

Econ 210a: 2023-01-18 We 13:00 PST: DeLong

- This week's readings:
 - **Robert M. Solow.** 1985. "Economic History and Economics." *The American Economic Review* 75 (May): 328-331 <<https://www-jstor-org.libproxy.berkeley.edu/stable/pdf/1805620.pdf>>.
 - **Jared Diamond.** 1999. "The Worst Mistake in the History of the Human Race." *Discover Magazine* (May) <<http://discovermagazine.com/1987/may/02-the-worst-mistake-in-thehistory-of-the-human-race>>.
 - **Richard Steckel.** 2008. "Biological Measures of the Standard of Living" *Journal of Economic Perspectives* 22 (Winter): 129-152 <<http://www.acaweb.org/articles.php?doi=10.1257/jep.22.1.129>>
 - **Gregory Clark.** 2005. "The Condition of the Working Class in England, 1209–2004." *Journal of Political Economy* 112 (December): 1307-1340 <<https://www-jstor-org.libproxy.berkeley.edu/stable/10.1086/498123>>.
- This course works much better as discussion: the 10%-30%-90% rule...
- But the first day of school is different—we will see what we can do...

Preliminaries...

- Introductions...
- Syllabus: <<https://bcourses.berkeley.edu/courses/1521277/files?preview=85041115>>
 - Paper
 - Participation
- Does this course need justification?
- **Robert M. Solow.** 1985. "Economic History and Economics." *The American Economic Review* 75 (May): 328-331 <<https://www-jstor-org.libproxy.berkeley.edu/stable/pdf/1805620.pdf>>.

Solow: "Economic History & Economics"

Robert M. Solow. 1985. "Economic History and Economics." *The American Economic Review* 75 (May): 328-331 <<https://www-jstor-org.libproxy.berkeley.edu/stable/pdf/1805620.pdf>>:

- "If the project of turning economics into a hard science could succeed, it would surely be worth doing. No doubt some of us should keep trying.... I suspect that the attempt... is doomed..."
- "Economics is a social science... subject to Damon Runyon's Law that nothing between human beings is more than three to one..."

Olivier Blanchard on Inflation: March 2022

Olivier Blanchard. March 14, 2022. "Why I worry about inflation, interest rates, and unemployment" *PIIE* <<https://www.piie.com/blogs/realtime-economic-issues-watch/why-i-worry-about-inflation-interest-rates-and-unemployment>>:

- "The only potentially valid comparison (with all the caveats listed below) is between the 1975–83 episode and the current one.... What happened when the Fed got seriously "behind the curve" in 1974–75. The real rate and inflation moved in opposite directions, very much like today.... It then took 8 years, from 1975 to 1983, to reduce inflation to 4 percent, with an increase in the real rate from bottom to peak of close to 1,300 basis points, and a peak increase in the unemployment rate of 600 basis points from the early 1970s."

The last time the Fed fell this far behind the curve on inflation was in 1975 and it took 8 years to bring under control

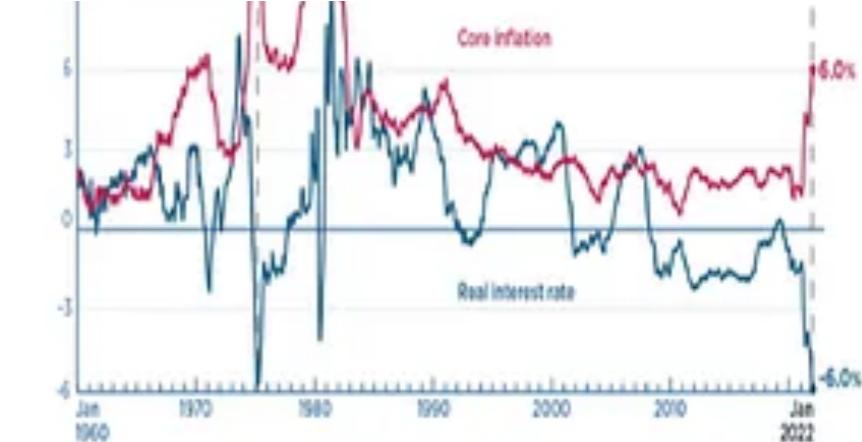


things is more than three to one....

- "The validity of an economic model may depend on the social context. What is here today may be gone... in ten or twenty years.... The economist is concerned with making and testing models of the economic world as it now is, or as we think it is. The economic historian can ask whether this or that story rings true when applied in earlier times or other places... need[s]... the ability to imagine how things might have been before they became as they now are..."

early 1970s

- "Today is obviously different in many ways.... Arthur Burns did not feel he had a mandate to execute a hard landing and William Miller did not have much time to act. Even so, together, they still had increased the real policy rate from -6 percent to about 0 percent when Paul Volcker took over. And it took Volcker another 7 percent real rate increase to finish the job and get inflation down to 4 percent by 1983.... In the 1970s, persistent inflation led long-run inflation expectations to become increasingly deanchored. They have not yet done so today.... Energy price shocks.... We might be in for a similar experience: The COVID-19 recovery already increased oil prices substantially, and the war in Ukraine could lead to a further major increase..."



A Longer View...



Malthusian Economies

- **Jared Diamond.** 1999. "The Worst Mistake in the History of the Human Race." *Discover Magazine* (May) <<http://discovermagazine.com/1987/may/02-the-worst-mistake-in-thehistory-of-the-human-race>>.
- **Richard Steckel.** 2008. "Biological Measures of the Standard of Living" *Journal of Economic Perspectives* 22 (Winter): 129-152 <<http://www.aeaweb.org/articles.php?doi=10.1257/jep.22.1.129>>
- **Gregory Clark.** 2005. "The Condition of the Working Class in England, 1209–2004." *Journal of Political Economy* 112 (December): 1307-1340 <<https://www-jstor-org.libproxy.berkeley.edu/stable/10.1086/498123>>.

Population

Current Estimates

Longest-Run Global Economic Growth

Date	Technological Ideas-Stock Growth Rate h	Technological Ideas Stock Level H (1870 = 1)	Average Annual Real Income per Capita y	Total Human Population L (millions)	Total Real World Income Y (billions)
-48000				1	
-8000				2.5	
-6000				7	
-3000				15	
-1000				50	
1				170	
800				240	
1500				500	
1770				750	
1870				1300	
2010				7600	
2100				9000	

- The labor force—the real, not the market-paid labor force—a roughly constant proportion of the population
- Hence no real distinction at this level of abstraction between **L** and **P**

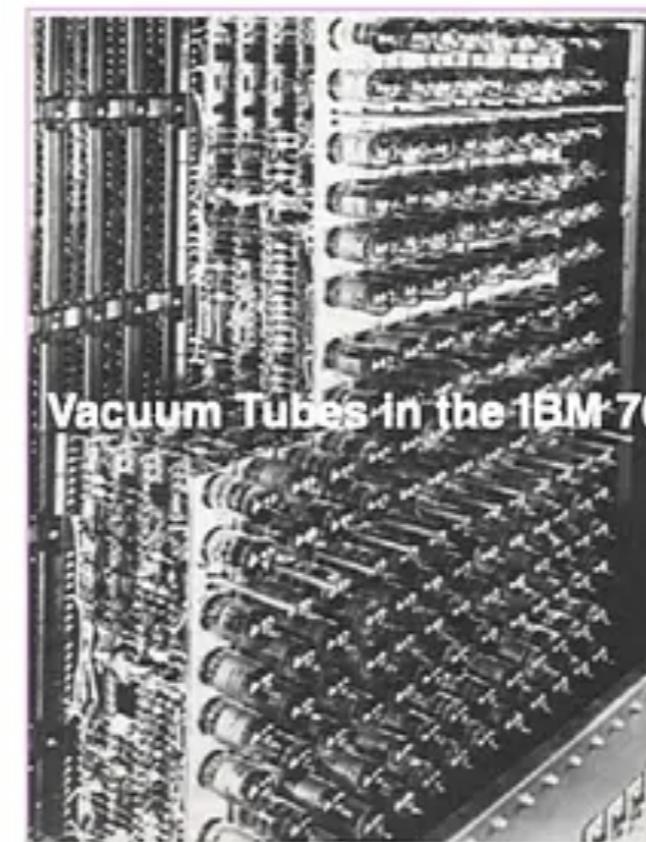
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-1000				50	
1				170	
800				240	
1500				500	
1770				750	
1870				1300	
2010				\$10,526	7600
2100					9000

Projecting into the Past Using Estimated Growth Rates

Date	Technological Ideas-Stock Growth Rate h	Technological Ideas Stock Level H (1870 = 1)	Average Annual Real Income per Capita y	Total Human Population L (millions)	Total Real World Income Y (billions)
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-6000				7	
-3000				15	
-1000				50	
1				170	
800				240	
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- How bad a thing is this to do?

From the Early 1960s: Each of These a Single Logic Gate



A glass tube filled with a vacuum:

- A NAND gate: 1" in diameter x 4" long
- Today a NAND gate is 100 nm³
- We could fit 5×10^{16} NAND gates inside one of these
- Bottom Line:
 - We produce commodities much more cheaply
 - But we also produce very different commodities
 - Commodities that could not have been produced at any price in 1960 are incredibly cheap today

Guessing at Income Levels

- Is every single one of us richer than Nathan Meyer Rothschild?
- NIPA is factor cost, but what we really want is consumer value, or rather user utility...



Projecting into the Past Using Estimated Growth Rates

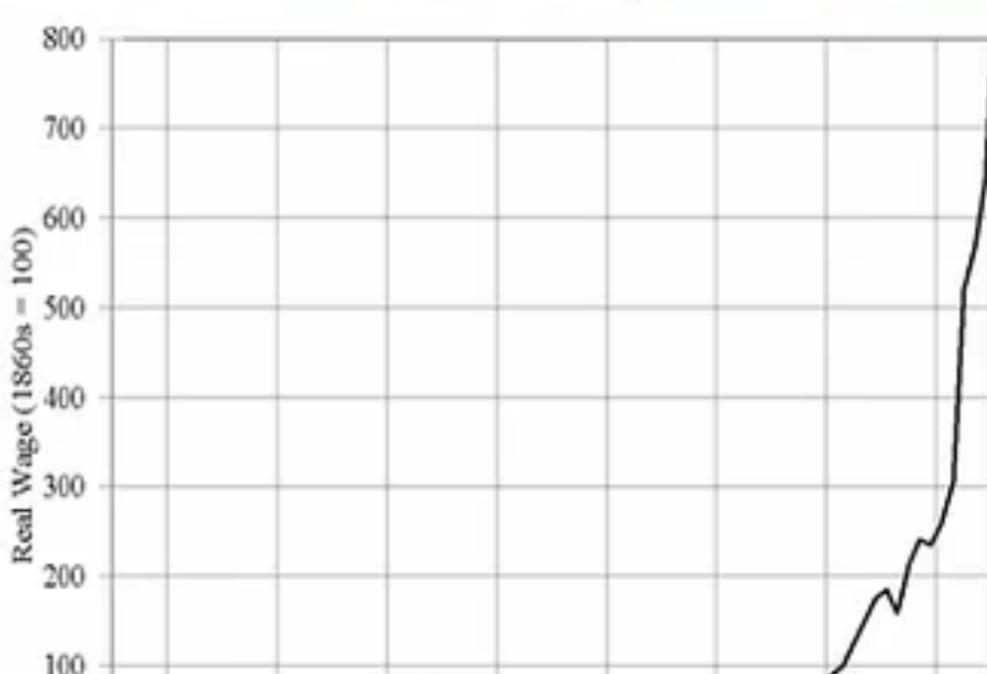
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1			\$900	170	
800			\$900	240	
1500			\$900	500	
1770			\$1,100	750	
1870			\$1,300	1300	

- Generalizing from Clark
- Generalizing from heights (lower- and upper-class)
- Generalizing from population

On the Other Hand...

- If we are so rich, why aren't we happier?

Clark: The English-Wage Hockey Stick



English construction workers

- Lots of monks in England hiring construction workers, and then writing everything down, and then saving it
- English construction workers on average earned the same real wages in 1000, in 1450, and in 1850
- In John Stuart Mill's old age—1870—they were only 20% above what they had been 400 years before.
- Yet today they stand sixteen times as high as in 1800—and maybe much more

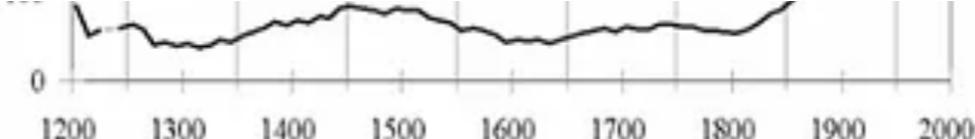
2010

2100

\$10,526

7600

9000

population
growth rates

- From Clark...

Steckel: Heights...

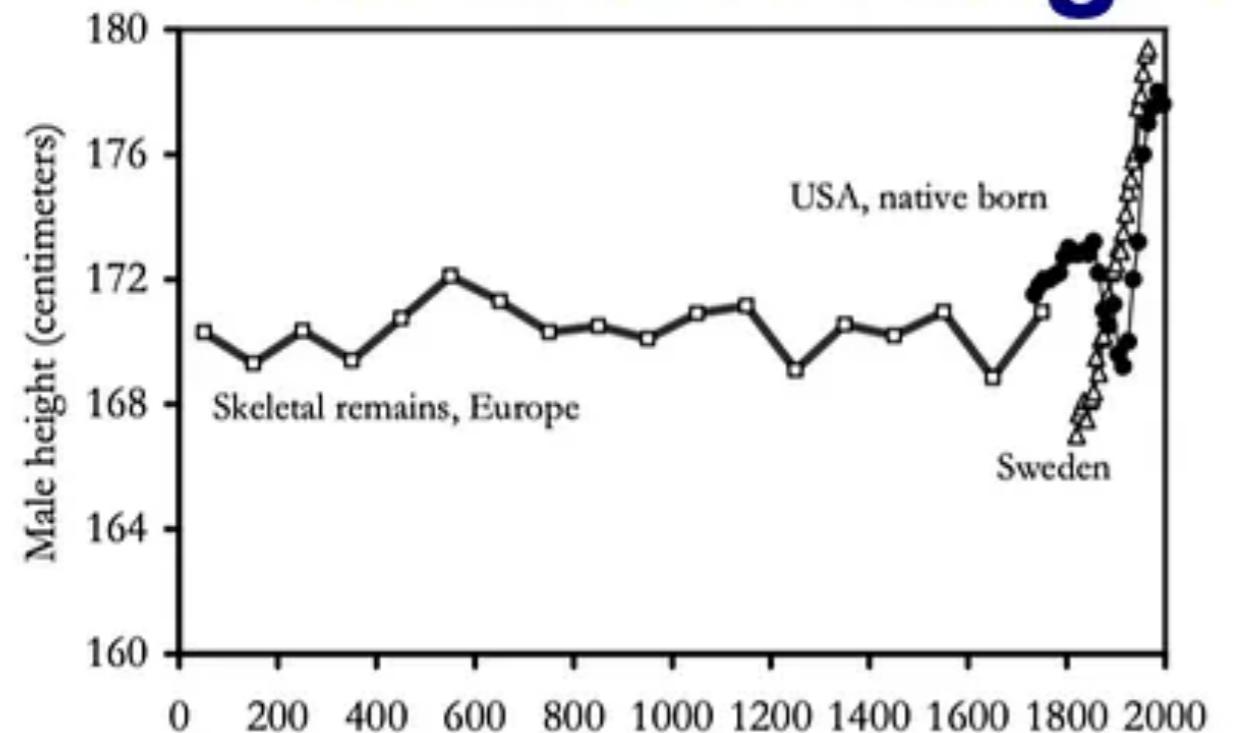
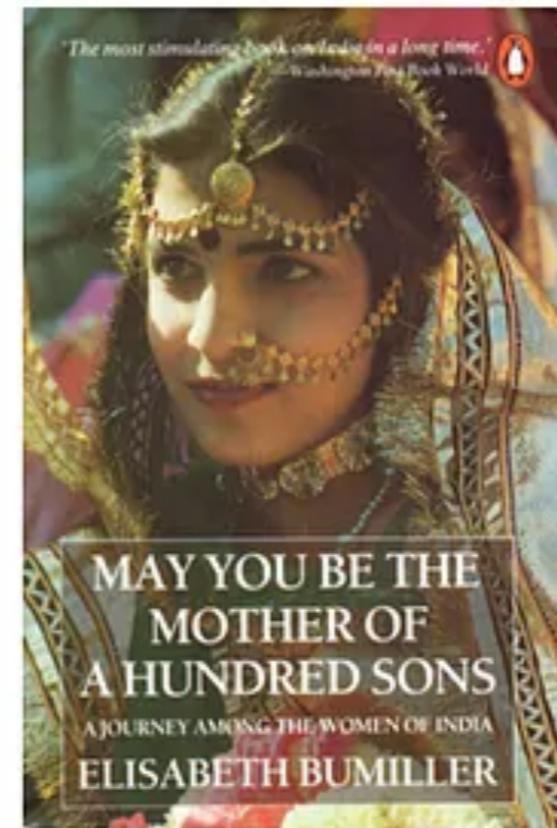


Figure 3.6 Male heights from skeletons in Europe, AD 1–2000. Data from Steckel, 2001, figures 3 and 4, and Koepke and Baten, 2005.

- What diet stunts your adult height by 8 cm?
- Upper classes 5 cm or so higher than lower classes...
- What would Alameda County child and protective services say about this?
- What constraints are parents under for this to happen?

Malthusian Demography



Social power depends on being the mother (or father, uncle) of sons:

- Technological progress is slow
- So population nearly stable
- Thus the average mother has only one son surviving to reproduce
- Some have two or three, and some have zero
- Hence very strong pressure to have as many as possible, in the hope that one will survive

- Slow population growth: average number of sons near 1
- Poisson distribution

- Two children survive to reproduce
- Three live to adulthood
- 4.5 survive to age 5
- 6.5 live births
- 9 pregnancies, with miscarriages and stillbirths

$$9 \times 9 = 81/12 = \text{more than 6 years pregnant}$$

15 years breastfeeding

21 years eating for two

1 in 7 dead in childbed?

John Stuart Mill



British polymath:

- “It is questionable if all the great questions of the day can be solved without reference to political economy.”

Inequality & Distribution

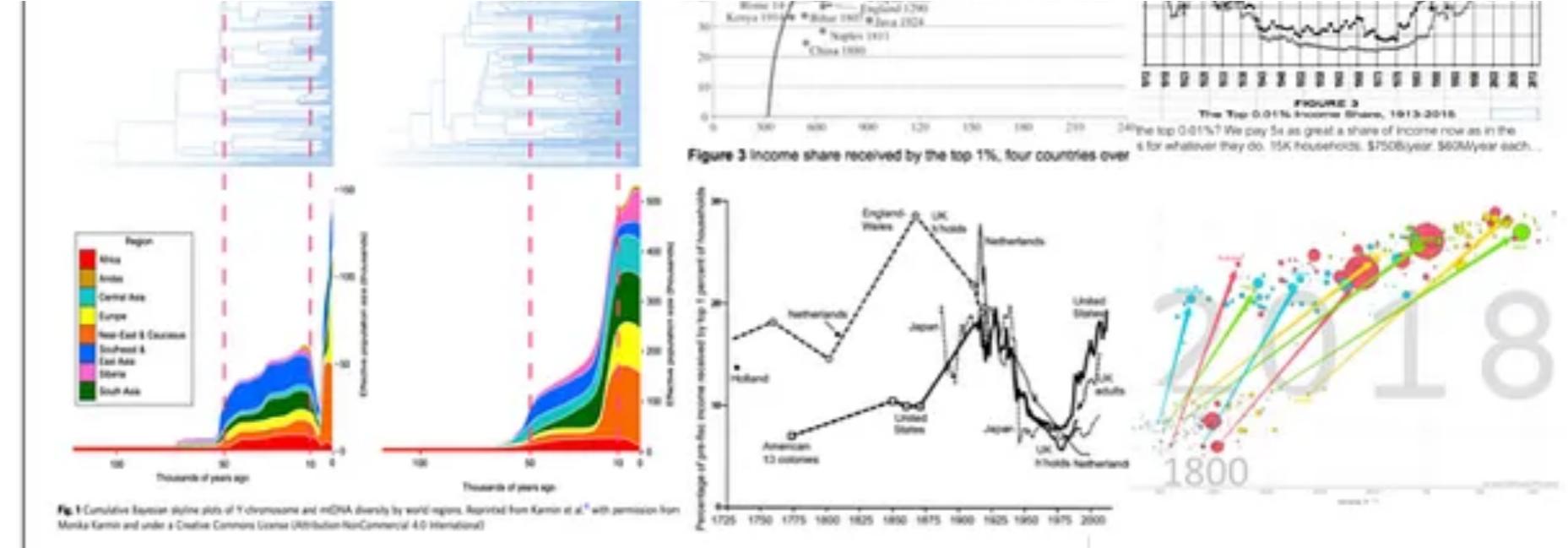


The Overclass

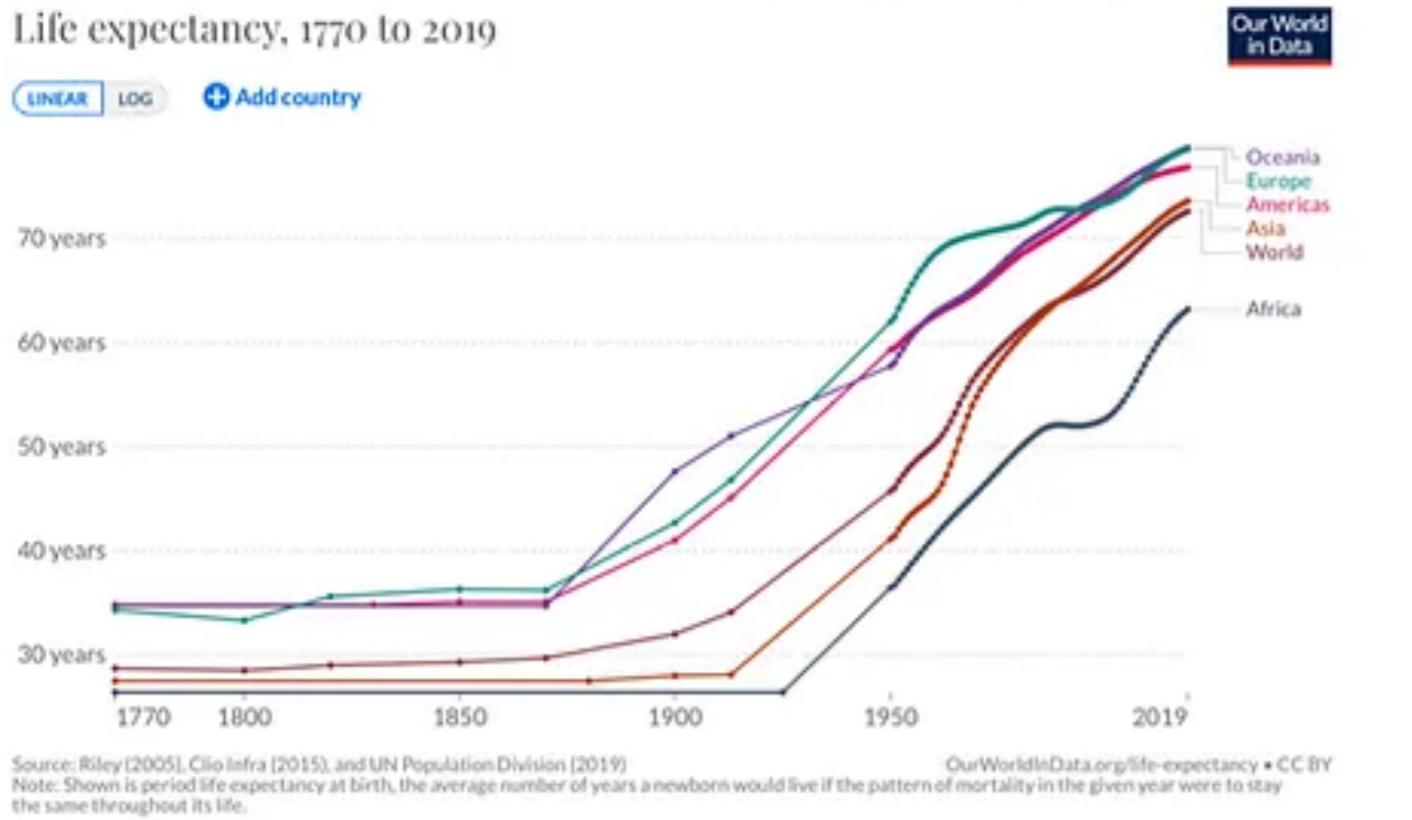


mechanical inventions yet made have lightened the day's toil of any human being.

- “They have enabled a greater population to live the same life of drudgery and imprisonment...”



Artificial Means of Birth Control, Life Expectancy, & Female Literacy



- These things have great consequences for demography
- They trigger the “demographic transition”
- The fall in birth rates and the drive toward ZPG...

Diamond: Before the Neolithic Revolution

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1770			\$1,100	750	
1870			\$1,300	1300	
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2100					9000

- Guessing from skeletal heights alone
- A different Malthusian setpoint—life was more strenuous
- It’s a jungle out there...
- Hence people as “unfit” as agrarian-age peasants would have been very likely to die...

And What Comes Next?

Date	Technological Ideas-Stock Growth Rate h	Technological Ideas Stock Level H (1870 = 1)	Average Annual Real Income per Capita y	Total Human Population L (millions)	Total Real World Income Y (billions)
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1770			\$1,100	750	
1870			\$1,300	1300	
2010			\$10,526	7600	
2100			\$58,518	9000	

- Demographic transition
- Future here right now, but unequally distributed?
- How strongly is the engine of MEG still beating?

Total World Product

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-3000			\$900	15	\$14
-1000			\$900	50	\$45
1			\$900	170	\$153
800			\$900	240	\$216
1500			\$900	500	\$450
1770			\$1,100	750	\$825
1870			\$1,300	1300	\$1,690
2010			\$10,526	7600	\$80,000
2100			\$58,518	9000	\$526,665

- By 2100, 300x the real economy of 1870
- Have to go back to -6000 for an equivalent proportional leap
- We appear near the middle of a *very, very* special time
- The LORD willing and the creek don't rise...

The Ideas Stock H & Its Growth Rate h

I define the worldwide value H of the stock of useful human ideas about manipulating nature and organizing humans invented, discovered, developed, deployed, and diffused—call it “technology”, from $\tau\acute{e}χνη$, *tekhne*, techniques or skills; and $\lambda\acute{o}γος$, *logos*, logic or rules—as:

Why \checkmark ?

- Answers?

Total World Product

Date	Technological Ideas-Stock Growth Rate h	Technological Ideas Stock Level H (1870 = 1)	Average Annual Real Income per Capita y	Total Human Population L (millions)	Total Real World Income Y (billions)
-48000	0.0256	\$1,200	1	\$1.20	
-8000	0.040	\$1,200	2.5	\$3.0	
-6000	0.051	\$900	7	\$6.3	
-3000	0.074	\$900	15	\$14	
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800	0.30	\$900	240	\$216	
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1770	0.64	\$1,100	750	\$825	
1870	1.0	\$1,300	1300	\$1,690	
2010	19.6	\$10,526	7600	\$80,000	
2100	118.4	\$58,518	9000	\$526,665	

- Technology:
 - $H = y\sqrt{P}$
 - $H_{1870} = 1$
 - Why the $\sqrt{}$?
 - $H = yP \rightarrow$ labor doesn't matter
 - $H = y \rightarrow$ resources per worker don't matter

Growth Rates h

Longest-Run Global Economic Growth

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-1000	0.030%	0.14	\$900	50	\$45
1	0.061%	0.25	\$900	170	\$153
800	0.022%	0.30	\$900	240	\$216
1500	0.052%	0.43	\$900	500	\$450
1770	0.149%	0.64	\$1,100	750	\$825
1870	0.442%	1.0	\$1,300	1300	\$1,690
2010	2.125%	19.6	\$10,526	7600	\$80,000
2100	2.000%	118.4	\$58,518	9000	\$526,665

- Technology:
 - $H = y\sqrt{P}$
 - $H_{1870} = 1$
 - Why the $\sqrt{}$?
 - What alternatives?



Dangers of Excessive Quantification

John Maynard Keynes warned us against carrying this too far:

Approximate statistical comparisons depending on some broad element of

Major Features

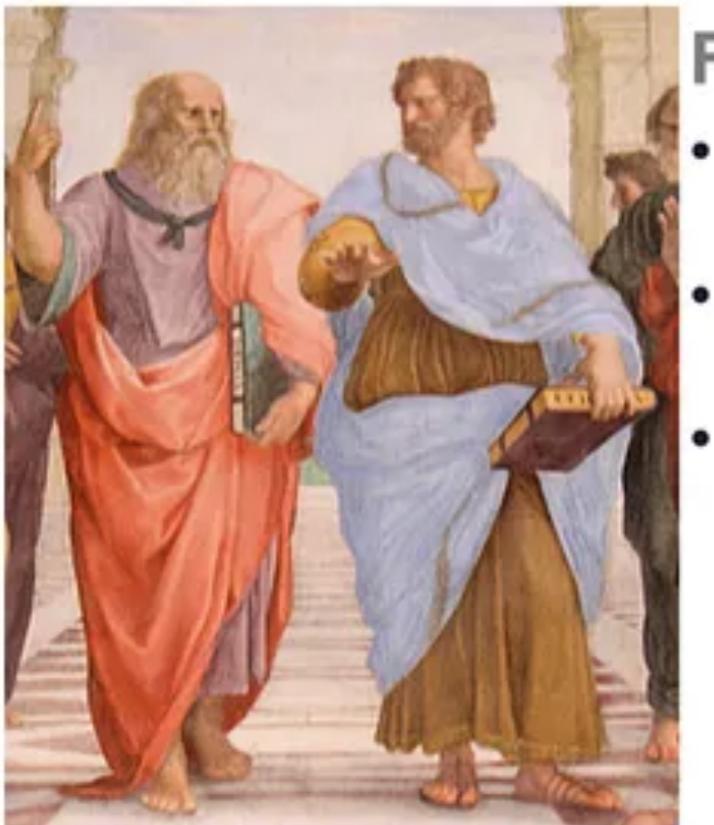
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-48000	0.0256	0.0256
-8000	0.0011%	0.040

- The Neolithic Revolution from -8000 to -6000
- The glacial pace of technological progress in the past—1870 to 2010 we saw, in an average year, 200 times the h of the early Agrarian Age. (And, of course, growth from a much, much higher pace.)
- Nevertheless, the large cumulative magnitude of technological progress.

judgment rather than of strict calculation... may possess significance and validity within certain limits. But the proper place for such things... lies within the field of historical and statistical description, and their purpose should be to satisfy historical or social curiosity... of a similar character to the statement that Queen Victoria was a better queen but not a happier woman than Queen Elizabeth—a proposition not without meaning and not without interest, but unsuitable as material for the differential calculus. Our precision will be a mock precision if we try to use such partly vague and non-quantitative concepts as the basis of a quantitative analysis...

-8000	0.0011%	0.040
-6000	0.011%	0.051
-3000	0.013%	0.074
-1000	0.030%	0.14
1	0.061%	0.25
800	0.022%	0.30
1500	0.052%	0.43
1770	0.149%	0.64
1870	0.442%	1.0
2010	2.125%	19.6
2100	2.000%	118.4

Aristotle: THE Philosopher



For, literally, millennia...

- “the master of those who know”, as Dante called him...
- Interested in *everything*—except economic growth
- Scroll I of his *Politics*
 - “household management” = oiko-nomos = economics
 - In order: bossing slaves, raising children, directing your wife, knowing market conditions

And This Is the Lot of Humanity



Unless...

A household... [needs] property as instruments for living. And... a slave is living property.... If every tool could accomplish its own work, obeying or anticipating the will of others, like the statues of Daidalos, or the tripods of Hephaistos, which, says the poet Homer, “of their own accord entered the assembly of the Gods;” if, in like manner, the shuttle would weave and the plectrum touch the lyre without a hand to guide them, chief workmen would not want servants, nor masters slaves...

The Tripods [Self-Propelled Catering Carts] of Hephaistos...



Homer: “Thetis of the Silver Feet...”

Akhilleus Needs Weapons! And Mom Steps in:

Thetis of the silver feet came to the house of Hephaistos,
imperishable, starry, and shining among the immortals,
built in bronze for himself by the god of the dragging footsteps.

She found him sweating as he turned here and there to his bellows

busily, since he was working on twenty tripods
which were to stand against the wall of his strong-founded dwelling.

And he had set golden wheels underneath the base
of each one
so that of their own motion they could wheel into
the immortal gathering, and return to his house: a wonder to look at.

These were so far finished, but the elaborate ear handles

were not yet on. He was forging these, and beating the chains out.

As he was at work on this in his craftsmanship and his cunning
meanwhile the goddess Thetis the silver-footed drew near him...



Glacial-Frozen Technology Before 1500

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Near-Stasis with “Efflorescences”





The Ice Breaks After 1870

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-1000	0.030%		0.14	\$900	\$45
1	0.061%		0.25	\$900	170
800	0.022%		0.30	\$900	240
1500	0.052%		0.43	\$900	500
1770	0.149%		0.64	\$1,100	750
1870	0.442%		1.0	\$1,300	1300
2010	2.125%		19.6	\$10,526	7600
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					\$526,665

Explosion After 1870

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And If We Go Further?

Date	Technological Ideas-Stock Growth Rate h	Technological Ideas Stock Level H (1870 = 1)	Average Annual Real Income per Capita y	Total Human Population L (millions)	Total Real World Income Y (billions)
-73000			\$1,200	0.005	
-68000	0.030%	0.008	\$1,200	0.1	\$0.12
-48000	0.002%	0.011	\$1,200	0.2	\$0.24
-8000	0.003%	0.036	\$1,200	2	\$2.4
-5000	0.006%	0.043	\$900	5	\$4.5
-3000	0.027%	0.074	\$900	15	\$14

- We all know what exponential growth looks like...
- What does a “singularity”

-1000	0.030%	0.14	\$900	50	\$45
1	0.061%	0.25	\$900	170	\$153
800	0.022%	0.30	\$900	240	\$216
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1	0.061%	0.250	\$900	170	\$153
800	0.016%	0.285	\$900	220	\$198
1500	0.059%	0.429	\$900	500	\$450
1770	0.149%	0.643	\$1,100	750	\$825
1870	0.442%	1.000	\$1,300	1300	\$1,690
2010	2.159%	20.557	\$11,600	6900	\$80,040
2100	2.000%	142.035	\$70,176	9000	\$631,583
2200	2.000%	1049.502	\$518,534	9000	\$4,666,804
2500	2.000%	423399.302	\$209,191,441	9000	\$1,882,722,970

Last: Bob Rubin's Question



Something I have always found very useful:

- Ever since I first heard it back in 1993:
- What, at the end of the semester, will we wish we had done today?



For Next Time: Technological Roots of Growth

Moses Finley, 1965, "Technical Innovation and Economic Progress in the Ancient World," *Economic History Review*, pp. 29-45. <<https://www.jstor.org.libproxy.berkeley.edu/stable/2591872>>

J. Vernon Henderson, Adam Storeygard, and David N. Weil. 2012. "Measuring Economic Growth from Outer Space." *American Economic Review* 102 (April): 994-1028. <<https://www.jstor.org.libproxy.berkeley.edu/stable/23245442>>

Michael Kremer, 1993, "Population Growth & Technological Change: One Million B.C. to 1990," *Quarterly Journal of Economics* <<http://www.jstor.org/stable/2118405>>

- Why pre-1770 near-stagnation in global technology?
- How Good Are Cross-Country (& Cross-Time) NIPA Estimates?
- How far can we get with just "two heads are better than one"?

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-48000	0.002%	0.011	\$1,200	0.2
-8000	0.003%	0.036	\$1,200	2
-5000	0.006%	0.043	\$900	5
-3000	0.027%	0.074	\$900	15
-1000	0.030%	0.136	\$900	50
1	0.061%	0.250	\$900	170
800	0.016%	0.285	\$900	220
1500	0.059%	0.429	\$900	500
1770	0.149%	0.643	\$1,100	750
1870	0.442%	1.000	\$1,300	1300
2010	2.159%	20.557	\$11,600	6900
2100	2.000%	142.035	\$70,176	9000
2200	2.000%	1049.502	\$518,534	9000
2500	2.000%	423399.302	\$209,191,441	9000

- Where does exponential growth logistic?
- And what about the "Great Filter"?

look like?

1. Bob Solowâ€™s view of economic historyâ€!
2. Olivier Blanchardâ€™s read of the inflation situationâ€!
3. A historical perspectiveâ€!

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2. Population estimates and guesses
3. Current and historical-memory estimates of productivity levels and living standards
4. Income levels and living standards from 1870 guessed at back to -6000
5. The character of a Malthusian society
6. The demographic transition
7. Before the neolithic revolution?
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