Evolution and the Industrial Revolution: New Evidence for the Galor-Moav Theory

Twenty-five years ago, Oded Galor and I conceived an idea that seemed—at least then, and perhaps still today—very speculative: the explanation for the Industrial Revolution lies in human evolution during the thousands of years spanning from the transition to agriculture to industrialization.

Even though this thesis was highly speculative and we lacked concrete evidence to support it, the *Quarterly Journal of Economics* (QJE), one of the "Top-5" in economics, published the article in 2002 as a lead article. If I recall correctly, the editor wrote to us that even if the chance of us being right was slim, if we *were* right, it was so significant that it deserved this prestigious platform. I am returning to this article because, over the years, a wealth of significant evidence has accumulated supporting our thesis, including recent, particularly strong evidence coming directly from genetic research.

The Paper: Galor-Moav 2002

The basic idea is that humans possess different traits that are passed down (genetically or through upbringing) from parents to offspring. Traits that contribute to economic success translate into higher income and, consequently, to more surviving offspring. Thus, over the years, the composition of the population changes, and the share of those possessing traits conducive to economic success—such as intelligence, patience, industriousness, or a high preference for investment in human capital—increases.

It is important to note that for most of human history, particularly the era before the Industrial Revolution, the correlation between income and the number of offspring reaching maturity was positive. In an era where nearly half of all children died before reaching adulthood, high-income households could provide better conditions for their children, thereby reducing mortality. Furthermore, evidence suggests that women in higher-income households gave birth to more children (they married younger, had shorter birth intervals, and likely enjoyed higher life expectancy).

In our model, we focus on one specific trait: the preference for investing in the human capital of children. This model is non-trivial because, in the short run, parents who invest more in their children are forced to reduce the total number of children. This is known in economic research as the Quantity-Quality Trade-off.

Nevertheless, within the model's parameters, the preference for investment eventually leads to more descendants: higher income allows these individuals to raise more children in comparison to the low human capital household, while investing more in each of them. The model's empirical prediction is also consistent with a simpler possibility: parents who, for hereditary reasons, could have fewer children—exhibiting moderate fecundity—invested more in each child.

Consequently, through a slow, gradual process spanning thousands of years, the human capital in the population grew via evolution. The second component of the model is that human capital contributes to the acceleration of technological improvements. The third component is that this technological acceleration raises the return to human capital, further incentivizing investment in education.

Eventually, the rate of technological progress becomes fast enough to trigger a positive feedback loop between human capital and innovation that no longer requires evolution. At this stage, even parents who only moderately prioritize human capital respond to the incentive to invest; this is the stage we call the Industrial Revolution. Much of this model was adapted from an earlier paper by Galor and David Weil (published in the *American Economic Review* in 2000), but their model did not include the key evolutionary component.

The Evidence

Before the paper was published, economic historian Gregory Clark (UC Davis) argued that our premise was flawed. He claimed that urban populations were more educated than rural ones, yet urbanites had fewer children. We responded that his claim didn't invalidate our prediction, as there is significant heterogeneity within populations. This likely led Clark, in collaboration with Gillian Hamilton, to examine English wills from the pre-industrial era to study the link between income, education, and the number of surviving offspring. The findings supported our theory! The educated, high-income class had more children who survived to adulthood.

Clark eventually published a book in 2007, *A Farewell to Alms*, based on our idea, adding a variety of facts. Unlike our focus on human capital, Clark focused on other human traits leading to economic success, arguing that human capital did not play a central role in triggering the Industrial Revolution and only became important in later stages. Regardless, the book was excellently written and helped popularize our theory—so much so that many began calling it "Clark's Theory."

Perhaps it wasn't just the quality of the writing that led to this attribution, but also the "stingy" credit Clark gave us: a small footnote in the book. For this, he was publicly criticized, notably by economic historian Joachim Voth, who wrote a critical review arguing that Clark's conceptual contribution was negligible.

Additional evidence for the positive link between socioeconomic status and surviving children has since emerged:

- **Church Records:** Cambridge Group Data from 18th-century Anglican church records showed the primary mechanism was the younger age of marriage for women in higher classes (Boberg-Fazlic, Sharp, and Weisdorf 2011).

- **Middle Class Advantage:** De La Croix, Schneider, and Weisdorf (2019) showed that the middle class—who had both the means and the economic incentive to invest (unlike the very wealthy)—had more surviving children than both the elite and the uneducated, consistent with the Galor-Moav theory.
- **Multi-Generational Success:** Oded Galor and Marc Klemp (2019) examined data from Quebec in the 17th–18th centuries, showing that families with moderate fecundity had more descendants after several generations, and those descendants had higher income and human capital. Similar findings were found in China (Sijie Hu 2025) and Germany (Johan Ohler 2025).

Genetic Evidence

Modern studies utilize **Polygenic Scores (PGS)**—genetic markers for various traits based on modern populations. Specifically, one can identify PGS for **Educational Attainment (EA)** and track the evolution of these markers using ancient DNA samples.

- **Piffer and Connor:** Found evidence of directional selection starting from 1350, indicating a genetic shift toward traits linked to education. They argue the magnitude of this shift was sufficient to be a primary driver of the Industrial Revolution.
- **Akbari et al. (2024):** Found a significant rise in EA-related polygenic scores over the 8,000 years leading up to the Industrial Revolution. They also identified shifts in traits like decreased smoking, decreased schizophrenia, and increased income, intelligence, and even walking speed—all of which could be linked to a broader evolution supporting higher genetic human capital.

Additional Components of the Theory

The Galor-Moav model includes three additional critical components:

1. Education contributes to innovation and growth.
2. Technological growth positively impacts the return to human capital.
3. Parents respond to these returns by investing more in each child (often at the expense of total child count).

There is ample supportive evidence for these three components, and they are generally not considered controversial.

In conclusion, the central "evolutionary" component of the Galor-Moav theory—the only part that was once highly controversial—is receiving significant support from diverse historical and genetic sources. Considering these facts, our theory deserves to stand in the first tier of explanations for the Industrial Revolution, alongside the

Institutional explanation (North, Acemoglu et al.), the Enlightenment (Mokyr), Factor Prices (Allen), and Geography (Pomeranz), and others (in case I missed something).