

Malthus and the Phantom Menace

Population and Economic Growth

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A Malthusian Model

- Robert Malthus, *An Essay on the Principle of Population*, 1798.
- Simple yet powerful model of the relation between population and economic growth.
- Good description of the evidence of humanity until around 1800.
- Good description of the natural economy of animals.
- Indeed, Malthus had a strong influence in Darwin.

Growth Facts in the Very Long Run

- For most human history, income per capita growth was glacially slow.
- Before 1500 little or no economic growth. Some growth between 1500 to 1800 in Europe.
- Around 1800s, the world average income was roughly as high as in the Neolithic.
 - 1 Income was higher in England or the Netherlands.
 - 2 But it was probably lower in China or India.
- Moreover:
 - 1 Hours of work were much longer in the 1800s than in the Neolithic.
 - 2 There was much more inequality in the 1800s than in the Neolithic.

Some Evidence

- **Paul Bairoch**, *Economics and World History: Myths and Paradoxes*:
 - 1 Living standards were roughly equivalent in Rome (1st century CE), Arab Caliphates (10th century CE), China (11th century CE), India (17th century CE), Western Europe (early 18th century CE).
 - 2 Cross-sectional differences in income were a factor of 1.5 or 2.
- **Angus Maddison**, *The World Economy: A Millennial Perspective* calculates 1500-1820 growth rates:
 - 1 World GDP per capita: 0.05%.
 - 2 Europe GDP per capita: 0.14%.
- After 1820: great divergence in income per capita.

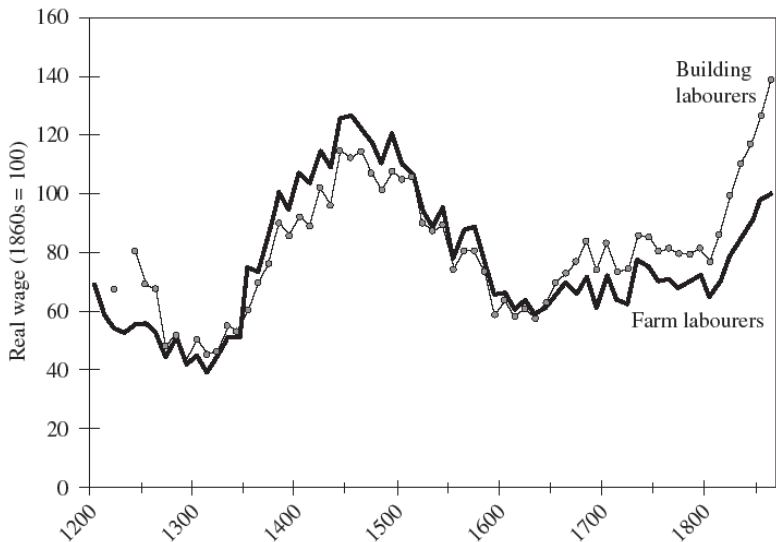
Heights from Skeletal Remains

Period	Location	Height, cm.
Mesolithic	Europe	168
Neolithic	Europe	167
2500 BCE	Turkey	166
1700 BCE	Greece	166
1600-1800	Holland	167
1700-1800	Norway	165
1700-1850	London	170

Laborer's Wages in Wheat Equivalent

Ancient Babylonia	1800-1600 BC	15
Assyria	1500-1350 BC	10
Neo-Babylonia	900-400 BC	9
Classical Athens	408 BC	30
Roman Egypt	c AD 250	8
England	1780-1800	13

Real Agricultural Day Wages, England, 1209-1869



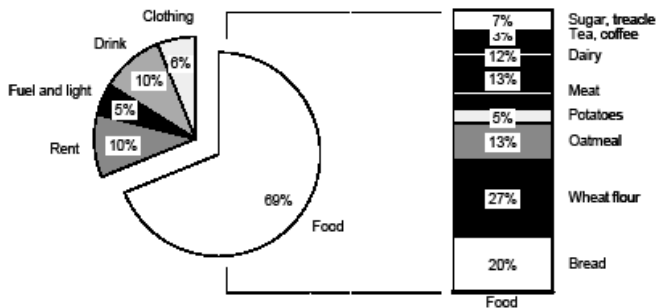


Figure 3

Composition of Working Class Expenditure, 1788-92

Source: Voth (2003)

World Income and Population

- Before 1800's, the world is in the *Malthusian trap*: improvements in technology only translate in increases in world population.
- In the 1800's the western world moved away from the trap: *demographic transition*.
- In the 1900's, much of the rest of the world went through similar process.
- Countries in Africa and Middle East still lag.
- We want to understand the *Malthusian trap* and the *demographic transition*.

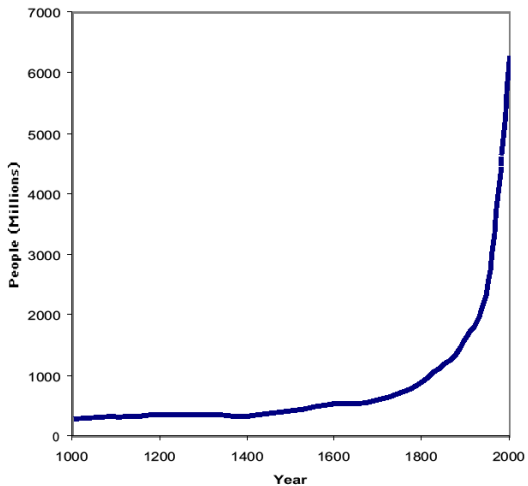
World Income and Population: Data

Year	Population*	GDP per Capita**
-5000	5	\$130
-1000	50	\$160
1	170	\$135
1000	265	\$165
1500	425	\$175
1800	900	\$250
1900	1625	\$850
1950	2515	\$2030
1975	4080	\$4640
2000	6120	\$8175

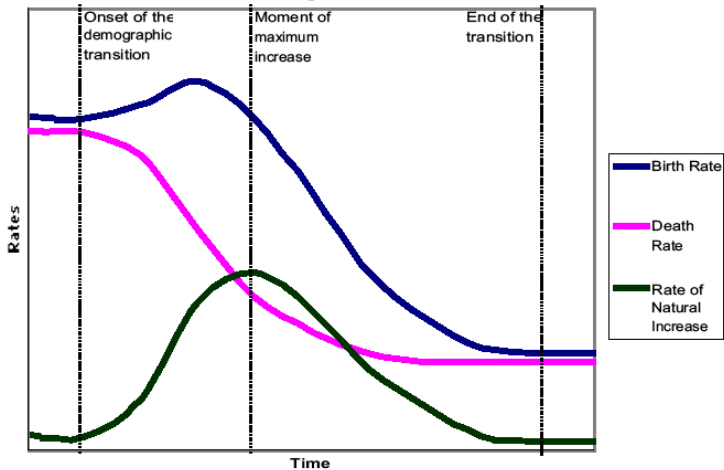
*Millions

**In year-2000 international dollars.

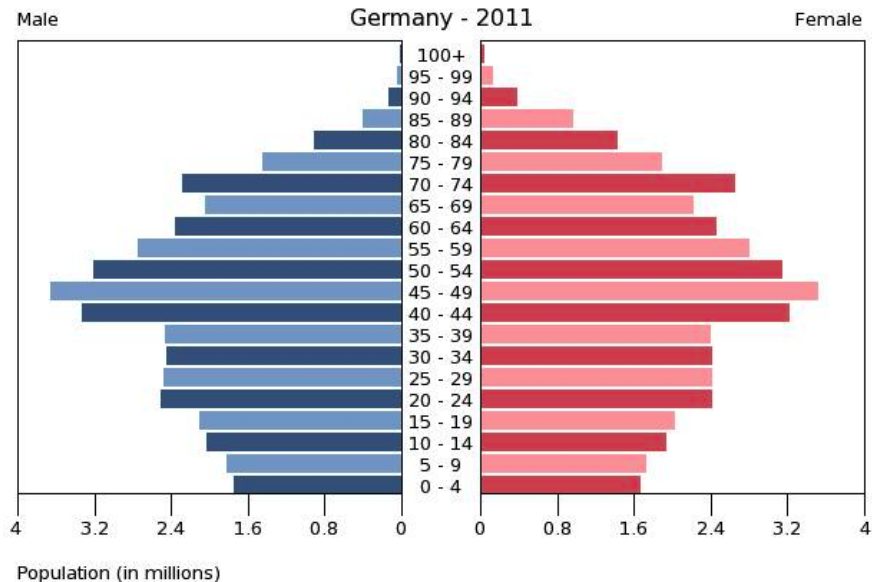
World Population Since 1000



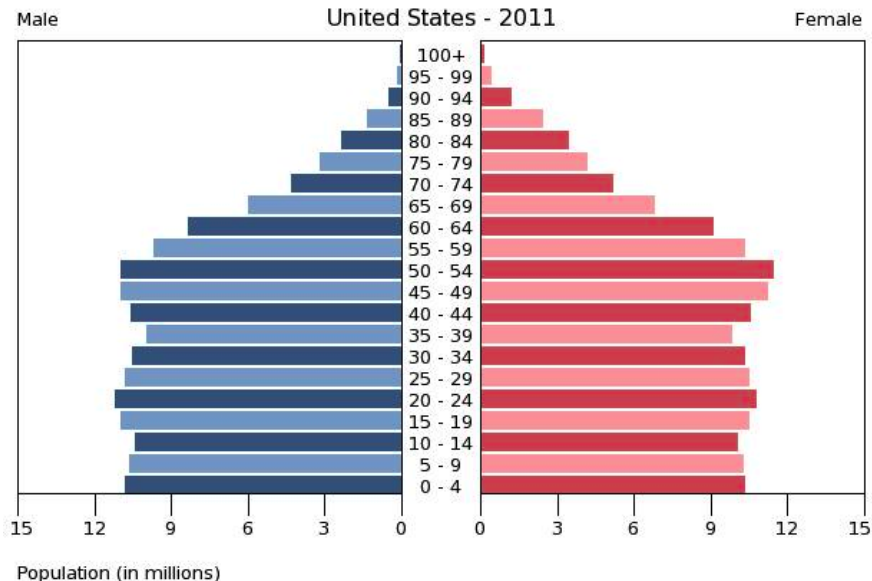
The Demographic Transition



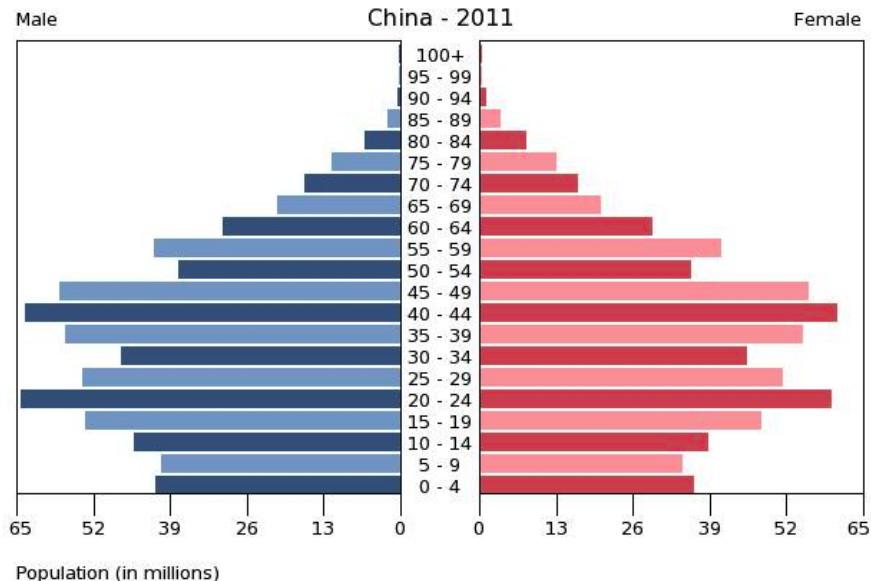
Population Pyramid for Germany



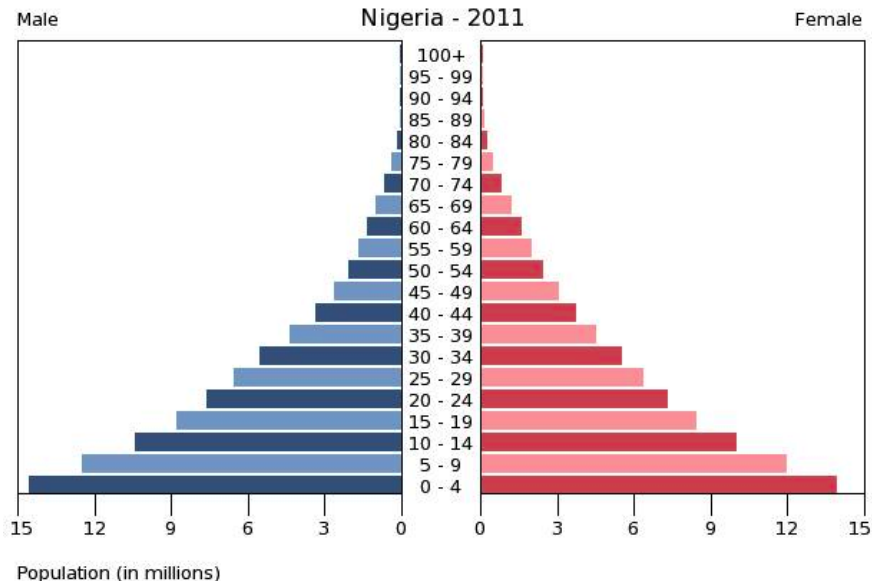
Population Pyramid for the United States

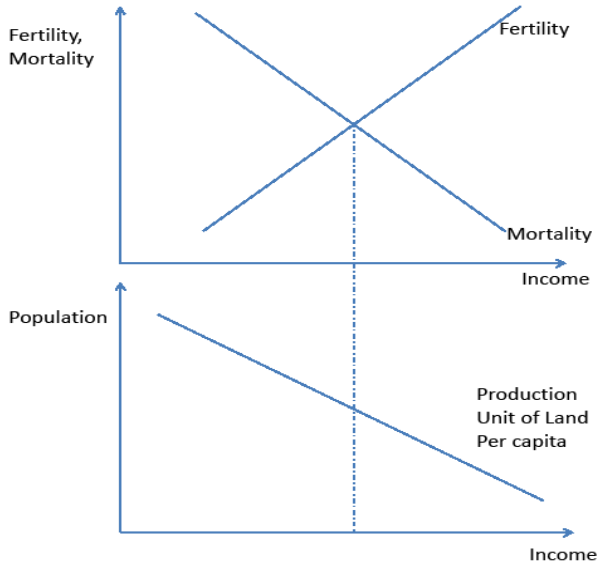


Population Pyramid for China



Population Pyramid for Nigeria





Interpreting Comparative Statics I

- Let us suppose that in a Malthusian world, we have two countries, one with better health conditions (i.e., better medical system, more vaccines, or better sanitation).
- The first country will have a lower mortality line.
- From our previous analysis:
 - 1 Income per capita will be lower in the first country.
 - 2 Population density will be higher.

Historical Example

- Preindustrial Europe was particularly filthy, specially in comparison with Japan.
- Simultaneously, Japan was poorer and had a higher population density.
- Evidence:
 - ① Cleanliness of Japanese was emphasized by European travellers between 1543 and 1811.
 - ② Toilets in Japan were built at some distance from living quarters, in England even the upper classes built their toilets adjacent to the bedrooms.
 - ③ Houses in Japan had raised wooden floors and outside shoes were taken off at the entrance. In England, dwelling had beaten earth floors covered by rushers that were only infrequently renewed.
 - ④ In the 1710s, English per capita soap consumption was less than 0.2 ounces per day. Convicts transported to Australia around 1850 got a ration of 0.5 ounces per day.

Interpreting Comparative Statics II

- Let us suppose that in a Malthusian world, we have two countries, the first with higher productivity than the second.
- From our previous analysis:
 - 1 Income per capita will be the same in both countries.
 - 2 Population density will be higher in the first country.
- Historical Example: China versus Europe.
 - 1 Rice delivers more units of calories per unit of land than wheat:
 $\text{productivity}_{\text{rice}} > \text{productivity}_{\text{wheat}}$.
18th century, one hectare produced if 7.5 million calories if Rice, 1.5 if wheat, 0.34 if meat.
 - 2 Hence, income per capita will be roughly the same but China will be more dense.
- Cultivation of different cereals may have many important consequences for economic growth and social organization (Wittfogel, *Hydraulic Despotism*).

Interpreting Comparative Statics III

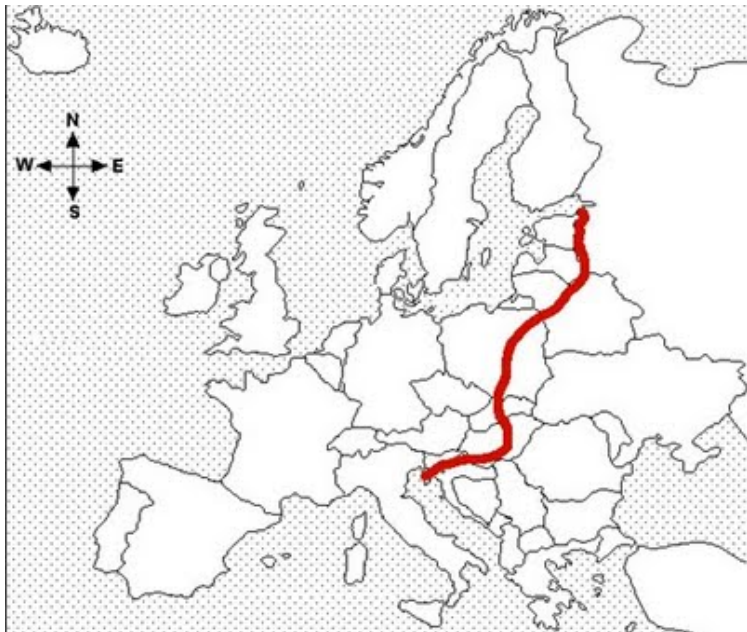
- Let us suppose that in a Malthusian world, we have two countries, the first with an Emperor that taxes τ of agricultural production to finance his own private consumption, for example a great palace.
- We have that the after-tax income is then $\tilde{y} = (1 - \tau) y$.
- With this new technology level, the analysis goes through unchanged with respect to previous case:
 - 1 Income per capita will be the same in both countries.
 - 2 Population density will be lower in the first country.

Political Economy Consequences

- Hence, in some sense, the cost of the palace is less population, not a lower income for the actually existing population.
- Similarly, having a landed gentry obtaining a huge rent from farmers only implies lower population, not higher income:
 - ① Elites may live much better if productivity increases (and hence taxes), even if the average person does not improve.
 - ② Strong limit to the effects of redistribution.
- Historical example: land reform in France during the revolution.

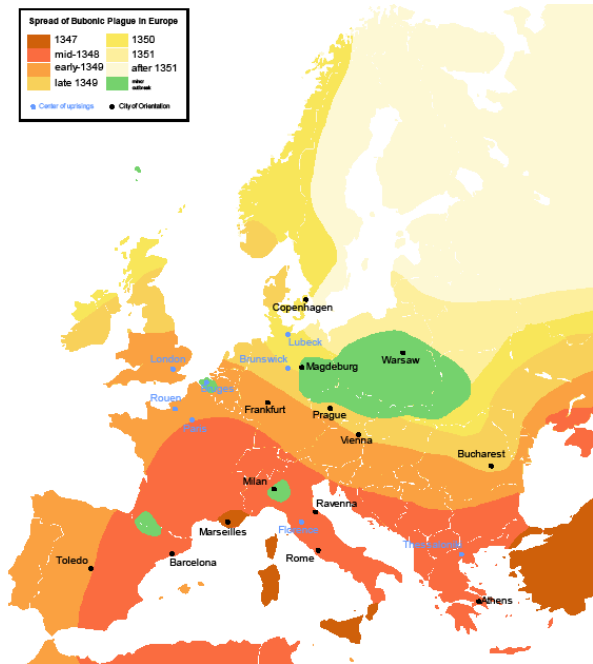
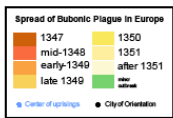
Historical Example

- Line between Saint Petersburg to Trieste.
- European Marriage pattern:
 - ① High marriage age of women (around 25-26).
 - ② A substantial proportion of women remained celibate (around 25%).
- It seems to appear in the later Middle ages.
- Why?
- Consequences.
- Alternative approaches: abortion, infanticide, extended lactancy.



Dynamics of the Model

- Population grows when density is low and income per capita is high.
- Let us suppose we are at steady state and that an epidemic wipes out 50 percent of the population:
 - 1 Income per capita will immediately rise by.
 - 2 Population will begin to increase (lower mortality and higher fertility).
 - 3 Eventually, we will end up in the same steady state as before.
- Historical example: Black Death in Europe in 1348.
- Robert Brenner's view: economic transformation in Europe.



Real Agricultural Day Wages, England, 1209-1869

