Sustained economic growth through technological progress

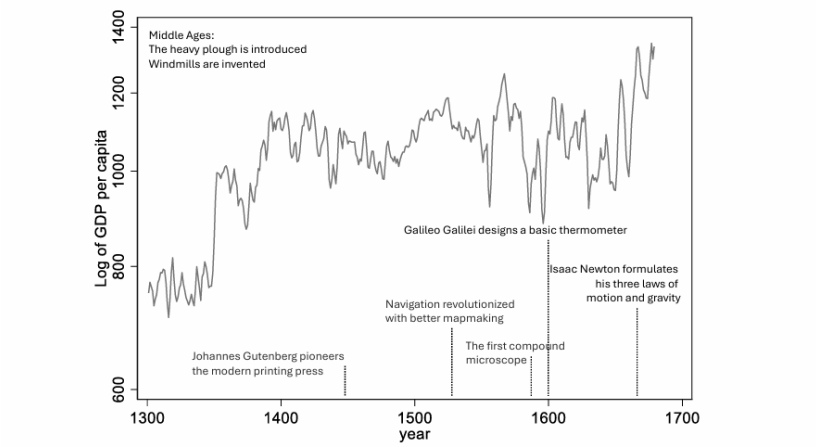
Joel Mokyr

Scientific Background to the Sveriges Riksbank Prize in Economics Sciences in Memory of Alfred Nobel 2025

Nicolás Malfetano

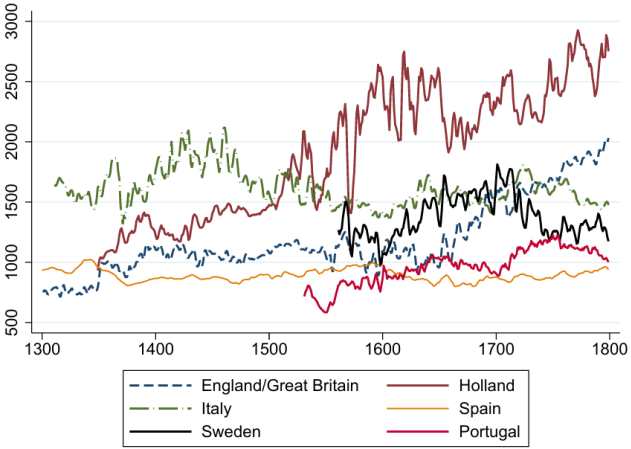
The Big Question

Figure 1: GDP per capita in England 1300–1680, paired with selected innovations and breakthroughs



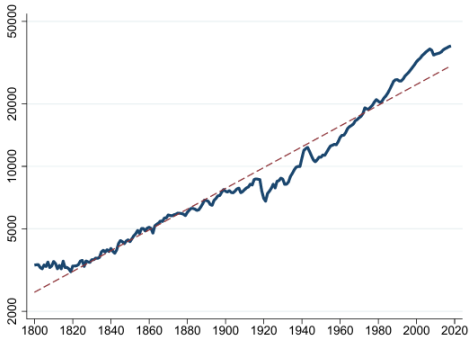
Small leaps, but no takeoff

Figure 3: GDP per capita in selected European Economies 1300–1800.

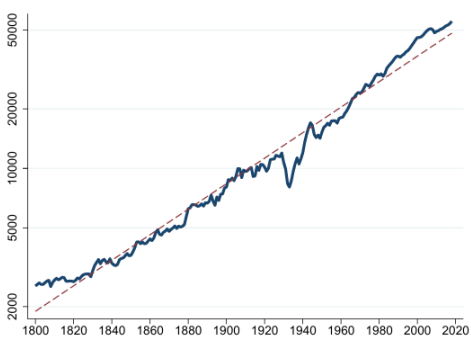


The Economic Takeoff

Figure 2: Real GDP per capita, 1800–2018



(a) United Kingdom



(b) United States

Timing and Location

- The puzzle is why did the Industrial Revolution start in England, and why in the late 18th century?
- Plenty of societies had been more technologically advanced much earlier (The Netherlands, India, China, etc).
- What set the Industrial Revolution apart from earlier breakthroughs was its effect on the long-term growth rate.
- Previously, advancements resulted in bursts of progress, followed by stagnation.
- The Industrial Revolution started a period of *persistent* growth, and constant advancements.

Types of technological breakthroughs

- Macro inventions: Radical technological discontinuities, because of a shift of knowledge or a combination of previously existing knowledge, with the potential to have large effects on the marginal product of further improvements.
- Micro inventions: Incremental improvements in existing technologies thanks to economic conditions.
- Macro inventions have happened for all of human history. Before the Industrial Revolution, they did not result in waves of micro improvements.
- 3 prerequisites for growth: Science and technology feedback loop, mechanical competence, and a society open to change.

The Feedback Loop

- Two types of knowledge that had previously not been connected were finally brought together:
  - Propositional knowledge: *Why* things work. Knowledge about natural phenomena, patterns of the physical world, the accumulation of empirically tested discoveries.
  - Prepositional knowledge: How things work in practice. The skills and craft of making things.
- A positive feedback loop between both is necessary to create sustained technological progress.
- Once they were connected, the breakthroughs of the late 18th century turned into a revolution.

Mechanical Competence

- The ability of agents to carry out prescriptive knowledge is key to the implementation of innovations.
- Constant contact between skilled practitioners and inventors was key to perfecting innovations.
- The top of the human capital distribution is the driver of the innovations of this era.

Openness to Change

- Interest groups frequently oppose new technologies.
- The Enlightenment shifted cultural attitudes towards progress.
- New institutions were more flexible and allowed bargaining between groups in favour and opposed to technological change.
- Europe was exceptional in this area, explaining why the Industrial Revolution happened there and not elsewhere.

Mokyr's Impact

With a novel framework that put technology at the center, Mokyr changed how the field viewed the onset of modern economic growth. Instead of seeing technology as the residual from everything we can measure(e.g., Solow(1957)), Mokyr introduced a new perspective, focusing exactly on explaining technology and the necessary requirements needed for technology to feed into sustained growth. By emphasizing the broad societal and technological changes that took place during and after the Enlightenment, Mokyr's work reintroduced the "revolution" into the Industrial Revolution. Contrary to those seeing the period as a gradual structural transformation, Mokyr emphasized the transformational character of growth rates that were sustained over the longer run, even though their magnitudes were at first sluggish.

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