

MCDB 150 Global Problems of Population Growth Lecture 8 Notes

Last time we discussed two factors that retarded Europe's progress:

- 1) A mindset that still largely focused on the supernatural and did not question received wisdom by testing it against some kind of empirical experience.
- 2) A food/population balance that left vast numbers of people in conditions of near starvation.

From around 1700, Europe started to outgrow these limitations.

- 1) We saw how the scientific revolution, given great impetus by the fabulous success of Newton's very simple laws, led to a new era of rationality called the Enlightenment.
- 2) At about the same time, as you have learned from your readings, new foods from America, primarily potatoes, allowed a tremendous increase in agricultural productivity.

The increase in food generated a boom in the population.

The population of Europe grew by 62%.

Tilly p182 bottom:

Now the standard belief at that time was that a high population was a good thing.

JJ Rousseau *The Social Contract* 1762. (p310 Gillis, *The European Experience of Declining Fertility*) The government under which ... the citizens do most increase and multiply is INFALLIBLY the best. Similarly, the government under which a people diminishes in number and wastes away is the worst.

A struggle for Power. Theodore Draper *Random House* 1996 E210 D73X 1996 (LC)

Short ref to French Canada as requiring Brit Protection of America in B. Tuchman: *First Salute* p135.

p 12 Benjamin Franklin (1751) argued that there were

"upwards of One Million English Souls in North America."

This Million, doubling suppose but once in 25 years,

will in another century be more than the People of England,

What an accession of Power [this will be].

Thomas Jefferson often said: "Population is Power".

Jefferson's Great Gamble: Charles A. Cerami 2003 p123:

In 1800, when the US was only about 10 years old, Napoleon was thinking about sending troops to Louisiana, which France had recently acquired from Spain.

The US objected.

The French Ambassador thought that Napoleon's plan was stupid.

He "simply sent Napoleon a summary of the American census of 1800,

which showed a doubling of the US population every 22 years.

There was no way that France could hold Louisiana against American objections.

Napoleon then sold Louisiana to the US for a pittance.

Seen from above by Governments

Large populations are wonderful because

1) more men are available for your army.

and 2) many people produce a lot, which makes for a large tax base.

This attitude toward power was suited to a situation where there were no limits to resources.

It is the situation I described to you wrt traditional Africa

It applies when land and other resources are plentiful and people are scarce.

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The reality was different. Land was limiting

Tilly p181-3: After 1750, people filled the European countrysides to overflowing

Mountains spilled over with people, cities grew, and the plains became full.

“this increase in population brought many more mouths to feed.

Tilly p182 bottom:

Population rose and Resources could not match the population

Prices rose and rural poverty deepened.

Tilly p184 (bottom)

The line between migration and vagabondage was crossed by hundreds of thousands of Europeans.”

Vast numbers of Vagrants and beggars flooded the highways of France , Germany, and the Low Countries

Their children crowded orphanages and foundling homes;

women and children begged on church steps and roadsides.

This problem of poverty was much observed and commented upon

All the major intellectuals of the day commented on it:

For instance, Edward Gibbon, famous from his book: The Decline and Fall of the Roman Empire wrote in 1789: Macfarlane, p11

“In the civilized world, the most numerous class is condemned to ignorance and poverty.

There was a general belief that poor people were poor because they were in some way deficient.

God had given some people – kings and aristocrats the abilities and capabilities to rule – and all others were relegated to the lower classes.

They had bad heredity, they were lazy, they were “the wrong sort.”

They were inherently incapable.

Then America opened up for colonization – mainly by the British and, largely, the lowest orders of people moved there.

But, they thrived. They made a strong and intelligent new country.

They did not fit the theory.

So this required revisiting the question of why the poor were poor in England?

The Bible, which all intellectuals of the time knew very well, had a more sophisticated take on the problem: It admitted that production could increase.

Ecclesiastes 5:11: "When goods increase, they are increased that eat them"

Quoted in Demeny PDR 29(1):15

Edmund Burke, Father of Conservative Political Philosophy, 1795

Details on Scarcity. quoted in David Levine, At the Dawn of Modernity, 2001. p7:

"The labouring people are only poor because they are numerous.

Numbers in their nature imply poverty.

In a fair distribution among a vast multitude, none can have much."

People began to think about the relationship between population and resources?

Natural History, the study of plants and animals in their natural habitats, was getting going then.

Adam Smith paid great attention to it: Wealth of Nations 1776

Macfarlane p16

"Every species of animal naturally multiplies in proportion to the means of their subsistence, and no species can ever multiply beyond it.

MEN, LIKE ALL OTHER ANIMALS, naturally multiply in proportion to THEIR means of subsistence."

How fast could humans multiply?

David Hume, 1742 Macfarlane p15 "Almost every man, who thinks he can maintain a family, will have one; and the human species, at this rate of propagation, would more than double every generation."

Adam Smith realized that an increase in wages would lead to an increase in population – he explicitly says it would lead to a decline in mortality.

But he apparently never realized that the competition for jobs engendered by this increase in labor would bring wages right back down.

That was the great achievement of Malthus. He realized that population and an improvement in living standards were locked in a negative feedback loop.

He argued that while the economy could grow –

it could not improve per capita income.

In the strongest way of saying this, economic progress was not possible.

At the end of the 18th Century, Malthus was aware of these two contradictory changes:

Agriculture was improving – there was more food grown,
But, nevertheless, poverty was growing.

Malthus' argument is based on a few very simple and obvious statements

Each man does some work. Doesn't just take from a fixed economic pie,

But increases the size of the pie.

For instance, In US colonial times, the vast lands to the West allowed each new person to get wonderfully fertile land and to produce as much as previously settled people.

Per capita income did not decrease.

But – this was not the condition for England or the rest of Eurasia.

There the law of diminishing returns takes effect.

The best land is used first.

More people must use less productive land.

Economic output grows more slowly than population.

The average goes down.

As population grows, the living conditions get worse.

Everyone must engage in some form of economic activity,

But it may not increase the pie by much

Women with very little to sell at Bolivian markets

Buying socks in Peru.

So Malthus was well aware of the law of diminishing returns, but he also was aware of a countervailing effect.

He was aware of technological improvement.

By his time new foods had come in from the Americas.

Agronomy was becoming a science whereby farmers could learn

how to get more production out of the same amount of land.

So, as time goes on – and population grows, these two opposite factors come into play- law of diminishing returns versus technological advance

Which of these would predominate?

England, then the most technologically advanced country in Europe,

He observed that agricultural output was growing steadily over time.

He described this as an 'arithmetic progression' of total food output.

We would now call it linear growth and would visualize it as a graph with food production rising in a straight line over time.

But, – population can grow faster than that.

If a couple has 4 surviving children – and those children have 4 and so on the population grows like 4, 8, 16, 32

Malthus used the term geometric progression for this kind of accelerating growth. We now call it exponential growth,

Malthus described this in mathematical terms

Population grows exponentially (geometric ratio)

But production grows less slowly (arithmetically).

SLIDE

Exact mathematical form is unimportant. If population grows faster than food (or any other resource) - then eventually disaster happens.

Malthus wrote in 1798. He was a very good historian. He painstakingly collected what was known about population all over the world and, given his sources, he was amazingly accurate in his description of the preceding several centuries.

His writings were controversial from the day they were published. However, when the Irish potato famine of 1840s occurred millions died or had to emigrate. The famine was taken as a spectacular confirmation of Malthus' theories. Unfortunately Malthus was dead by that time.

Wheat yield is 4.2 Meg KCal/hect; potato=7.5 Meg KCal/h Cohen pg 43

Malthus was right, and Malthus was wrong.

He was correct about the situation of Europe in the hundreds of years up to his time.

He was correct for about 80 years after his time.

I'll describe that to you in a minute.

He didn't have a crystal ball – so he didn't foresee two phenomena of the next century.

Malthus lived at the very beginning of the Industrial Revolution. Production was increasing very slowly. He didn't know that Production could grow exponentially. As a society produces more, it can invest more in science and technology. As it invests more, productivity can grow at an ever faster pace. So, production can also grow exponentially.

When we say our economy grew at 2% a year – we are describing exponential growth. A certain percentage of the base each year. As the base grows – the AMOUNT of the annual increase grows. Just like population.

So production can keep up with population.

AS LONG AS THERE ARE NO LIMITS.

Now we seem to be at a new kind of limit.

Population has increased dramatically all over the earth.

Almost everything which can be used by humans is being used.

The new limit seems to be the environment – the resources of the whole planet.

Now, the 2nd thing that Malthus didn't foresee, was a drop in the birth rate.

Malthus believed that the sex drive was an instinct that would not go away.

He also was very opposed to contraception, and did not believe that it would become widespread..

So he thought the birth rate would continue as it always had been.

What actually happened was that production started increasing exponentially,

AND the birthrate started dropping.

The combination of these two factors has allowed production to keep up with population.

In fact, since Malthus' time, production has more than kept up with population.

The average income of the world has risen dramatically.

Malthus is now widely attacked because he didn't have a good enough crystal ball.

His predictions were only correct for less than a century.

But if we rephrase his ideas very slightly – Malthus is as relevant today as ever.

1. Instead of asking whether population growth absolutely stops per capita growth of income we ask whether conditions in countries with high population growth would have MORE per capita growth of income that would have relieved poverty faster. That is, would conditions be better?

2. Instead of asking whether food is the limiting factor, we ask whether the environment is the limiting factor when considering ever more rapid growth of population and production.

1. STOPPING

An amazing thing happened in about the middle of the 18th century.

The French stopped having a lot of children.

The age of marriage didn't change much.

The age at first birth didn't change much

The interval between babies didn't change much

But, the age at last birth dropped by 10 years during transition. Livi-Bacci pg 130.

People were clearly deciding how many children they wanted – and then stopping.

No one really understood the change, but they were horrified by it:

John Adams and his wife, Abigail, visited France at that time (1783),

she was distressed at French people's "feeble commitment to family life" exemplified by the French family's 3 or 4 children, whereas Americans often had eight or nine.

They were equally horrified by the French upper classes

"easy acceptance of adultery"

This they found was an indication of "general moral and societal disintegration.

John Adams said "The French are not a moral people."

Harvey Levenstein, *Seductive Journey*. Univ Chicago Press 1998. Reviewed in NYT Book Review 10/25/98 by Deirdre Bair

Within a century after France initiated this reduction in childbearing,

the whole of Europe started controlling their fertility by this "stopping" behavior.

Period of drop from 30 children/1,000 women to 20/K Chesnais Fig. 4.12 p 133. BAR GRAPHS SLIDE 1

In another century Asia and Latin America would follow suit.

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2. THE DEMOGRAPHIC TRANSITION

The two phenomena that we have just discussed:

- 1) The drop in mortality
- 2) The drop in fertility

are together called "The Demographic Transition".

It is usually schematized as in the following graph

SLIDE 2

There are two stages. First, the mortality rate falls – then after a delay, the fertility rate falls.

Before the transition – the birth rate and the death rate are both high.

There is little population growth.

After the transition – the birth rate and the death rate are both low.

There is little population growth.

During the transition, the mortality rate is below the birth rate. Population increases. If, during the transition, the difference between the birth and death rates is large and the delay between the two phenomena is long,

– a population explosion happens.

So MAJOR POINT: The Population explosion was not caused by an increase in the birth rate but by a decrease in the death rate!

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2. THE DEMOGRAPHIC TRANSITION IS ONE OF THE MOST FUNDAMENTAL CHANGES IN THE HISTORY OF HUMANKIND

There is a tremendous increase in the number of humans that are alive.

Individual humans get to live about 3X as long

And they don't spend all of their adult lives in a desperate battle to keep a large number of children alive.

No one is particularly surprised that people don't want to die.

So, it is to be expected that when rational attitudes toward sanitation and public health come into play, the death rate drops.

But the drop in fertility is quite shocking.

We know that all the biological drives - since the beginning of evolution-

Are focused on maximizing the rate of successful reproduction.

We've seen that all the great cultures and religions focus on maximizing the rate of successful reproduction.

And yet, within the space of a hundred years – people start dropping their fertility everywhere.

AMAZING.

Something very powerful must be going on that causes this change almost everywhere.

WHAT IS IT? WHAT CAUSED THE GREAT FERTILITY DECLINE?

3. CONTEMPORANEOUS EXPLANATIONS

People at the time were dumbfounded:

The French fertility drop came at a time when France was at the very forefront of world culture and of world power.

Why should some of the world's richest and most advanced people stop having children?

Why should a country whose people were almost totally Roman Catholic stop having children?

Various historians have various theories:

"The reasons for the French fertility decline lie in the moral and religious reassessments that occurred in the tumultuous years of the French Revolution." Caldwell PDR 25:479 (9/99)

Clearly a reassessment of sexual morals was taking place:

Great French Novel 'Madame Bovary,' (Gustave Flaubert, 1856). Considered the 1st modern novel and one of the greatest of all time. Madame Bovary is a young married woman with a child. She has a husband who adores her and is quite permissive. But she considers him "boring". So she takes an exciting lover (and not only one).

I won't give away the plot, but this apparent justification of an extramarital affair BY A WOMAN utterly shocked France. (Of course it was completely acceptable for a man to have affairs.)

Flaubert was promptly arrested and prosecuted by the government "for affronting religious morality"
And everybody read the book. NYT Book Review 4/16/06 p11

in English speaking countries, the example of France, and the impact of its ideas, especially in novels, were widely blamed for fomenting extra-marital liaisons, and by implication, the use of contraception. Caldwell PDR 25:485 (9/99)

20 years later (installments from 1873-6), in Russia, Tolstoi uses a similar plot in "Anna Karenina" and introduces the same ideas to the Russians.

3. QUANTITATIVE EXPLANATIONS

After the European transition was over (about 1930),

Social Scientists started thinking about the transition in less moralistic terms

and tried to find more quantifiable explanations.

PRINCETON PROJECT studied statistics from every Province of Europe in an effort to demonstrate the causal factors.

EXPLANATION 1 Given the schema of the demographic transition, SLIDE 2

the most obvious conclusion is that the Fall in the Death Rate CAUSED the fall in the Birth rate.

The argument usually goes: People want to have a certain number of surviving children,

When the death rate is high, variable and unpredictable, you have to have a lot children to make sure that at least a few survive.

As infant mortality declines, after a suitable delay, people realize they don't need so many babies in order to ensure that some will stay alive – so they reduce their birth rate.

It is still a very common explanation.

A GREAT THEORY. But, does the data support it?

In some countries, yes.

NORWAY, Ches 227 3

But in some NO

In England, for example, fertility fell before mortality

SLIDE 122----> 4

In France, fertility falls by 1825 (many authors put it earlier)

Combined Bar Graphs 5

But mortality doesn't fall till ~75 years later (~1900)

Lets compare the sequence of mortality and fertility falls in the various countries of Europe:
Norway and Denmark, which led in the mortality drop are securely in the middle of the fertility drop.
France which was WAY OUT in FRONT in the fertility decline

Are middling in the mortality decline.

Overall the Princeton Project found all the possibilities: Coale 436

Let's try to spin this a whole lot of different ways:

Instead of looking at one point in time - lets ask at what level of mortality does fertility start to decline. Chesnais 147

Infant Mortality:

infant mortality rates just before the drop in fertility

You see basically the whole range - from 100 to 300 (10% to 30%)

Chesnais p148 SLIDE 126 6

Total Mortality:

In France fertility began to fall when mortality was 35/K

Czechoslovakia, Hungary and Poland it was 30/K

In Germany and Switzerland it was 25/K

In India 20/K

In Scandinavia 15-20/K

South Korea, Egypt Tunisia and Brazil 15/K

Mexico and Taiwan 10/K

Given that the total range of mortalities that humans have experienced ranges from 40/K in primitive times to 5/K in Japan today

Finding that the fertility decline can start at a mortality of anywhere
from 35/K to 10/K - means it can start at any possible level.

PRINCETON PROJECT CONCLUSION:

MORTALITY AND FERTILITY WERE FALLING ALL THROUGH THE PERIOD.

BUT ==YOU CAN'T MAKE A CONVINCING CASE THAT THE FERTILITY DECLINE WAS
RELATED IN ANY SIMPLE WAY TO THE MORTALITY DECLINE

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4 ECONOMIC DEVELOPMENT

The next most commonly referred to factor is economic development:

As people become richer, they have fewer children

Let's look at a graph of this:

in every country as per capita income grows, fertility falls.

Case Proven!

Not so fast.

Is there a particular level of income at which fertility falls?

Well, the answer is no.

Look at France and Sweden - their fertility starts falling at an income of about \$180 per capita per year.

Here's Italy - it takes twice as much money to keep an Italian out of bed.

Convincing proof that Italian men are sexier than French men.

By the time France and Sweden reach an income of \$700 - their transition is essentially completed.

But Italy completes its transition at an even lower income \$600

Yet here is England. Its transition doesn't get started until about \$700

So at an income where Italy, Sweden and France have finished their transition

England is just beginning.

Other countries, like Germany, are somewhere in between.

One can extend these comparisons to currently developing countries:

When the British fertility decline began the real per capita income level was 5 times what it was in India and 4 times the level of Sri Lanka or Kenya when they started their fertility decline.

The Princeton study could not substantiate the hypothesis.

That a rise in income causes the fall in fertility.

5 OTHER FAVORITE FACTORS & HYPOTHESES

The Princeton project went through the same kind of analysis for: Cohen p59

LITERACY: Fertility began to fall when literacy was low in France, Bulgaria and Hungary - but high in England and Wales.

URBANIZATION

When the fertility decline began in Netherlands, Scotland, England and Wales, more than 70% of the population was urban.

But in France, Sweden, Finland, Hungary and Bulgaria less than 20% of the population was urban.
Coale & Watkins 1986 p235

INDUSTRIALIZATION

When fertility started to decline in France, Bulgaria and Hungary, they were largely still agricultural.

But fertility didn't decline in England until ~80% of the British labor force worked outside agriculture, See Table 1.1 p18 in Continuing Dem Transition

When fertility started to decline in England, the population was only 28% rural and only 15% of the men were still employed in agriculture.

This is several times the level found in most of contemporary Asia and Africa.

EDUCATION - Male and or Female

Education is the best correlate of fertility decline. Especially education for women.

But we have the same problem as with all correlations: it doesn't provide evidence of causality.

We don't know if it's education of the mothers that matters – or education of the daughters.

Education for mothers may equip them to get a paying job – that would pull them away from spending time childbearing and child raising. This is part of an economic explanation.

Or, education might make new ideas available to women and thus be part of a cultural explanation.

The Princeton study concluded that: Cohen p60

There is no evidence that indicators of socio-economic development can explain the timing of the fertility decline. Large differences existed in the level of development of European populations at the start of their fertility transitions. There is no definable threshold of social or economic progress required for the transition to begin. An empirical relationship between fertility and any of these variables in one European country does not allow one to predict what is going to happen in another country.

6. DIFFICULTIES OF INTERPRETATION OF PRINCETON PROJECT

The period of the fertility transition was one of rapid change in Europe. Almost anything one could measure was changing – and was either going continually up, (income, literacy, urbanization, industrialization, education) or continually down (infant mortality, overall mortality). Fertility was going continuously down.

The previous slide showed income on the horizontal axis:

SLIDE 27 AGAIN

You could put almost anything on this axis:

Urbanization, industrialization, education, women's employment, literacy or even just the year

and they all would increase as countries modernize and at the same time fertility would be falling -

So they would all give you graphs with the same general shape as the graph for income. The countries might shift positions, put all the curves would fall from left to right.

Hence, all of these factors will correlate (either positively or negatively) with fertility.

It is hard (or impossible) to determine which one (or combination) is the 'real' determinant of the fertility drop.

The problem in all these studies is that everything is changing at once.

As countries modernize - everything you can measure changes

How do you know which variable is the important one.

(The Princeton Project demographers were, of course, well aware of this problem.)