A photograph of a woman in a rural setting, likely Sub-Saharan Africa, working in a field. She is wearing a blue headwrap and a brown dress, and is carrying a large sack on her head. She is bending over, working with the soil. In the background, there are other people and some huts under a clear sky.

Analysis of IR

PS 1599 | Week 2: Welfare and Technology

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Admin

- Office hours
- Email
- Website (slides)

What did we talk about last time?

Today

- Last time:
 - Welfare can be a legitimate goal for humankind
- Today (and next week):
 - Definition of welfare (+measurement)
 - History global/European development
 - Connection to technology

Welfare: definition and measurement

- Welfare = good
- True for both **utilitarianism** and **egalitarianism**
- Okay, but *what* is welfare?
- In practice: vastly diverging views.

How would you define
(and measure) welfare?

- Not an academic question
- Two approaches to define welfare
- 1st: **subjective**. Let people say what makes them “well”
- **Pros:** flexible, respectful of personal views
- **Cons:**
 - Are all personal views legitimate in society?
 - Hard to measure

- 2nd approach: **objective**. Decide for all of us what is ‘legitimate’ welfare.
- Potential candidates: physical well-being, happiness, equality of opportunity, access to resources, etc
- **Pros:** avoids ‘bad’ preferences; can be measured
- **Cons:** defines welfare in a narrow way (spiritual? etc.)

Two things to note...

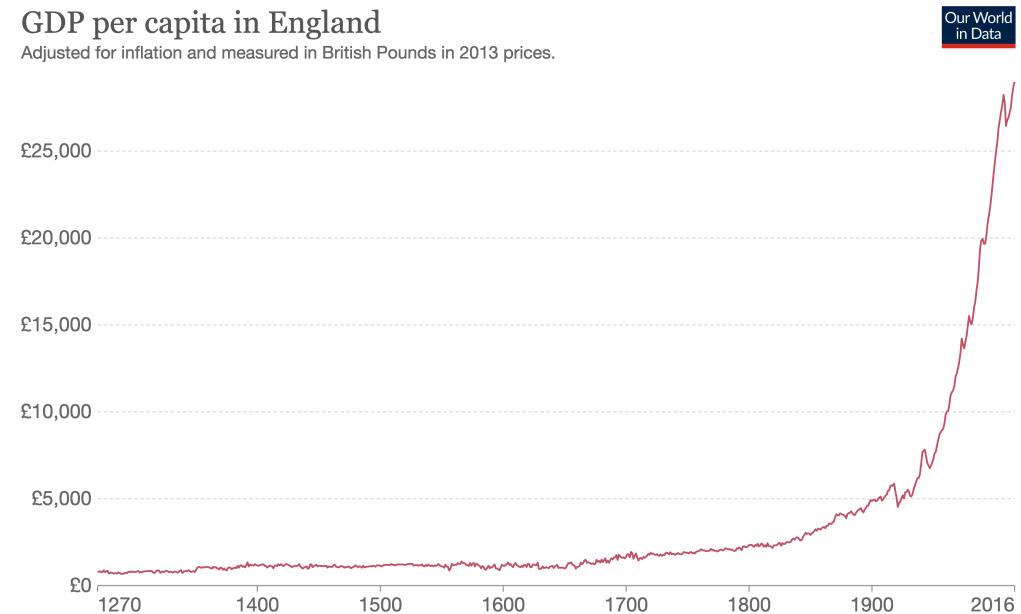
- 1. These obj measures can be equated to “development”
- Narrow version: how “modern” an economy is
- Amartya Sen’s version: economic opportunities + political freedom + protection from extreme poverty
- Broad version: adds social stuff (gender rights, etc.)
- Often criticized: western-centric, materialistic
- Often measured by the Human Development Index: schooling + GNI (similar to GDP) + life expectancy

- 2. Most measures can be proxied by **economic growth**
- Often measured by GDP:
 - Value of goods+services produced in a region over time
 - Eg GDP of Pennsylvania for 2022 is \$722b
- Note:
 - Not the same as household income/wage, but close
 - Doesn't tell us about **distribution** of income
 - Economic growth \neq development

Physical well-being

GDP per capita in England

Adjusted for inflation and measured in British Pounds in 2013 prices.

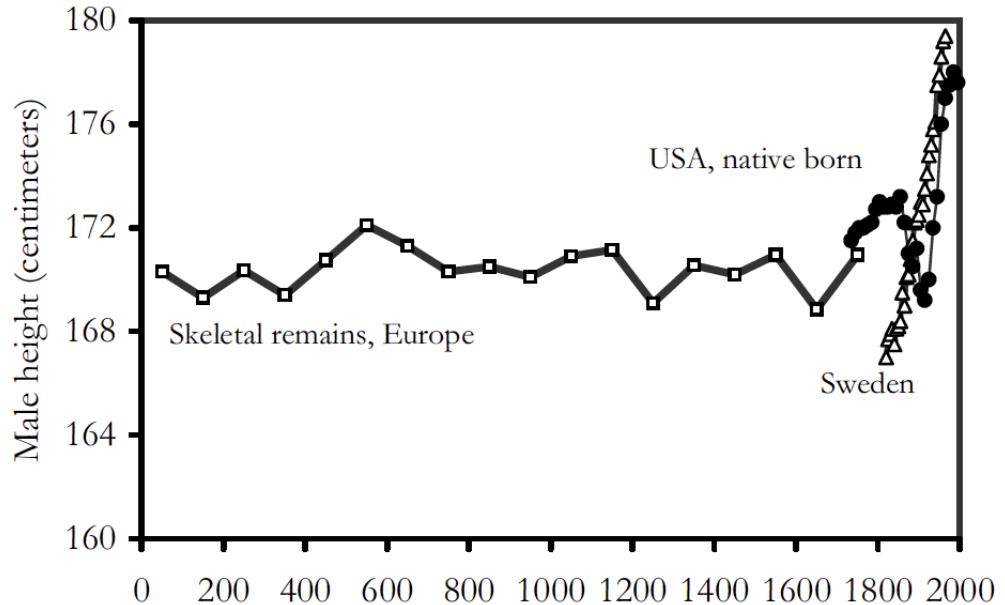


Source: Broadberry, Campbell, Klein, Overton, and van Leeuwen (2015) via Bank of England (2020)

Note: Data refers to England until 1700 and the UK from then onwards.

OurWorldInData.org/economic-growth • CC BY

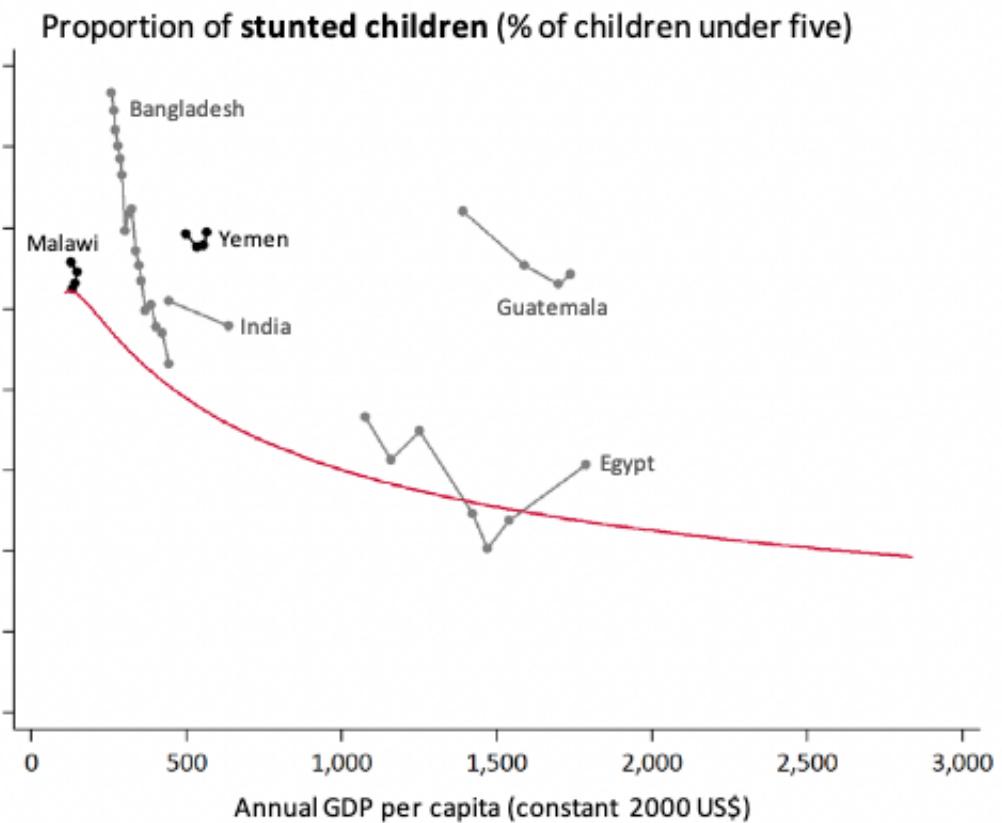
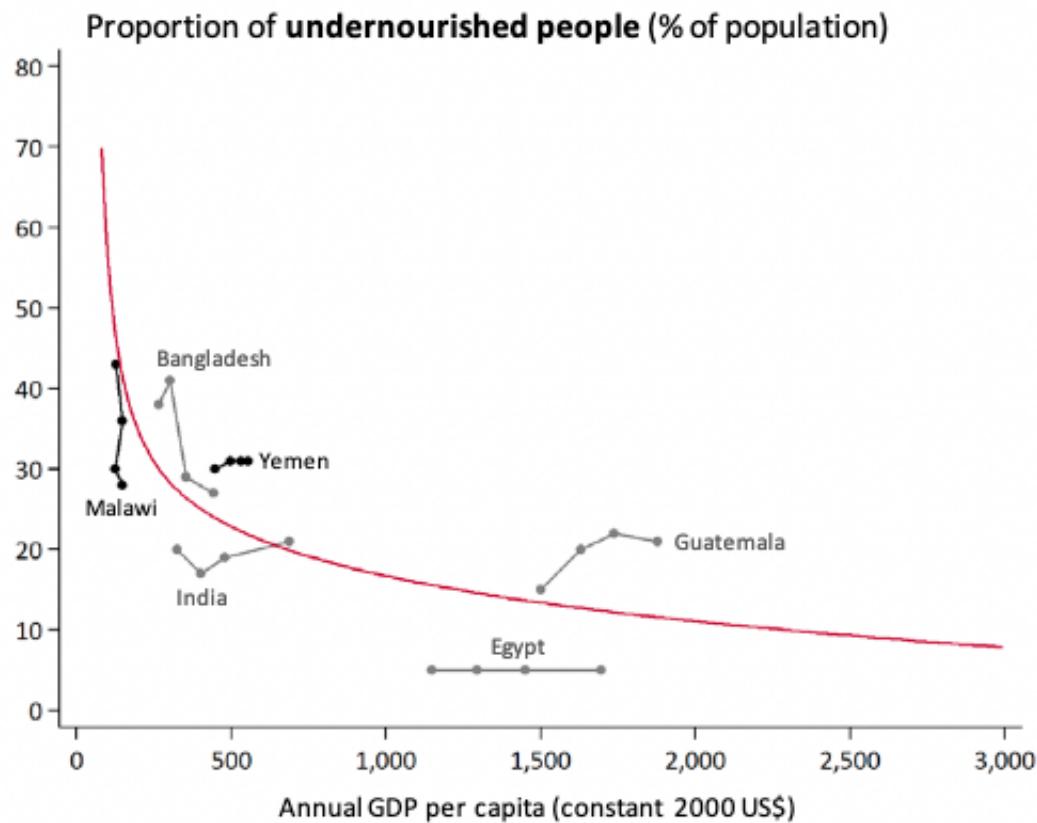
Our World
in Data



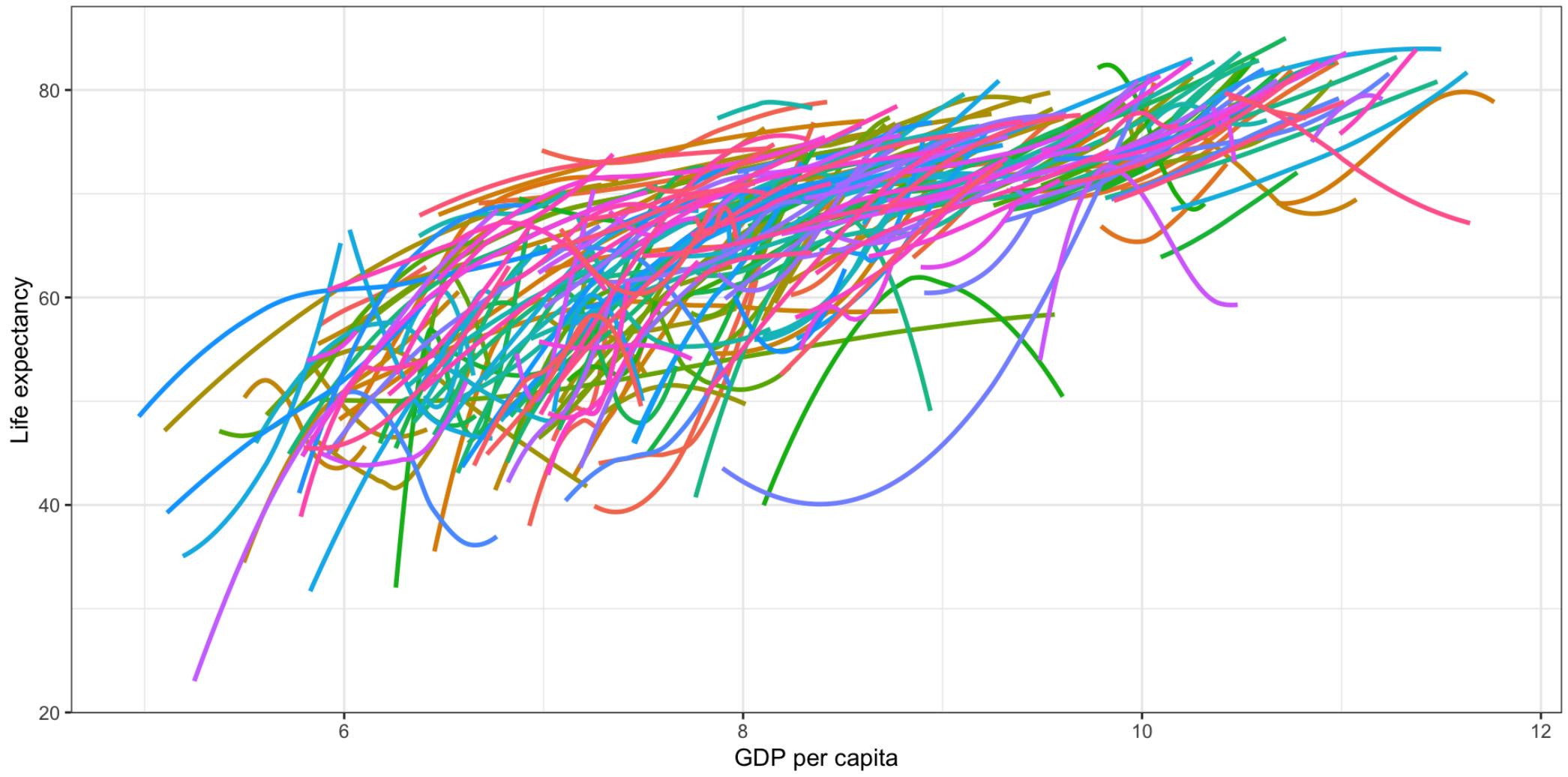
Source: Clark (2008).

Figure: OwD. Source: Bank of England.

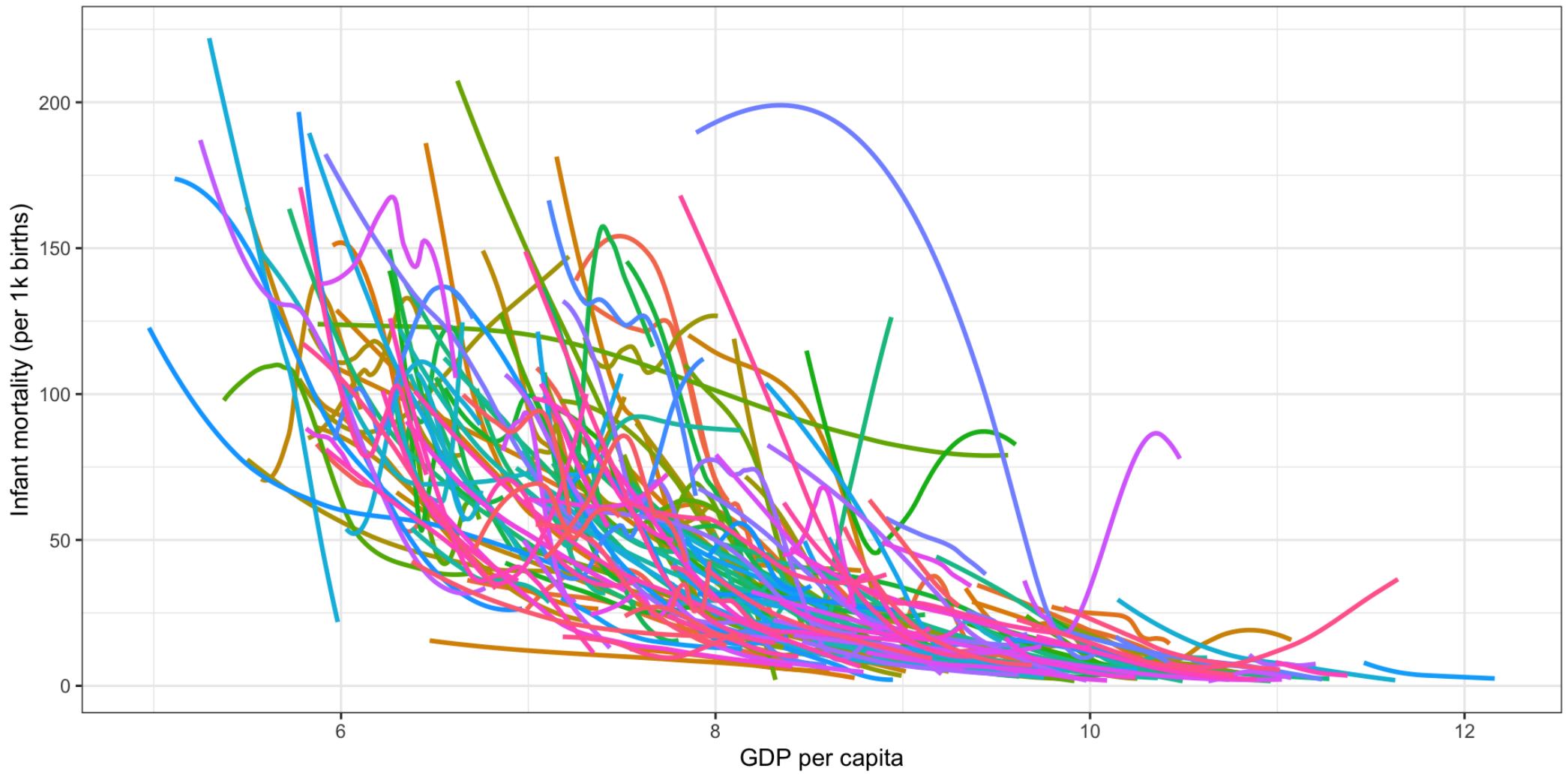
Figure 1: Height



Nutrition. Source: Ecker, Breisinger, and Pauw (2011).

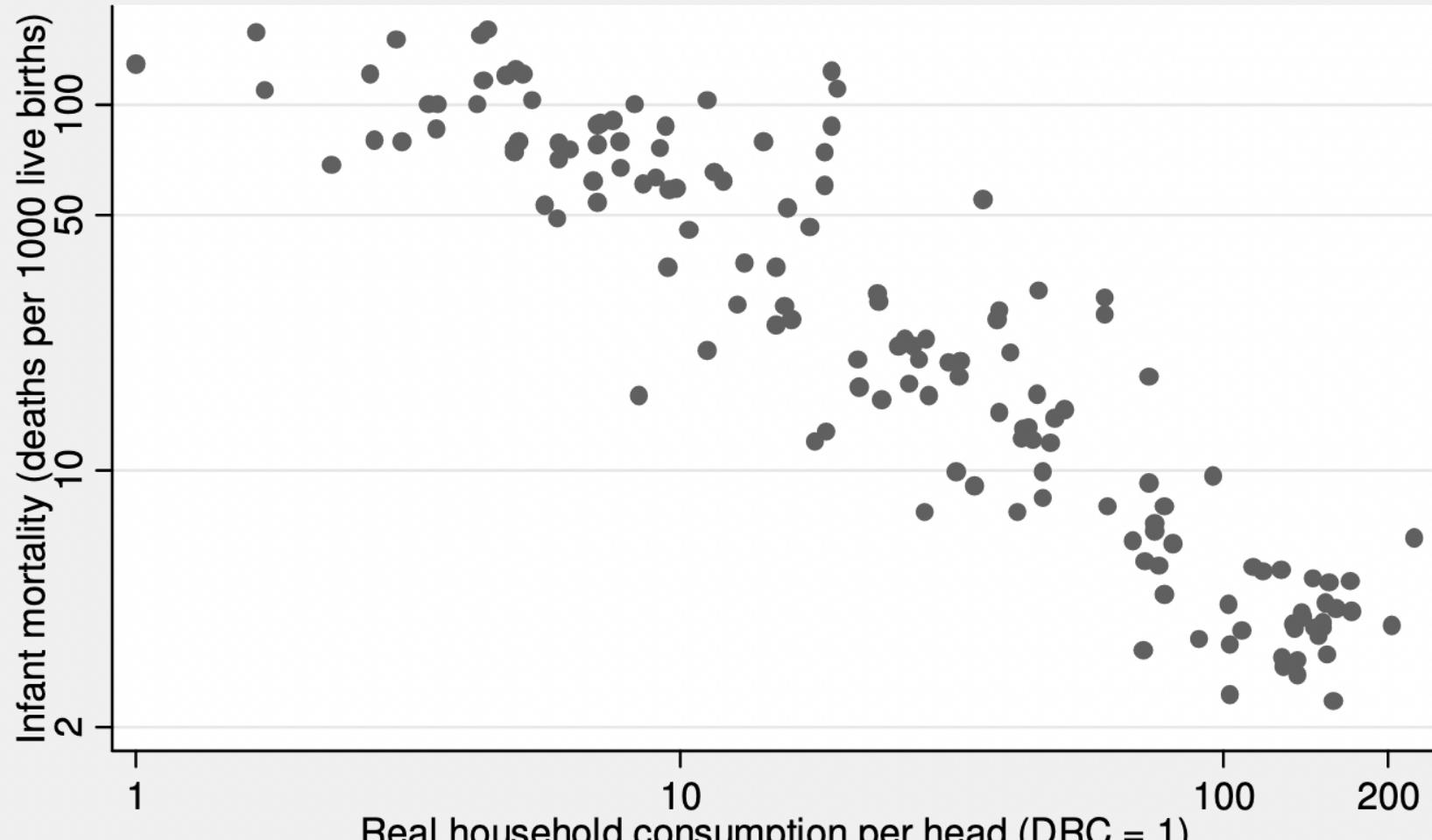


GDP per capita and life expectancy. Figure: Aklin. Source: WDI.



GDP per capita and infant mortality (death per 1,000 births). Figure: Aklin. Source: WDI.

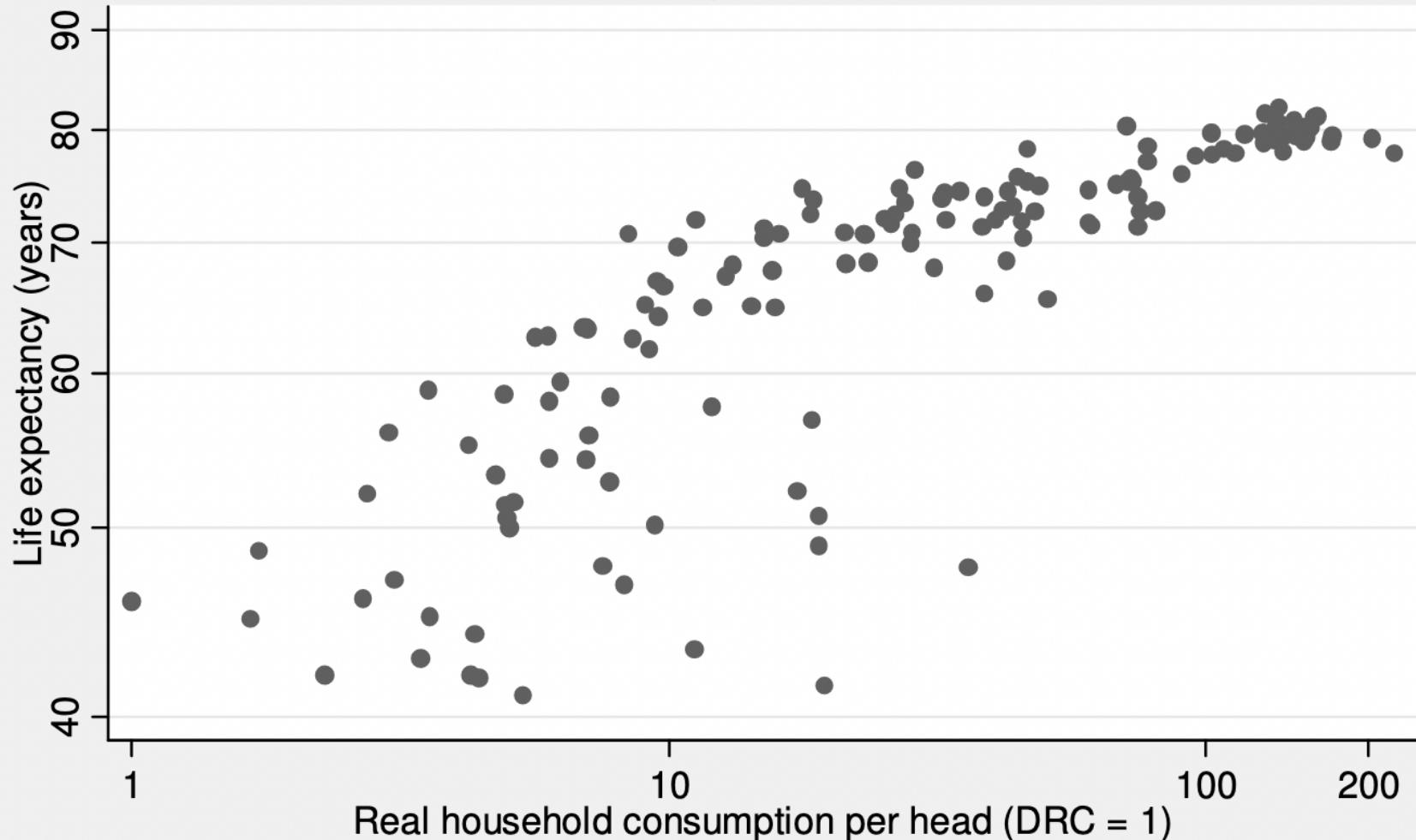
Infant mortality versus household consumption per head (log scales)



Notes: 146 countries. Household consumption deflated by EKS Fisher PPP.

Source: Oulton ([2012](#)).

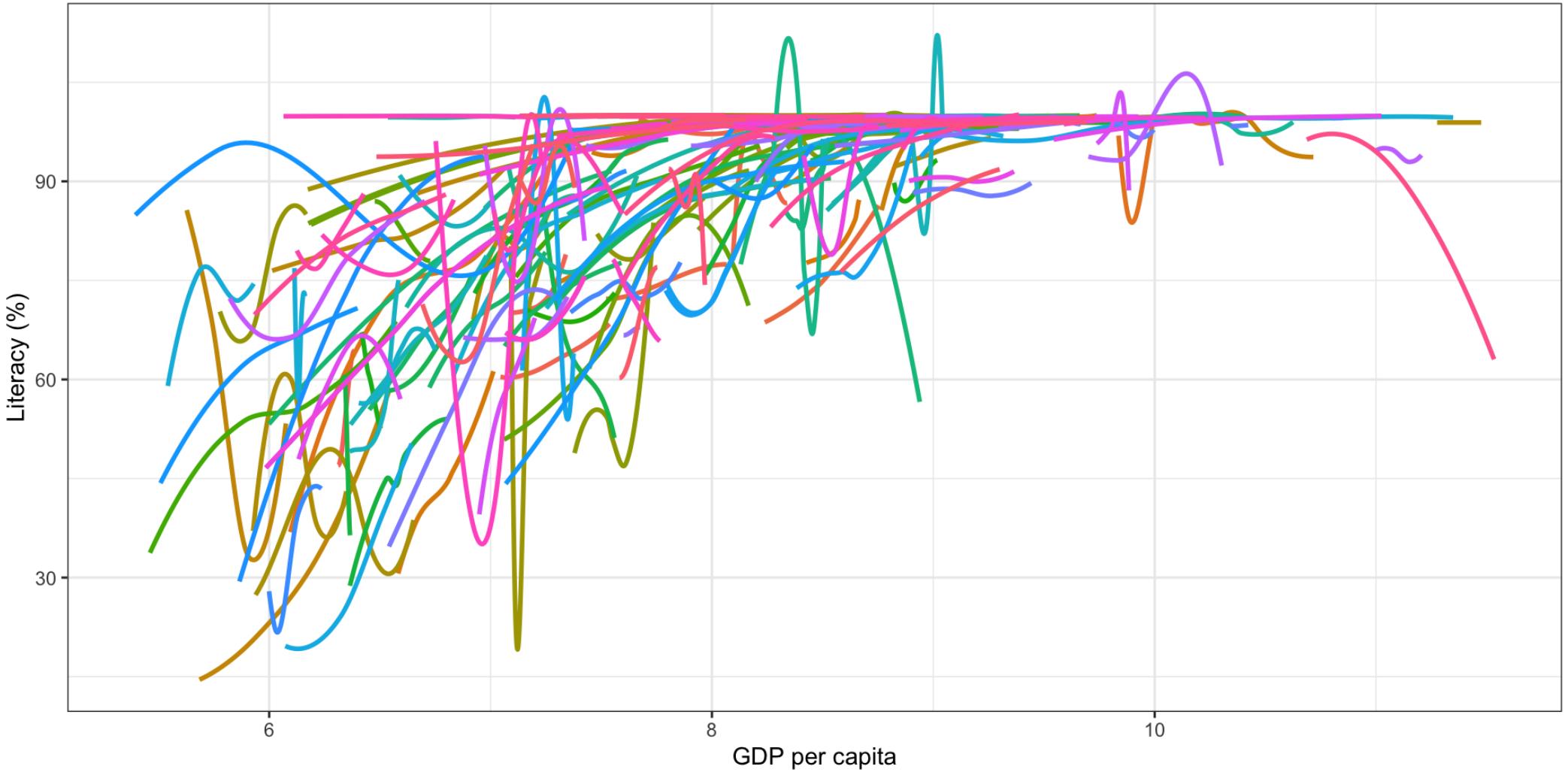
Life expectancy versus household consumption per head (log scales)



Notes: 144 countries. Household consumption deflated by EKS Fisher PPP.

Source: Oulton ([2012](#)).

Opportunities



GDP per capita and literacy. Figure: Aklin. Source: WDI.

Happiness

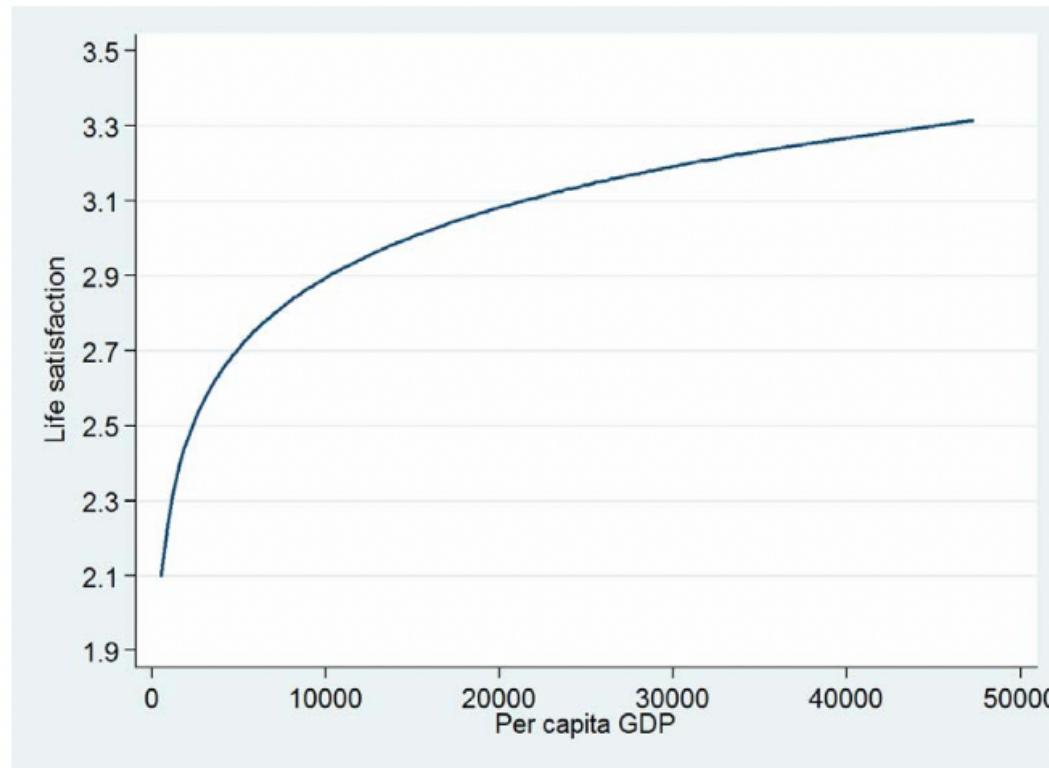
- Happiness: end goal?
 - Locke: yes! Bentham: yes!
 - US declaration of independence: yes!
 - But remember: could be happy for bad reasons
- Does happiness increase with economic development?
 - Yes [within and across countries](#)
 - Not [over time](#)
 - = Paradox of happiness (Easterlin 1974)
 - One explanation: hedonic treadmill

Individual effect of income

Figure 1

Diminishing Marginal Utility of Income

[Life Satisfaction and GDP per Capita (Absolute Scale) Based on WVS Cross Section (n=195)]



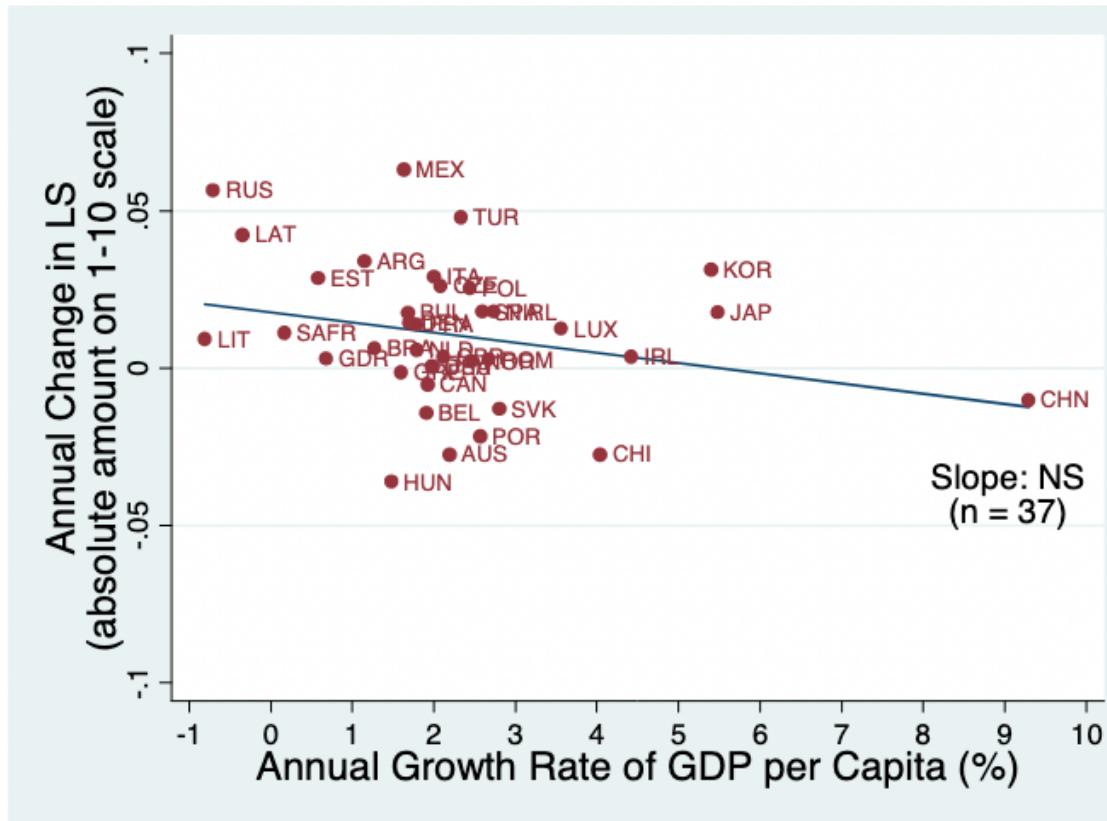
Source: The basic data are 195 pooled observations for 89 countries surveyed in waves 1-4 of the World Values Survey. Individual country observations are omitted from the figure. The fitted regression is $y = 0.405 + 0.270\ln(x)$ (adjusted $R^2 = 0.452$); t-statistics in parentheses.
(2.05) (12.68)

Source: Easterlin and Angelescu 2009.

Aggregate effect of income over time

Figure 6

Longer Term Relationship between Growth Rates of Life Satisfaction and GDP per Capita: 17 Developed, 11 Transition, and 9 Developing Countries (12-34 Years; Mean=22)



Source: See text. The fitted regression is $y = 0.018 - 0.003x$ (adjusted $R^2 = 0.069$); t-statistics in parentheses.
(3.07) (-1.61)

Source: Easterlin and Angelescu 2009.

Summary so far

- a. What we want: improve people's **welfare**
 - Reason: welfare is plausibly a **just** goal!
- b. What determines welfare? **Economic growth/development**
 - Welfare could be equated to well-being
 - Development correlates highly with well-being
 - Thus: development is probably good!
- Next Q: how do we get development?

History of development

Development vs growth

- **Growth:** increase in prod and diversity of goods and services
- **Development:** deep econ transformation (+pol & social)
 - Example: shift from manufacturing to services
- Note:
 - Growth w/o development is possible
 - Development w/o growth is possible
 - But the two are generally connected

- Development is continuous, but two critical junctures
 1. Neolithic period (“Stone Age”) (~12,000 BCE)
 2. Industrial revolution(s) (~1760-1890s)

1. Neolithic revolution

Pre-neolithic period

- Early homo sapiens: nomadic hunter-gatherers
- Strong limits on population growth
 - Europe: 1 person needed ~4 sq miles
 - Tropical regions: 1 person needed 0.4 sq m
- Implications?
- Small tribes, no surplus, few activities outside of food, no trade, no innovation

Neolithic period

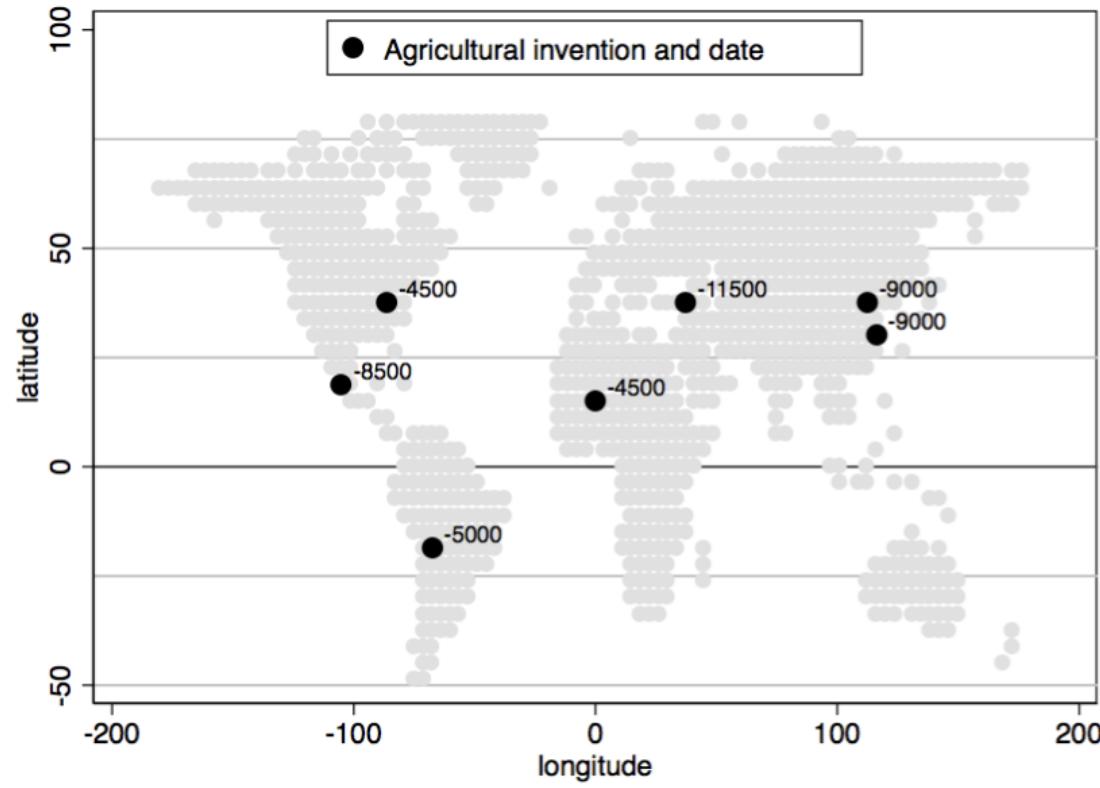
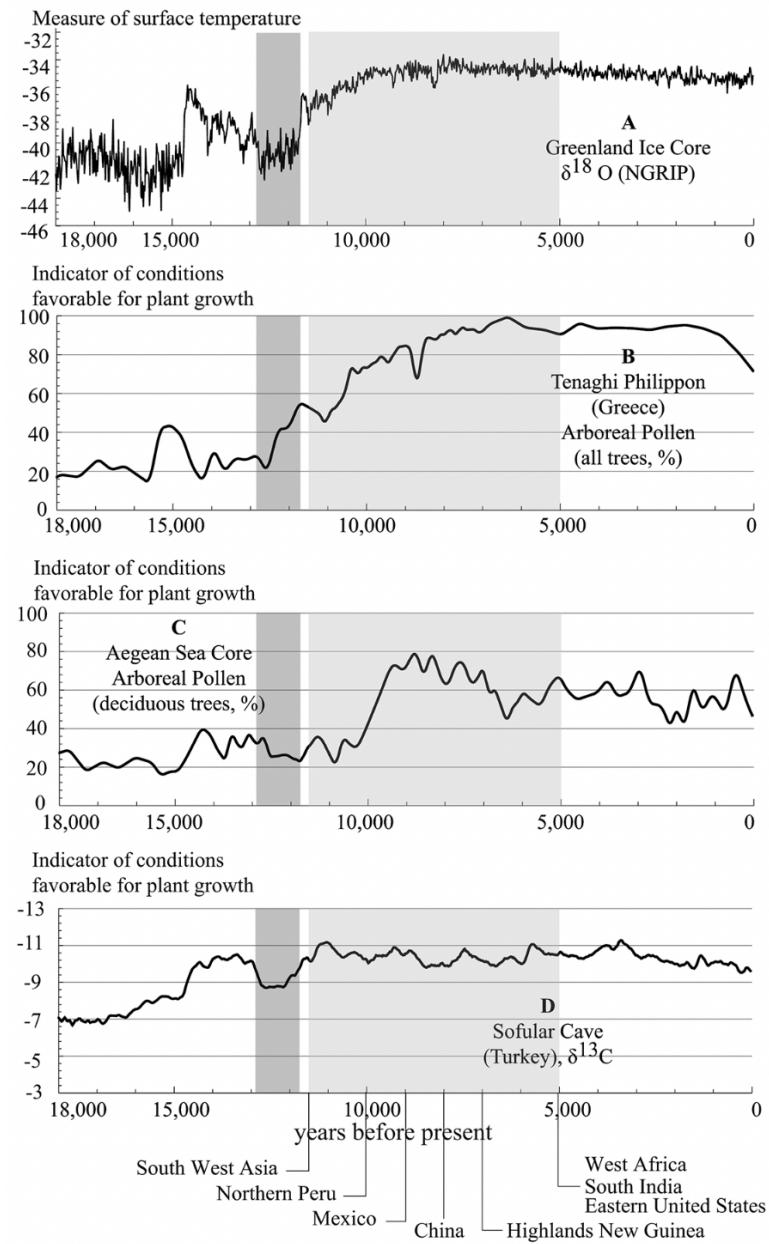


Figure 2: The locations where agriculture was invented and their respective dates in years before present.

Source: Matranga (2022).

→ New technology: agriculture (Bairoch 1997)

- Causes: climatic change
 - End of Last Glacial Period (~12,000 BCE)
 - Higher temperatures = harder to hunt
 - Longer dry season: need food that can be stored
- Additional causes: social development, property rights (animals, storage, gardens)



Source: Bowles and Choi (2019)

Consequences of Neolithic revolution

- Short term: few benefits (smaller, more joint health issues)
- Long term: radical transformation...
- Population: agri surplus → larger pop
- Labor: non-farming jobs (crafts, trade)
- Social: development of cities: Middle East: ~3500 BCE,
Harrapa (Punjab, India): ~2000 BCE, China: ~1400 BCE
- Laws and institutions: Hammurabi code (1750 BCE),
common defense, taxes, etc.
- Civilizations Mesopotamia, Egypt, Greece, Rome

2. Industrial revolution

- Misnomer...
- Period of **economic, social, political** transformations
- Shift from agriculture to industry
 - 1st Industrial rev: ~1760-1830 (UK)
 - 2nd Industrial rev: ~1870-1914
 - Since then: 3rd and 4th IR
- Enabled by new energy tech: steam, spinning jenny, etc

England

	1500	1700	1900	1950
Calories	1.8k	2.2k	3k	3.1k
Life expectancy	34	38	46	69
Location	Rural	Rural	Rural	Urban
Literacy rate	5-15%	~50%	90%+	95%+
Cities >500k (world)	2	7	44	

What makes countries/regions
grow (economically)?

Types of growth

Growth (and development) can happen in four ways

1. *Smith-ian* growth: **market** expansion
2. *Solow-ian* growth: **capital** accumulation (machines, etc.)
3. Scale growth: more people, **division of labor**
4. *Schumpetarian* growth: **technological** disruptions

- #1 and #2 limited potential (cannot ‘rediscover’ China...)
- #3 helps but is slow
- #4 is key

Context: Medieval times and Renaissance

- Until 1600s: no clear trend in (median) living standards
- Does *not* mean **stability** (eg Black Death:~-50%)
- Does *not* mean **stagnation**
 - Trade (Smith-ian): global trade networks
 - Capitalism (Solow-ian): banking, accounting, money
 - Technology: agri, paper, medical science, universities
- But few **permanent** changes

1600s

- Change in W Europe starting around 1600s (**Enlightenment**)
- Expansion of regional+global markets (goods, finance)
- Growth of science: physics, statistics, philosophy
- Development of modern state (property rights+law)
- But still little change in welfare

1st Industrial revolution

- Schumpetarian process
- Starts in UK, 1760s-1830s (spreads later)
- Rapid **productivity growth** (output per worker/year)
 - More goods and products available
 - Declining prices of such goods
 - Shift from agriculture to manufacturing (**industrialization**)
 - Eventually: large increase in GDP and welfare

How?

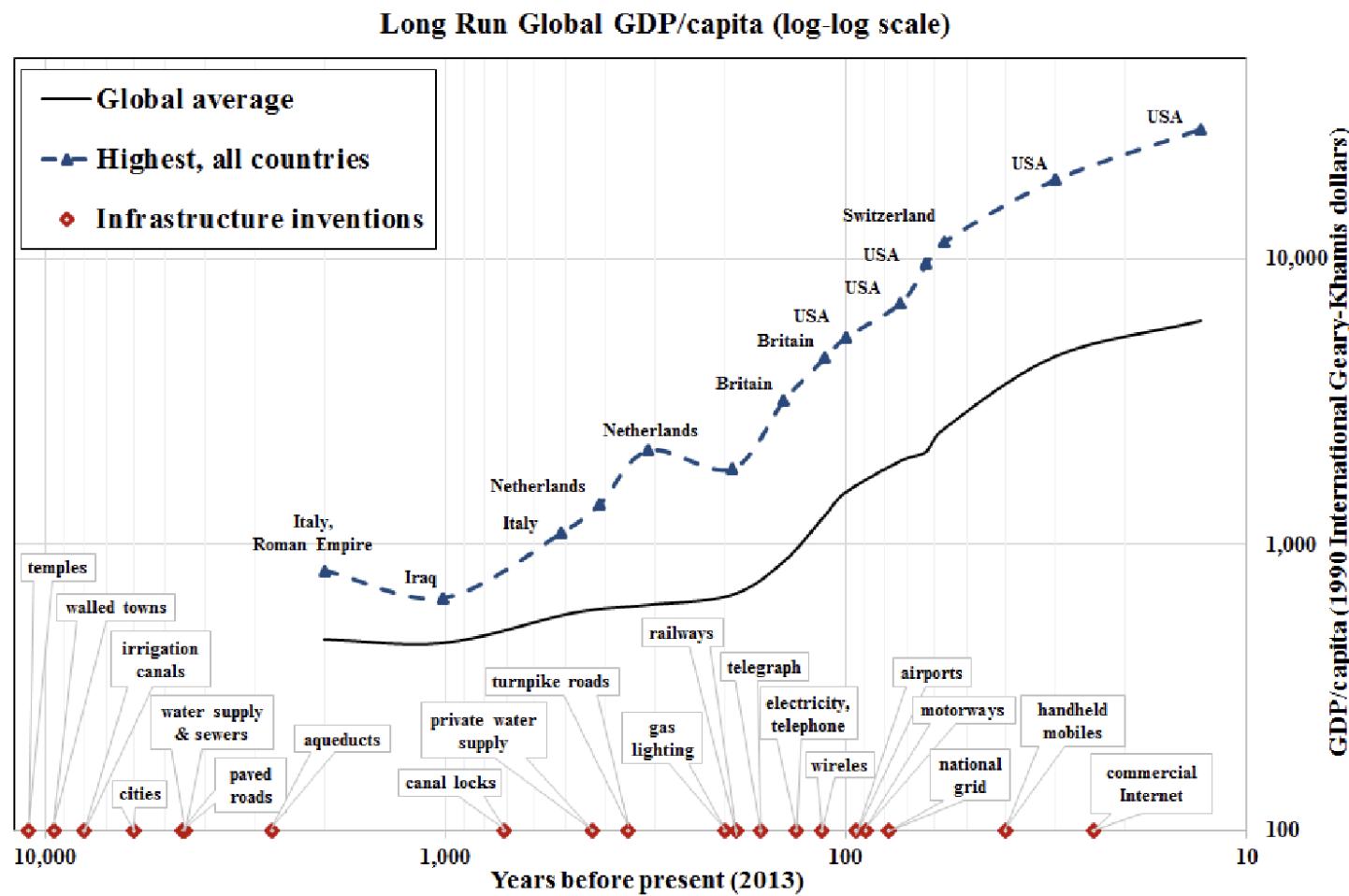


Figure 1. Time line of infrastructure innovations and economic growth

Source: Author's own elaboration for infrastructure invention dates (see text). GDP/capita data from Maddison (2007) - country maximum values exclude small oil states after 1920.

Source: Goldsmith (2014).

How?

Three steps

- Tech change in small sectors (**mechanization**):
 - Textiles. Cotton and “spinning Jenny”
 - Minnig. Coal, steam engine, deep mining.
 - Metallurgy. Coal, blast furnace.
- These sectors become more important overall
 - Size of the economy
 - Urban workers
- Later: technological **spillovers** (learning)

Broader impact

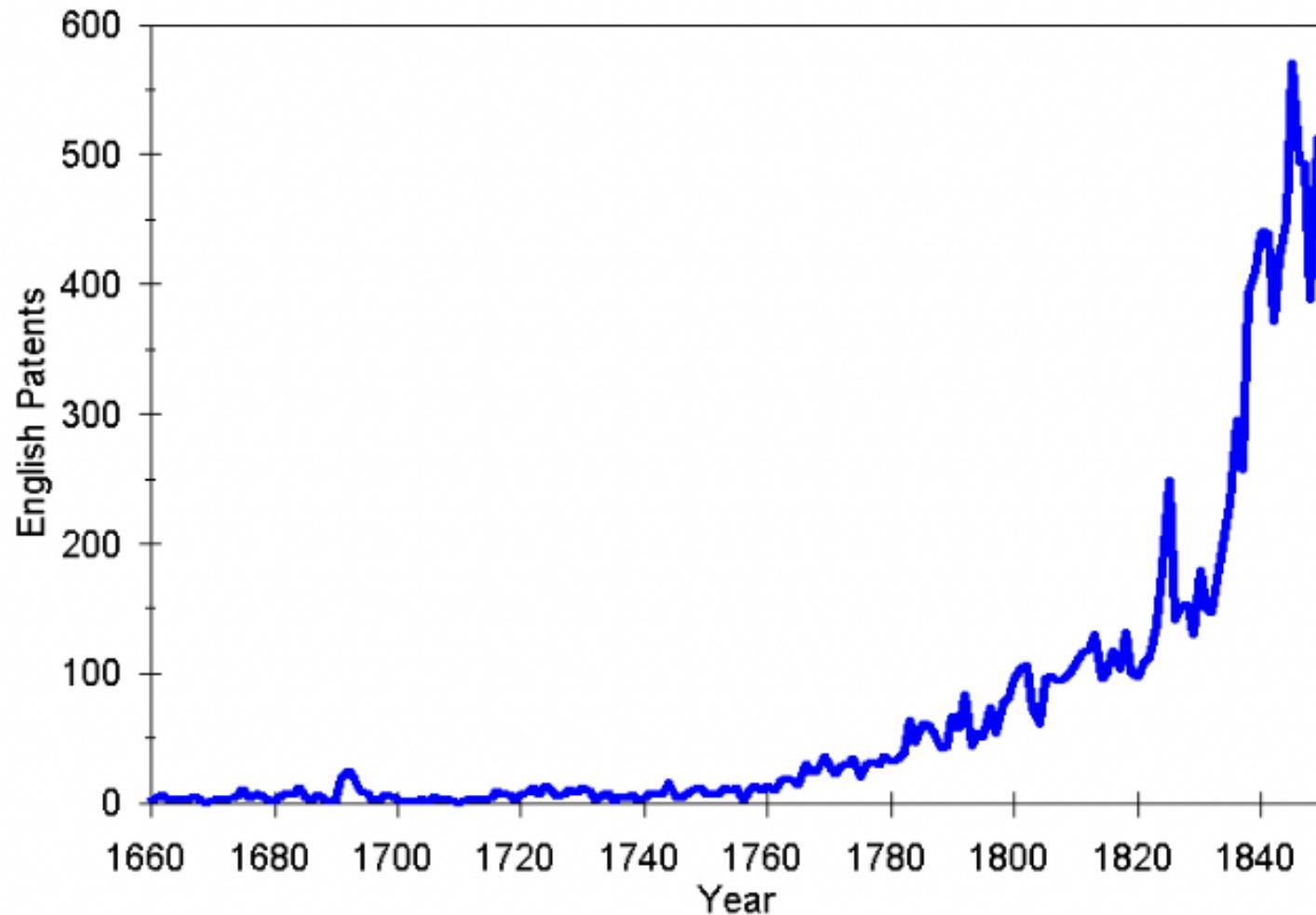
Deep causes

- Tech was key...
- But what triggered its development?
- Why UK 1760s? Mystery! Hypotheses:
 - Colonies? Small and poor...
 - Political institutions? But Netherlands...
 - Energy? Netherlands vs. Belgium...
 - “Culture” (Max Weber, etc.)? But Belgium...

Major consequences

- Short term
 - Period of low growth (!)
 - Low wages (!) and urban poor (“proletariat”)
- Long term
 - Improvements in life quality
 - Rise in living standards, esp among poor
 - Decline of rural world
 - Expansion of public services (schools, public health)

Figure 5: Patents per Year, England, 1660-1851

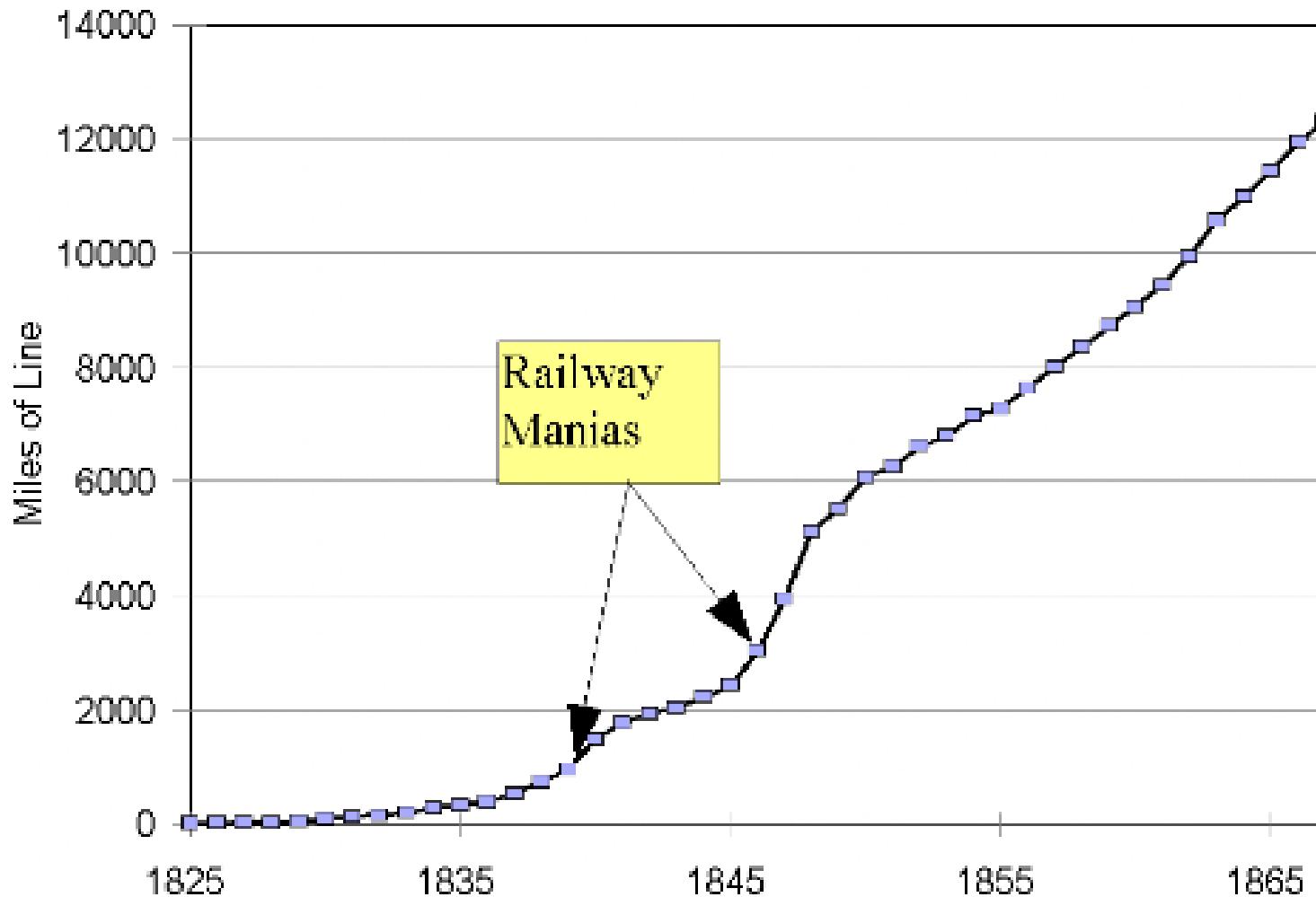


Source: Clark (2014)

**2nd Industrial
revolution**

- Pause of innovation after 1820s
- Around 1870s until WWI (**recombinant growth**)
- 2nd generation of innovations
 1. Transportation infrastructures (trains, steam boat)
 2. Energy infrastructures (eg grid) for **mass production**

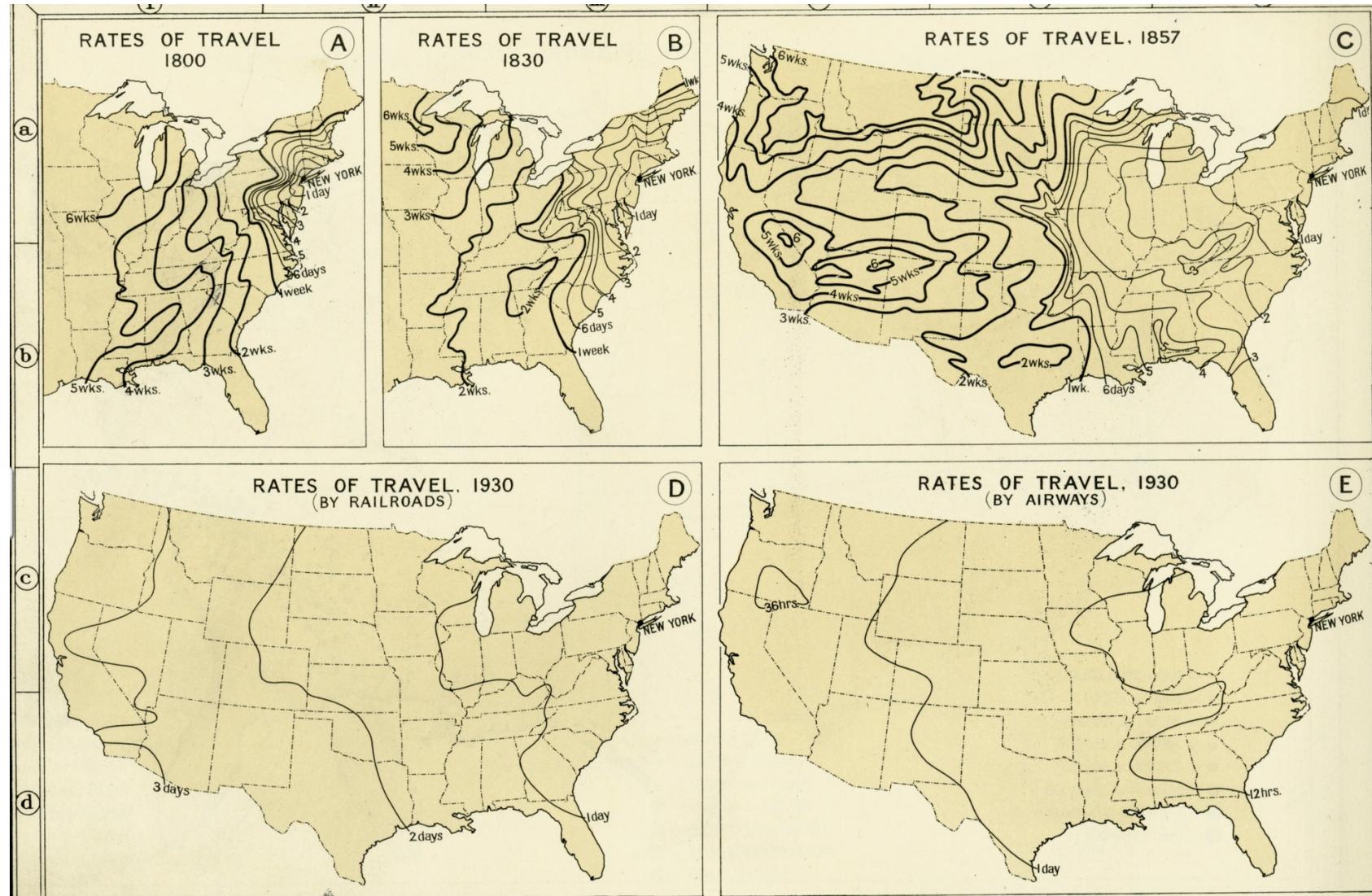
Figure 7 English Railroad Construction, 1825-1869



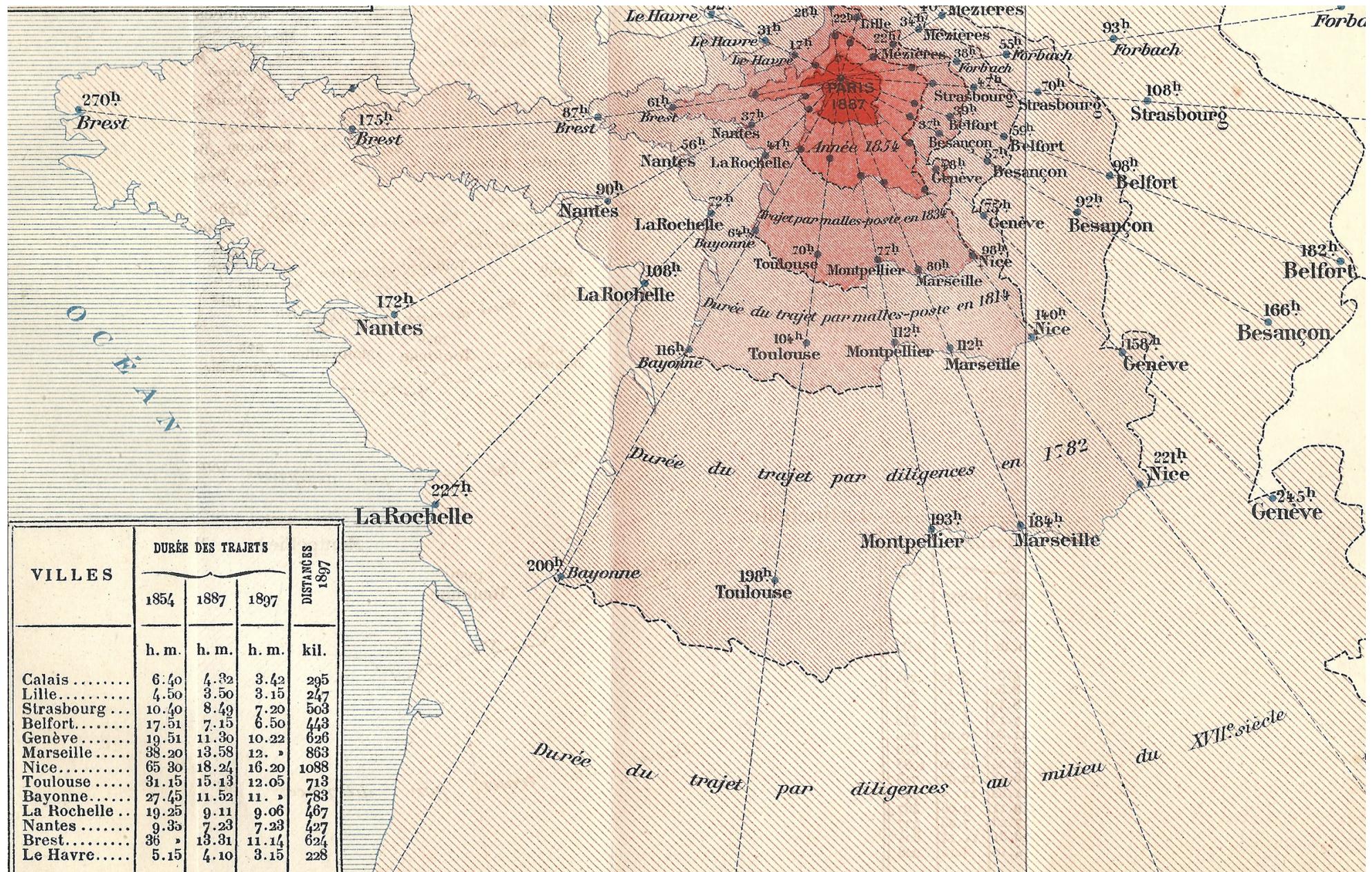
Source: Clark (2014)

What were the consequences
of transportation innovations?

World is becoming small



Isochrome map of US. Source: Atlas of the historical geography of the United States



Isochrome map of France

Some consequences

- Labor market. Eg:
 - UK w/ train station → pop growth + shift male workers away from agriculture
 - Germany: train tracks → pop growth for bigger parishes
- Erasure of local culture. Eg France: 50% of pop doesn't speak French in 1789
- Urbanization: working class, marxism, social democracy demand for social protection, education

Challenges

- Currently: 3rd and 4th IR
- Are technological innovations slowing down?
 - Worry about **stagnation**
 - But maybe just hard to measure?
- Are technologies hurting us?
 - Worry about **sustainability**
 - Unprecedented risks of disaster

Conclusion

- IR = unprecedented levels of welfare
- Diff with past: few cases of backsliding
- Doesn't mean everything is great...
 - Inequality across/within countries
 - Hedonic treadmill
- Yet: would you trade your seat with anyone in the past?
- Bigger problems: what's next?
 - Negative side effects of tech
 - Will growth stop?

Questions?

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Source for title page painting: Jean-François Millet, “The Gleaners”

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