

MEMORANDUM

FROM: Ted Aronson
DATE: December 28, 2015
RE: PROSPECTS FOR ECONOMIC GROWTH

This is classic Larry Siegel:

*Is the slowdown in economic progress in this new century an aberration or should we have expected it all along? Is it the result of unwise policies or unfavorable demographics, or is it the comedown that naturally occurs after a century-long global economic miracle? How one views the prospects for economic growth will have profound implications for the long-term performance of the capital markets.**

And that's just the opening paragraph!

By "classic" I am channeling my own habits — I will buy Gordon's latest (out in mid-January), perhaps leaf through it, put it aside, and then rely on Larry's review (so I will only read the chapters on economic history). I trust him implicitly, because I've always found his reviews to be balanced — even when he is correctly associated with the opposite position.



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*See Larry's "debate" with Bill Bernstein (in 2013 we shared Bernstein's "The Paradox of Wealth" alongside Larry's "Fewer, Richer, Greener").

ROBERT GORDON, THE SPECIAL CENTURY, AND THE PROSPECTS FOR ECONOMIC GROWTH

Laurence B. Siegel
December 22, 2015

Is the slowdown in economic progress in this new century an aberration or should we have expected it all along? Is it the result of unwise policies or unfavorable demographics, or is it the comedown that naturally occurs after a century-long global economic miracle? How one views the prospects for economic growth will have profound implications for the long-term performance of the capital markets.

Robert Gordon, a celebrated economic historian and Northwestern University professor, addresses these questions in his magisterial new book, *The Rise and Fall of American Growth: The U.S. Standard of Living since the Civil War*. Gordon has long been associated with the view that future economic growth will be slower than that of the fairly recent past. In his new work, he expands on the idea that the Second Industrial Revolution, the period from roughly 1870 to 1970 when the basic machinery of modern life was invented (from 1870 to 1940) and then distributed to the masses (1940 to 1970), was unique and unrepeatable. The car, the telephone, the airplane, the electric grid and electric appliances, and basic antibiotics and other medicines have already been invented and cannot be invented again.

Further improvements in our quality of life, he argues, will be slower and less profoundly transformative.

Arguing against this view are an assortment of techno-optimists (Elon Musk is the best-known) and econo-optimists (including the late Julian Simon, Joel Mokyr, Matt Ridley and myself). The opposing argument holds that economic growth is not a miracle; it is what happens naturally when, under conditions of secure property rights and appropriate rewards for innovation, people try to improve their lives and those of future generations. They seek advancement by learning and inventing, saving and accumulating capital, and trying to do more with less — activities that are not about to stop, partly because they have been so consistently rewarding. While economic growth in the future may mean less accumulation of “stuff” and more improvement in experiences, conveniences, and leisure, we should expect economic growth to continue at roughly the pace that it has historically.

While I’ve disagreed with Gordon’s pessimism in the past, I highly recommend *The Rise and Fall of American Growth* for a simple reason: Most people do not know much about economic history. Gordon’s latest book is a treasure trove of this rich and neglected history. Investing is everywhere and always about the future — but to understand the future, investors need to have more than a passing acquaintance with the past; they need a commanding knowledge of it. In particular, they need to understand the history of business and how it interacts with the rest of society and with government, culture and domestic life. Gordon’s book will greatly help investors in their pursuit of this knowledge.

THREE INDUSTRIAL REVOLUTIONS

Like many economic historians, Gordon divides technological progress in modern times into three industrial revolutions, plus periods between the revolutions. The first (roughly 1760-1840) was based on the harnessing of steam power and led to the development of mechanized farming, the railroads, an iron and steel industry, and the rise of the factory system.

The second began around 1870. It gathered force with Alexander Graham Bell's invention of the telephone in 1876 and Daimler and Maybach's 1885 internal-combustion engine, and continued at an astonishing pace through the discovery of sulfonamide antibiotics in 1935.¹ During that short time — many Civil War veterans lived through the whole period — almost every American family acquired a car, a telephone, and a radio. All of those existed only in science-fiction stories when the Civil War was being fought. Gordon argues that the Second Industrial Revolution was the most important one, and that the scope of the change it wrought cannot be repeated. His book's subtitle, focusing on the period since the Civil War, is a reminder that he considers this period very special.

The third is the computer revolution, which is ongoing. It began at a rudimentary level around 1950, but did not profoundly affect everyday life until the last 30 years or so. We do not know when this revolution will end or what its ultimate benefits will be.

THE FIRST INDUSTRIAL REVOLUTION AND ITS AFTERMATH

Gordon takes the First Industrial Revolution as a *fait accompli* and begins his tale at the start of the Second — but the conditions at the start of the Second were, naturally, set by the successes and failures of the First, a point that I wish Gordon had made more forcefully. By the time the First Industrial Revolution ended, certain elements of modern living were in place. Americans spent “only” 44% of their income on food, leaving quite a bit for what we think of as the rest of life; this is a remarkable contrast with the finding that German laborers at the beginning of the nineteenth century spent 85% of their income on *bread*. The telegraph, invented in 1837, made fast communication over long distances possible; just 22 years earlier, in 1815, Colonel Jackson fought the Battle of New Orleans two weeks *after* the War of 1812 had ended. Why? Because his commanders had no way to tell him.

Looking back on the First Industrial Revolution and only the first stirrings of the Second, Mark Twain wrote to Walt Whitman on his 70th birthday:

What great births you have witnessed! The steam press, the steamship,
the steel ship, the railroad, the perfected cotton-gin, the telegraph, the

¹ Sulfa drugs were discovered after penicillin but mass-produced and widely adopted first. Patients who were near death from infection were sometimes completely cured after one dose of sulfonamides. In the thousands of years that medical treatment had been attempted, nothing like this had ever happened before. It is perhaps the most important innovation in history.

History geeks will note that technical inventions are generally contested; Bell beat Elisha Gray by a matter of hours in claiming priority for inventing the telephone. Essentially all inventions involve teamwork and rivalry. A completely accurate historical portrayal of the Industrial Revolutions is beyond the scope of this essay.

phonograph, the photograph, photo-gravure, the electrotpe, the gaslight, the electric light, the sewing machine, and the amazing, infinitely varied and innumerable products of coal tar... And you have seen even greater births than these; for you have seen the application of anesthesia to surgery-practice, whereby the ancient dominion of pain...came to an end in this earth forever.²

Only a handful of these wonders — the phonograph and the electric light — were new. Twain was writing mostly about the First Revolution. And, remarkably, the usually savvy Twain missed the most important point: the greatest marvel was not the accumulation of gadgets, but the easing of backbreaking work. Farming was already becoming increasingly mechanized. While it had always been possible, by working for countless hours, to save enough money to obtain a likeness of one's mother (by hiring a painter), the invention of the box camera in the mid-1800s made the requisite amount of labor trivially tiny.

Lest we romanticize this period in our history too much, we should note that, using purchasing-power parity measures, the U.S. was as poor in 1800 as Pakistan or Cambodia is today. By 1870, our purchasing power had only doubled. Yet our standard of living improved more than that because work and home life were becoming more pleasant in ways that are not captured by GDP statistics. Foreign travelers to the U.S. regarded it as prosperous, even in the early years of the Republic, and certainly by 1870.

Twain concluded with a prescient forecast:

Yes, you have indeed seen much — but tarry yet a while, for the greatest is yet to come. Wait thirty years, and then look out over the earth! You shall see marvels upon marvels added to these whose nativity you have witnessed; and conspicuous above them you shall see their formidable Result — Man at almost his full stature at last! — and still growing, visibly growing while you look.

THE SECOND INDUSTRIAL REVOLUTION

In the 30 years after Twain's 1889 birthday letter to Whitman, the Second Industrial Revolution would run much of its remaining course. By 1919, "we," humankind, specifically John Alcock and Arthur Brown, had crossed the Atlantic nonstop in an airplane, *sitting in a chair in the sky*.³ Thirty more years after that, the innovations of the Second Revolution had become almost universal: practically every American family had not only a car, telephone, and radio, but also an indoor bathroom, hot and cold running water, electrical power, and an assortment of kitchen and laundry appliances.

² <http://www.rationaloptimist.com/blog/twains-half-full-glass/>

³ Thanks to "Louis C. K." (Louis Székely) for that lovely image. Alcock and Brown did not have it quite that easy, almost crashing several times, nearly freezing to death and having to walk on the wings four times to de-ice them.

This was truly a profound change in a short period. Not that many years earlier, one of the primary jobs of women was *carrying water* from a river or well to the home, as it still is in some parts of the world.

The story of this revolution of mobility and power is the heart of Gordon's book. Each major sub-theme of the Second Industrial Revolution is treated in a chapter: housing, transportation, communication, health, working conditions, and finance.

Gordon argues that the most important innovation in this period was the car. Observers during the Great Depression noted that even the poorest households, typically lacking running water, still tried to hold onto their cars. Mobility was, and still is, the key to opportunity, including the opportunity to recover from serious deprivation.

Because the first half — more than 300 pages — of *The Rise and Fall of American Growth* is about the Second Industrial Revolution, I will not go into any further detail in summarizing it. That part of the book is an encyclopedia of U.S. economic history, focusing on the consumer, from 1870 to 1940, and could have easily been a standalone book. Because my goal is to place Gordon's work in context, I've focused on the period before that very special three-quarters of a century and I now turn to the period after it.

THE TAIL END OF THE SECOND INDUSTRIAL REVOLUTION: DEMOCRATIZATION, 1940-1970

By the time the Great Depression ended, around 1940, the basic tools that facilitate modern life, except the computer, had been invented and, to a great extent, disseminated to the consuming public. Even in the massive economic expansion of 1940-1970, Gordon observes a slowing in the rate of innovation. Improvements in the food supply after 1940 were "turtlelike." Progress in housing also slowed; the housing of the 1940s was cramped but perfectly adequate, and the transition from "Levittown to McMansions" reflected rising incomes and more efficient construction methods, not a continuing revolution in technology. Some of the most beautiful mansions ever built were already standing in 1900. The possibility that a middle-class person might own one, or a passable imitation thereof (with much better heating, cooling and appliances), did not emerge until a century later.

Household appliances were an exception, developed later. Washing machines in 1940 were of poor quality, usually requiring hand wringing of wet clothes. Those disappeared by 1970, replaced by reliable and fully automatic washers and dryers. "Somewhat surprisingly," Gordon writes, "the percentage of households with a stove that included an oven and a cooktop was only 24 percent in 1952, rising to 99 percent by 1990." We, too, are a little surprised that the Honeymooners' modest 1950s kitchens were actually top-quartile accoutrements.

Still, Gordon sees an intimation of the future slowdown in economic growth in the marginal improvements of 1940-1970. The basic tools of life would not need to be, and could not be, invented again. Further progress could come from technology diffusion, including the modernization of other, poorer countries; and smaller inventions would build upon the great ones already in existence.

THE THIRD REVOLUTION AND THE SLOWDOWN IN ECONOMIC GROWTH

Meanwhile, against this backdrop of marginal improvement in existing technology and the spread of pre-existing inventions, a third and largely unforeseen revolution was brewing in the research departments of universities, large corporations, and government agencies. The unwieldy ENIAC (1946) and UNIVAC (1951) computers were the harbingers; by the 1960s, mainframe computers were used to prepare bank and credit card statements, make airline reservations, and process taxes.

Because early computers were not a consumer item, the influence of the computer revolution revealed itself slowly. Not until mass-marketed personal computers appeared between 1977 and 1981 did the eventual impact of the Third Industrial Revolution become obvious. It took off quickly after that.

Gordon acknowledges that certain aspects of life are more affected by the Third Industrial Revolution than by any other historical event. Computers are as central to industrial production, transportation, communication, and scientific research as paper is, or used to be, to books. However, the daily business of cooking, eating, bathing, dressing, working, playing, and sleeping has not changed much since 1940 and certainly not much since 1970. The changes in these activities in the century before that were profound.

It has become commonplace (and it is correct) to say that a time traveler from the present would be perfectly comfortable in the 1950s — this was the premise of the movie “Back to the Future,” where perhaps the biggest surprise upon arriving in 1955 was finding six well-dressed men fussing over your car in a gas station. In other words, what has changed since 1955 is superficial; we live a streamlined version of the life that was established by our parents when they were young. This could only be the case if Gordon is correct about the Second Industrial Revolution being the most important one.

Gordon is concerned that the Third Industrial Revolution has not had the impact on real per capita GDP that might have been expected. (He acknowledges, and explains at some length, that GDP data do not fully capture changes in the standard of living that are experienced as easier work, more leisure or greater happiness.) As Robert Solow famously said, “You can see the computer age everywhere but in the productivity statistics.”⁴ He is correct, but that fact casts more doubt on the relevance of the productivity statistics than it does on the importance of computers.

And here is where Gordon makes another noteworthy contribution. He documents the weaknesses of conventional economic statistics, such as productivity and GDP, in capturing the amount of change that takes place due to changes in technology. In chapter 8, for example, he carefully documents the widespread improvement in working conditions since 1870, noting that GDP statistics do not show how much easier, more pleasant and less dangerous most jobs and household tasks became over that period — they only show how much was produced.

⁴ Solow, Robert M. “We’d Better Watch Out.” *New York Times Book Review*, July 12, 1987, <http://www.standupeconomist.com/pdf/misc/solow-computer-productivity.pdf>.

PROSPECTS FOR THE FUTURE

In *The Rise and Fall of American Growth*, Gordon is persuasive in convincing the reader that 1870-1970 was indeed special and unrepeatable. He seems to have been collecting the evidence for this position all his life in preparation for writing this massive book. I still think the human race has a brilliant future, but I agree with Gordon that the pace of improvement as measured by the growth rate of real per capita GDP may very well decelerate for a while, at least until some unforeseen new technology arises.

The key to this paradox — continued rapid progress with slower growth-as-measured — is that the unit of measurement most people look at, real per capita GDP, focuses on the physical quantity of goods and services produced and not on the amount of usefulness and pleasure (or avoidance of pain) provided. Gordon's friend and rival Joel Mokyr notes that, in the 1840s, surgery without anesthesia was a horror that was eliminated forever with an innovation that cost a few dollars.

Does this dollar cost accurately measure the benefit of anesthesia? Of course not. You would give essentially your whole fortune to avoid undergoing surgery without anesthesia, but that is unnecessary. The difference is the "consumer surplus," a number that becomes unfathomably large when summed over many innovations and calculated over long time periods wherein the dollar costs of the innovations fell from high to low.

How much would you pay to avoid living the life of my own grandmother-in-law, born in the 1880s? She had to prepare 357 meals a week for her gargantuan, hungry family without going to the grocery store except on the rarest of occasions. Today, if she were a stay-at-home mom (and that would be a choice, not an obligation), she would probably shop at Whole Foods and Trader Joe's, buy many nutritious prepared meals and eat in restaurants of widely varied cuisine. Her gain in well-being would be measured by the difference between her two paychecks, then and now, which in this case is zero. This absurd result shows that conventional economic statistics are simply not the right tool for measuring that kind of progress.

This logic implies that economic growth has been far greater and more transformative than even the impressive real GDP numbers suggest.

Given Gordon's full awareness of the wedge between GDP growth and the growth of "utility" or overall human well-being, he should have been more specific about whether his forecast of much slower future growth applies just to real per capita GDP as measured or to well-being more broadly defined. It is obvious that the pile of stuff we produce cannot grow forever at 1.8% per year or any other positive rate, no matter how small. But it is not obvious that human well-being is stuck at a particular level due to that fact. An economy can produce much of value that has no physical substance, but that is hard to capture using the narrow metric of real per capita GDP.

HEADWINDS AND TAILWINDS

The last section of Gordon's book is an elaboration of his much-discussed 2012 paper, "Faltering Innovation Confronts the Six Headwinds." I've reviewed and challenged Gordon's headwinds in earlier writings. The headwinds are: slowing

population growth, government and private debt, low-quality education, inequality, globalization (obviously only a headwind for the United States and certain other advanced countries), and environmental and energy concerns.

I noted, in my 2014 article, that “there are also tailwinds.” I identified them, from a U.S. perspective, as: (1) relatively free markets and trade, (2) patent protection, making innovation profitable, (3) instantaneous global communications, (4) cheap, safe air travel enabling innovators to collaborate, socialize, and sell, (5) widespread use of English as the world’s common language, and (6) outstanding universities that could create a global education network on the Internet.⁵

But wait! There are more:

- Cheap shipping, which we’ve had for a long time. But now, when cheap and fast technology transfer is combined with cheap shipping, the world’s poorest people, wherever they happen to be, can compete in global markets and improve their productivity and standard of living tremendously;
- Cheap non-fossil energy (it’s coming, probably including cold fusion, but it could be a long wait);
- Robots and drones;
- Geographic information systems good enough to enable self-driving cars *right now* (the safety record isn’t perfect but neither are human drivers);
- 3-D printing (so far a disappointment, but wait till you can print replacement parts for human beings; it’s already being done in dentistry);
- Innovations in bioengineering and genetic engineering that will eventually make most physical and mental illnesses much rarer; and
- Credible studies showing that global warming is likely to produce only a tiny decrement to global GDP and human development.

If you want to know more, don’t read the *Journal of Financial Economics*. Read *Scientific American*.

FOR INVESTORS, A GLOBAL PERSPECTIVE AND A BRIGHT FUTURE

Should investors learn economic history to help them do their jobs — to allocate assets, hedge liabilities, and earn alpha more effectively? Emphatically, “yes.” While Gordon’s book, with its focus on a single country and century, is not the natural

⁵ Justin Hicks, of the [Information Technology and Innovation Foundation](http://www.innovationfiles.org/no-more-growth-lets-not-be-so-hasty-an-assessment-of-robert-j-gordons-recent-working-paper/) (Washington, DC), has written a critique of Gordon’s headwinds that is more incisive than mine. It is at <http://www.innovationfiles.org/no-more-growth-lets-not-be-so-hasty-an-assessment-of-robert-j-gordons-recent-working-paper/>. Highly recommended.

starting point, it contains a remarkable amount of background information relevant to understanding today's economy. It is part of a series, the Princeton Economic History of the Western World, edited by Joel Mokyr, which has showcased an impressive fraction of the world's leading economic historians, including Gregory Clark, Philip Hoffman, and the Nobel Prize winners Douglass North and Thomas Sargent.

Investors who read *The Rise and Fall of American Growth* may fret that the future will not be as rewarding as the past. They will be both right and wrong. They will be right in the following way: the rates of return earned by investors between 1870 and the present, especially on equities, are reflective of economic and profit growth rates that will be hard to replicate in the future, if only because the world has finally — and blessedly — gotten its population under control. In the United States, with population growing at 0.7%, a real per capita GDP growth rate of 1.8% (the 200-year historical average) on top of that produces a total real GDP growth rate of 2.5%, which sounds anemic. But it is perfectly fine. What matters for well-being is the per-capita experience, not the aggregate.

Moreover, some of Gordon's headwinds for the United States are tailwinds for other countries. Globalization causes factor-price equalization — the tendency of prices, including the prices of labor and capital, to converge among countries that trade with each other. So buy non-U.S. stocks. (Many stocks that purport to be U.S. stocks and that are included in U.S. benchmarks are actually global anyway.)

In an even more powerful force for growth, technology diffusion lags technology creation by decades. While the spread of smartphones to less developed countries has been unusually rapid, there are billions of people in those countries who have never been on an airplane (invented 1903) or driven their own car (invented around 1885). Their modest endowment of housing will be replaced as their incomes rise. They will get an education. The world has no shortage of investment opportunities *based purely on the spread of existing technology*, with no further innovation required.

Investors should also be aware that while the rate of change in productivity may be slower than at various times in the past, the level of productivity — and thus the standard of living — is much higher. You will be better off with a high income and a slower rate of growth than your grandfather was with his modest factory wage and a faster rate of growth. Levels matter!

Even if growth rates are slower than during the Special Century, then, I'll take my chances on the future (not that I have any choice). Globally, the next generation will experience the highest standard of living that has ever been experienced.

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