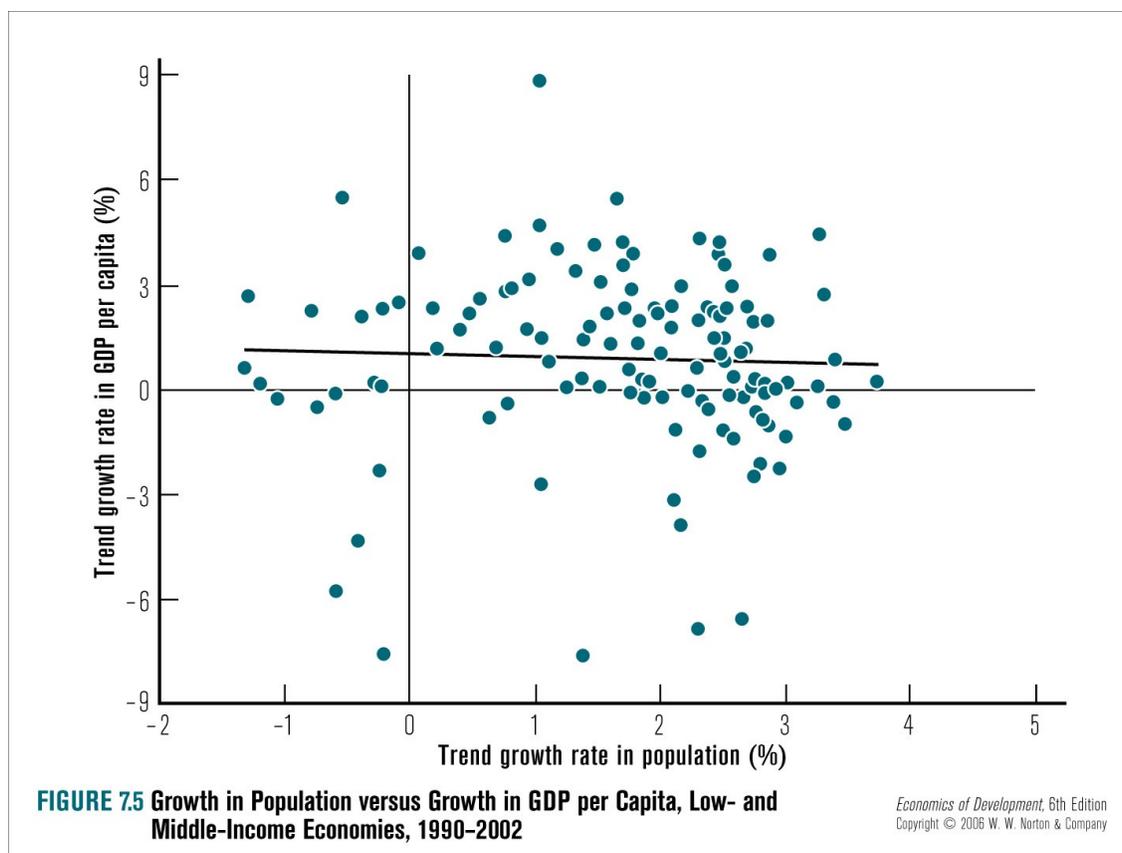
Everything being equal, more population, lower income per capita. For example, China and India are the two of the largest economies in the world in terms of GDP, but in terms of GDP per capita, they are still quite poor. But is population the culprit?

- If land is the main “capital”, as in most agricultural dominated economies, more population will cause faster diminishing return of labor, and lower wage.
- In household, everything being equal, more children, fewer resources devoted to each → nutrition, quality of education, etc. are adversely affected.
- Increasing pressure on natural resources: e.g. rising oil and food prices.



Population and Economic Growth

The empirical relationship:





Population and Natural Resources



Watch this video at http://www.youtube.com/watch?v=uLQoa_FA_zo



Endogenous Population Theory

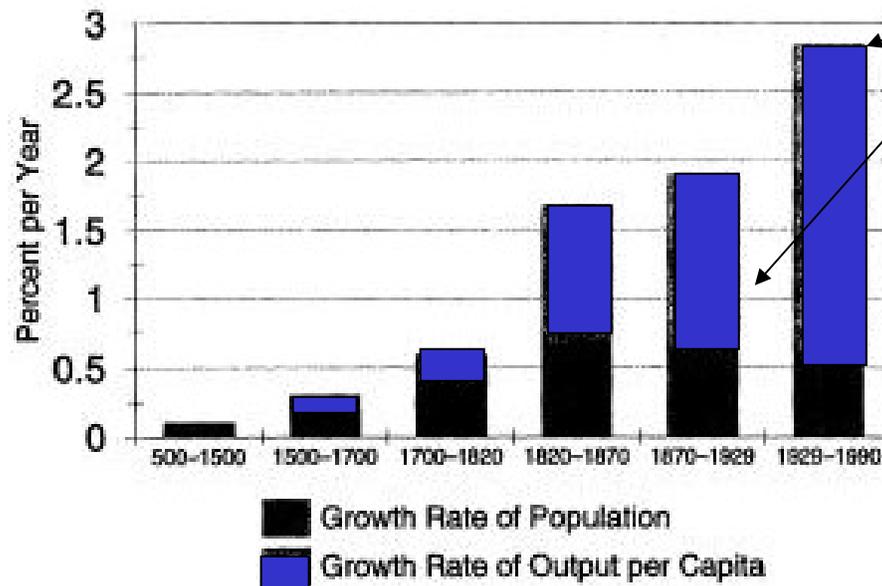
Three distinct regimes in population growth

- Malthusian regime
 - Almost no technological progress and population growth, income per capita was roughly constant
 - The relationship between income per capita and population growth is positive
- Post-Malthusian regime
 - Income per capita grew, but not as rapidly as in modern growth regime
 - Positive relationship between income per capita and population growth was still in place
- Modern growth regime
 - Characterized by steady growth in both income per capita and the level of technology
 - The relationship between income per capita and population growth is negative

Endogenous Population Theory



Growth of Population and Output per capita



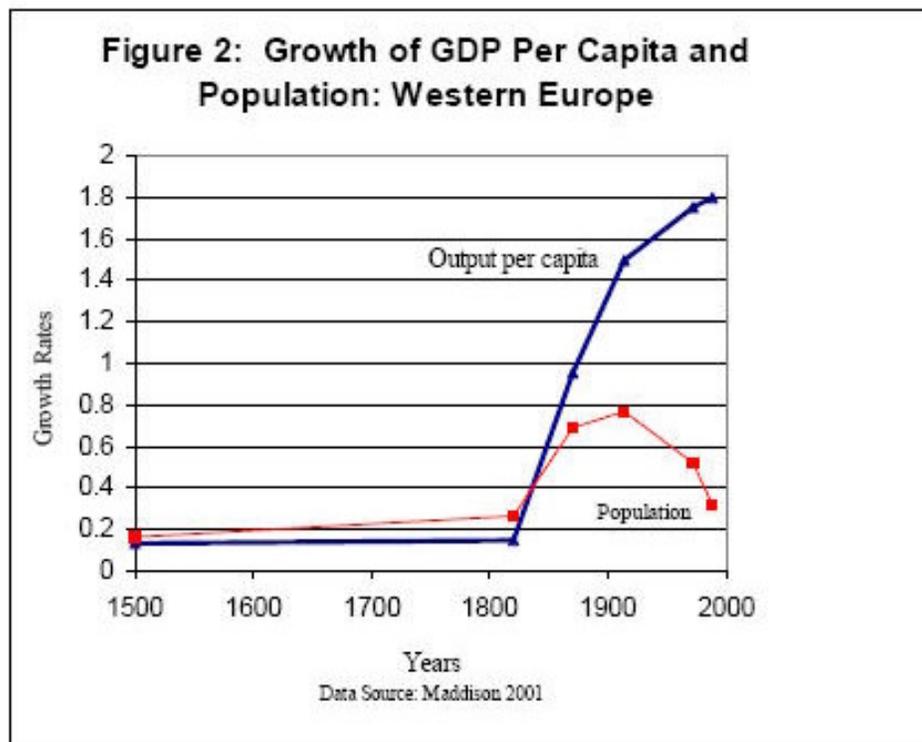
Growth of Output per capita greater than population growth, where “Malthusian trap” was overcome.

FIGURE 1. OUTPUT GROWTH IN WESTERN EUROPE



Endogenous Population Theory

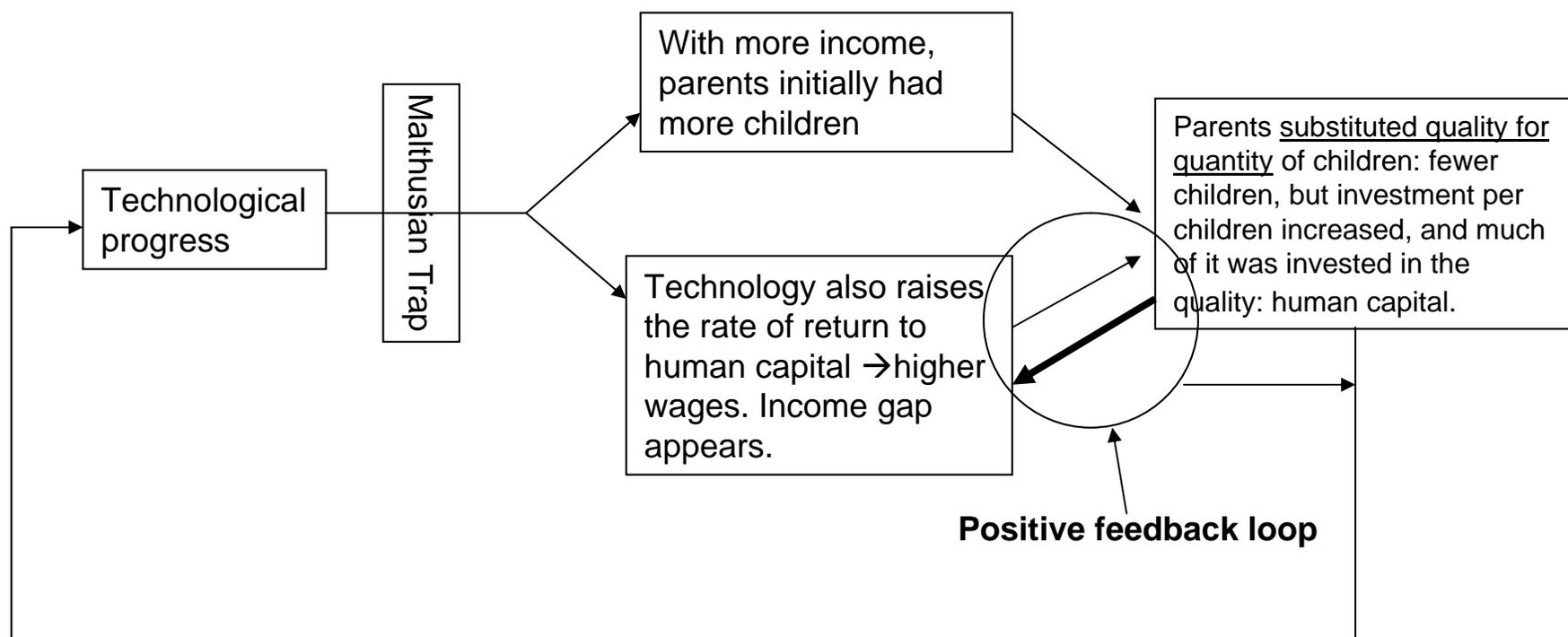
Why did we have declining fertility and increasing growth rate of output per capita?





Endogenous Population Theory

A theory trying to explain why we had such a dramatic population transition process





Other Theories on Fertility Decline

- More women started to join the workforce and earned their own living, also more women became educated (or better educated). Both caused the rise of the *relative income* of women's to men's. Thus, the *opportunity cost* of having children (or more children) rose. This resulted in family's decision to substitute quality for quantity of children (more births)
- People live healthier and much longer than before. So there are incentives to have better and longer schooling (consider college, graduate school). If life expectancy was only around 30 years, imagine how many people will want to pursue graduate education. So when more people invest more in human capital, it will put the economy on a virtuous growing spiral.
- Other factors: higher income, savings, and establishment of social security system.



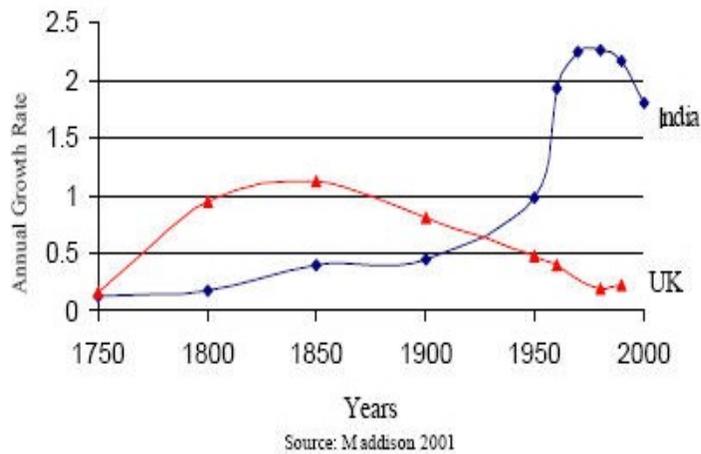
Trade Driven Divergence Hypothesis

- International trade induces countries to specialize:
 - Poorer countries specialize in comparatively low-skilled productions and richer countries specialize in comparatively high-skilled productions.
 - Unlike low skilled productions, high-skilled productions value human capital more, so people have incentives to invest more in training and education. That brings about the substitution effect between quantity and quality of children, which brings down fertility rate.
 - Countries specializing in low-skilled productions does not require people to have more education and knowledge to engage in production activities. So compared to rich developed countries, people have less incentive to invest in human capital. Above described substitution effect does not exist or a lot weaker. Therefore, higher income per capita mainly brings about higher population growth.



Diverging Growth Patterns in Population and Output

**Figure 3: Population Growth Rates
UK and India**



**Figure 4: The Great Divergence:
UK and India**

