

US Economic Growth is Over: The Short Run Meets the Long Run

Robert Gordon Stanley G. Harris Professor in the Social Sciences, Northwestern University; NBER



Distinguishing Between Secular Stagnation and Slow Long-term Growth

A set of lively debates about future U.S. economic growth has engaged me as the lonely proponent of pessimism about the future against three very talented proponents of what I have called “techno-optimism.” In their best-selling book *The Second Machine Age* (2013), Erik Brynjolfsson and Andrew McAfee have argued that the U.S. is at a “point of inflection” toward faster technological change. In two public debates with them, I have lost overwhelmingly; the techno-optimists have captured a consensus view that the future will be better than the past, and that hope is understandable because economic conditions in the U.S. have been so dismal during the six years since the beginning of the 2008-09 financial crisis.¹ Another series of debates has pitted me against my Northwestern colleague of 40 years, Joel Mokyr (2014).

This short paper reviews my case for long-run pessimism divided among two sets of explanations, the “headwinds” and the decline of innovation that distinguishes the 80 years before 1972 from the 42 years since 1970. The novelty here compared to previous expositions is the merging of the short run with the long run. The growth experience of the U.S. economy in the decade prior to 2014 combined with a widely accepted estimate of potential GDP growth out to 2024 results in estimated past and future growth almost exactly equal to the long-run growth rate that I formulated more than three years ago. The conclusion of the paper combines the long-term and short-term data on the growth performance of the U.S. economy.

No single image captures the present concern about secular stagnation and slowing long-term economic growth better than *The Economist* cover of July 19, 2014, showing a frustrated jockey dressed in the colors of the American flag frantically trying to get some movement from the gigantic but sluggish turtle that he is riding. U.S. real GDP growth has grown at a turtle-like pace of only 2.1 percent per year in the last four years, despite a rapid decline in the unemployment rate from 10 to 6 percent. Almost all of that improvement in the unemployment rate has been offset by an unprecedented decline in labor force participation, so that the ratio of employment to the working-age population has hardly improved at all since the trough of the recession, and as a result 10 million jobs have been lost forever.²

I have recently (2014a) restated the case for slow growth over the long run of the next 25 to 40 years. At the same time, Larry Summers (2014a) has signaled his alarm about a return of “secular stagnation,” a term associated with a famous 1938 paper by the Harvard economist Alvin Hansen. However, Summers and I are talking about different aspects of the current American growth dilemma. His analysis concerns the demand side, “about how we manage an economy in which the zero nominal interest rate is a chronic and systemic inhibitor of economic activity, holding our economy back below its potential.”³ In contrast my version of slow future growth refers to potential output itself.

As the U.S. unemployment rate declines toward the normal level consistent with steady non-accelerating inflation, by definition actual output catches up to potential output. I have provided (2014b) a layman’s guide to the numbers that link the

performance of real GDP and the unemployment rate and have concluded that U.S. potential real GDP over the next few years will grow at only 1.4 to 1.6 percent per year, a much slower rate than is built into current U.S. government economic and budget projections. My analysis suggests that the gap of actual performance below potential that concerns Summers is currently quite narrow and that the slow growth he observes is more a problem of slow potential growth than a remaining gap. Summers (2014b) has now admitted that his version of secular stagnation is obsolete.

Hansen's 1938 version of secular stagnation was written prior to the invention of the concept of potential GDP and indeed of real GDP itself.⁴ Because there was no comprehensive measure of real economic activity, there was no notion of aggregate productivity or its growth rate. When we look at today's statistical rendering of the American economy in the late 1930s, we see that Hansen was writing about an economy with healthy potential GDP growth but a large gap of roughly 20 percent separating the levels of actual and potential GDP.⁵

Some have dismissed Hansen's concerns by pointing to the rapid growth in productivity that was occurring as he wrote during what Alex Field (2003) has called the 20th century's "most technologically progressive decade." Some optimistic writers have pointed to the upsurge in productivity growth that occurred in the 1930s and 1940s as offering the possibility that history might repeat itself and lead to faster productivity growth over the next two decades than even the productivity heyday of 1996-2004.⁶

The reality of 2014 is far grimmer than faced Hansen's America of 1938, because America was about to receive a succession of lucky breaks that utterly transformed the late 1930s gloom into postwar prosperity. Hitler's invasion of Poland created a doubling of export orders in the winter of 1939-40. After the fall of France, the U. S. government pushed the ignition switch on the Arsenal of Democracy, and before Pearl Harbor the share of total government spending in GDP had doubled.

Real GDP grew at an annual rate of 12.8 percent between 1939:Q4 and 1941:Q4. By 1944, real GDP had doubled from the level of 1939. Most amazingly, the economy did not slide back into Depression conditions when this huge dose of fiscal stimulus was removed; labor productivity was actually higher in 1950 than in 1944.

The Demise of Growth Originates in Headwinds, Not Technology

My forecast of growth over the 25 to 40 years is measured from 2007, not from now. The sources of slow growth do not involve technological change, which I assume will continue at a rate similar to that of the last four decades. Instead, the source of the growth slowdown is a set of four headwinds, already blowing their gale-force to slow economic progress to that of the turtle; the four are demographics, education, inequality, and government debt. These will reduce the growth rate of real GDP per capita from the 2.0 percent per year that prevailed during 1891-2007 to 0.9 percent per year from 2007 to 2032. Growth in the real disposable income of the bottom 99 percent of the income distribution is projected at an even lower 0.2 percent per year.

While many authors acknowledge the demographic headwind, its long-term quantitative impact on economic growth remains open to debate. By definition, growth in output per capita equals growth in labor productivity plus growth in hours per capita. The slowdown in productivity growth that began 40 years ago was partly offset between 1972 and 1996 by an increase in the labor force participation rate of 0.4 percent per year, as females and baby-boom teenagers entered the labor force. In contrast during 2004-2014 the participation rate has declined at an annual rate of 0.5 percent, and over the shorter 2007-2014 interval at an annual rate of 0.8 percent.

This transition from a 0.4 percent *increase* to a 0.8 percent *decline* accounts for a 1.2 percent reduction in the growth of per capita real GDP for any

given growth rate of labor productivity. Recent research (Hall, 2014) has shown that about half of the 2007-14 decline in participation is due to the aging of the population as the baby-boom generation retires. The other half is due to declining participation within age groups. Aaronson *et al.* (2014) have concluded that *all* of the 2007-2014 decline in the participation rate has been due to secular factors and none to cyclical factors.

The second headwind is education. Throughout most of the 20th century rising high school completion rates permanently changed the productive capacity of American workers, but this transition was over by 1970. Further increases in high school completion rates have been offset by dropping out, especially of minority students, as the U.S. slides to number 16 rank for secondary school completion in an international league table among developed countries. Similarly, the U.S. has a low ranking in college completion rates and there are new problems—over \$1 trillion in student debt combined with the inability of 40 percent of college graduates to find jobs requiring a college education, spawning a new generation of indebted baristas and taxi drivers.

The third headwind is income inequality that continues to grow inexorably as salaries for CEOs and celebrities march ever upward, augmented by the creation of trillions of dollars in stock market wealth. Below the 90th percentile corporations are working overtime to reduce wages, reduce benefits, convert defined benefit pension plans to defined contribution, and to use Obamacare as an excuse to convert full-time jobs to part-time status.

The fourth headwind is the predicted upward creep in the ratio of Federal government debt to GDP. The official CBO data greatly understate the gravity of the problem, because the CBO estimate of future potential GDP growth is out of touch with reality. Because potential real GDP growth is already much slower than the CBO estimates (Gordon, 2014b), future tax revenue will grow more slowly, boosting the debt in the numerator of the debt/GDP ratio, while the denominator will grow

more slowly, thus further increasing the ratio. If current policies remain the same, debt/GDP ratio will reach 87 percent by 2024 in contrast to about 70 percent today, and this does not take into account the apparently intractable pension burdens in some of the largest state and local governments.

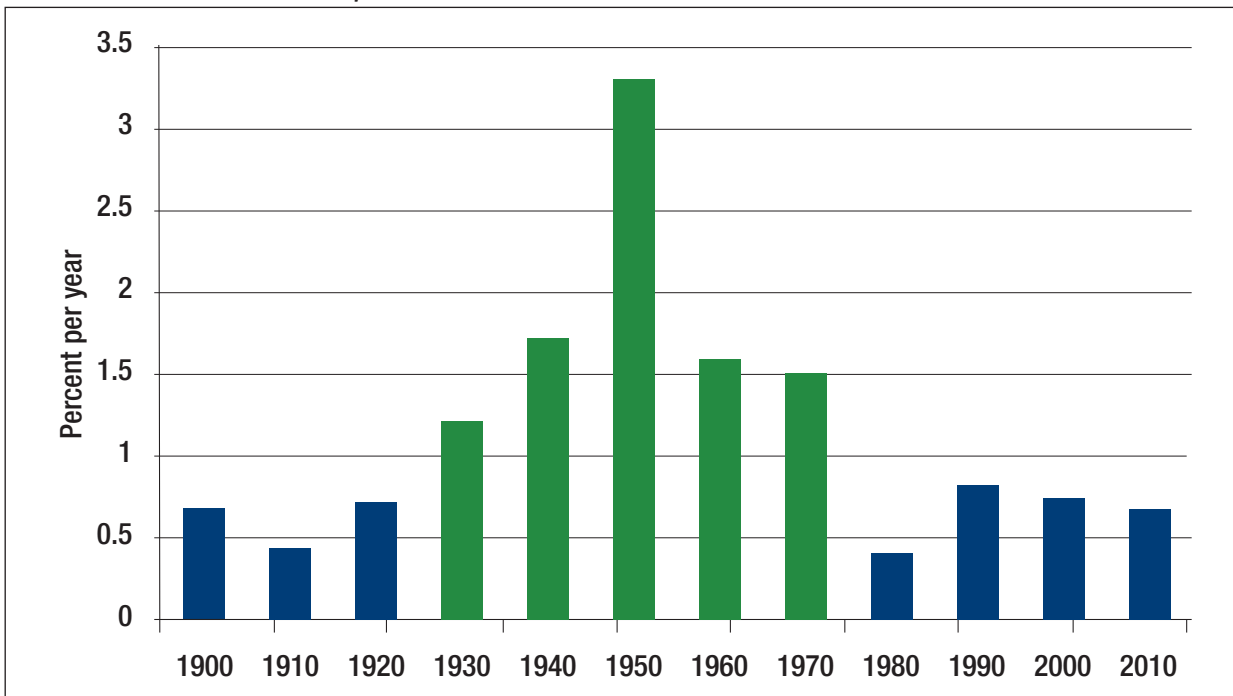
For the disposable (after tax) incomes of the bottom 99 percent, it is hard to find any room for growth at all. Indeed official measures of median wage and household income have been stagnant for several decades. While these measures may understate income growth, my exercise in taking the historical record of growth of real GDP per capita and then subjecting it to “an exercise in subtraction” avoids the problem that some of the median wage and household income data exclude elements that are included in the data on GDP and personal disposable income.

Nobody Debates the Headwinds, Instead They Debate Technological Progress

My forecast of slow future growth after 2007 does not rely on any slowing of future technological change. My “exercise in subtraction” deducts 1.2 percent from the realized 1891-2007 per capita output growth rate of 2.0 percent for the combined impact of the four headwinds. Then I deduct an additional 0.6 percent for the fact that productivity change slowed markedly from the 80 years before 1972 to the 40-plus years since 1972. *In my numbers there is no forecast of a future technological slowdown—productivity growth adjusted for educational stagnation is predicted to be just as fast during 2007-2032 as during 1972-2007.*

Critics of my growth forecasts have largely ignored the fact that I am not suggesting that the pace of innovation will slow in the future compared to the achievements of 1972-2014. What the *Economist* cover called today’s “loss of oomph” in the U.S. economy occurred after 1972, that is, after the first century of implementing the rainbow of benefits from the inventions of the Second Industrial

FIGURE 1. ANNUAL GROWTH RATE OF TOTAL FACTOR PRODUCTIVITY FOR TEN YEARS PRECEDING YEARS SHOWN, YEARS ENDING IN 1900 TO 2012.



Revolution. In the early postwar years the spread of air conditioning, commercial air travel, and the interstate highway system represented the final implementation of technologies invented in the 1870s. After 1972 the slowdown was visible in the data and has continued to the present.

For decades macroeconomists struggled to understand the post-1970 productivity growth slowdown. But in fact our entire generation has been asking the wrong question. Instead of wondering why there was a productivity growth slowdown after 1972, we should have asked, “Can we explain the productivity miracle that occurred in the U.S. economy between 1920 and 1970?” While I join most analysts in preferring to compare productivity growth data between years when unemployment and utilization were “normal,” nevertheless it is interesting to look at the raw data for each of the 12 decades since 1890, as in Figure 1. Any techno-optimist must look at this history with dismay. The future is not going to be better than the past, because the economy during 1920-70 achieved growth in Total Factor Productivity (TFP) of a different order of magnitude in these “green” decades

than during the “blue” decades before 1920 and since 1970.⁷ If we compute the area of the green triangles and blue triangles, we conclude that roughly three-quarters of observed TFP growth since 1890 occurred in the half-century between 1920 and 1970. The sum of the blue areas (1890-1920 and 1870-2012) contributes only one-quarter of cumulative TFP growth since 1890.

As noted in the introduction, my findings have been disputed by the techno-optimists, namely Brynjolfsson, McAfee, and Mokyr. The techno-optimists focus entirely on their dreams of unprecedented future breakthroughs in technology that center on the benefits of artificial intelligence, big data, small robots, medical miracles, and driverless cars and trucks. They ignore the headwinds and thereby have nothing to say about the core of my case that future disposable income growth for the bottom 99 percent will be slower than in the past, a slowdown that already began years ago when the headwinds began to gain momentum.

These techno-optimist forecasts are useful only along one dimension. They give us hope that

innovation might proceed at the same pace in the next few decades as in the last four. Yet they are utterly unconvincing that the pace of technological change will be *faster* over the next 25 years than over the last 40. Consider what they are up against that happened within the last 40 years since 1972: the mainframe era that eliminated routine clerical jobs of endlessly retyping contracts, bills, and legal briefs; the invention of the personal computer that allowed many professionals to write their papers without the aid of a secretary; the invention of game-changing technologies in the retail sector including the ATM machine, bar code scanning, self checkout, and airline automated check-in kiosks; Amazon and e-commerce; Wiki and the availability of free information everywhere; the obsolescence of the hard-copy library catalog, the auto parts catalog, the print dictionary and encyclopedia.

The pessimism in my forecasts of future economic growth is based on the headwinds, not a faltering of technology. I am dubious that the nirvana of artificial intelligence, big data, robots, driverless cars, etc. will match the achievements enumerated above of the last 40 years. By basing my productivity forecast on a continuation of the 1972-2014 pace of innovation, I am deliberately suppressing my skepticism.

The techno-optimists differ in the nature of their concerns. Brynjolfsson and McAfee (2013) are admirable in their social concern that their abundant robots and big data will eliminate millions of jobs. Mokyr is not interested in jobs or headwinds. He predicts hypothetical future breakthroughs without any contact with the historical data, a remarkable position for an economic historian. He does not appear to care about the drama shown in Figure 1 above of the TFP speedup during the 1920-70 period and its subsequent relentless slowdown.

Mokyr's sole comment about the headwinds (2014, p. 14) is that the unprecedented decline in the labor force participation rate is partly offset by an increase in leisure. However we have long known that leisure time during the work week experi-

enced by the unemployed or by those who would prefer to work has far less value than leisure time on weekends and during vacations. Labor force participation has been declining in large part because many people are forced to retire without adequate finances and others give up looking for jobs after a desperate and endless search. Mokyr punctuates his dismissal of declining hours per capita with a remarkable quote: "But it may well be that a leisurely life is the best 'monopoly profit.'" He forgets his history—from the standpoint of the increasing marginal disutility of work, the real welfare-enhancing transition involving leisure occurred in the first half of the 20th century when the 60-hour manufacturing workweek of 1900 fell to 40 hours per week by 1950.⁸

The optimists, both Brynjolfsson-McAfee and Mokyr, share a common reaction to any display of historical productivity data such as contained in Figure 1. They claim that GDP is fundamentally flawed because it does not include the fact that information is now free due to the growth in Internet sources such as Google and Wikipedia. A complementary statement is that numerous items have disappeared from GDP because they are already provided for free with a smartphone—not only the print dictionary or encyclopedia, but the music-playing capability that makes the separate iPod obsolete, the photo capability that makes my camera obsolete, the restaurant locator that makes the print Zagat guide obsolete, the growth in companies like Uber and Lyft that may make the urban taxicab obsolete, and many more.

Two responses are appropriate about the unmeasured GDP made possible by the smartphone. The most obvious is that TFP growth sagged decades before the popularization of smartphones and the Internet. The most important event of the digital age was the marriage of personal computers and communications in the mid to late 1990s in the form of the Internet, web browsing, and email. Many of the sources of consumer surplus and free information were established more than a decade ago, including Amazon in 1994, Google in 1998, as well as Wikipedia and iTunes in 2001. While progress has

continued in the past decade with smartphones, gmail, Google Maps, and other applications, these innovations are second-order inventions compared to the great marriage of computers and communication of the late 1990s, and the slow growth of TFP reflects that.

The much more important response is that GDP has *always* been understated. Henry Ford reduced the price of his Model T from \$900 in 1910 to \$265 in 1923 while improving its quality. Yet autos were not included in the CPI until 1935. Think of what GDP misses: the value of the transition from gas lights that produced dim light, pollution, and were a fire hazard, to much brighter electric lights turned on by the flick of a switch; the elevator that bypassed flights of stairs; the electric subway that could travel at 40 mph compared to the 5 mph of the horse-drawn streetcar; the replacement of the urban horse by the motor vehicle that emitted no manure; the end of disgusting jobs of human beings required to remove the manure; the networking of the home between 1870 and 1940 by five new types of connections (electricity, telephone, gas, water, and sewer); the invention of mass marketing through the department store and mail order catalogue; and the development of the American South made possible by the invention of air conditioning.

Perhaps the most important omission from real GDP was the conquest of infant mortality, which by one estimate added more unmeasured value to GDP in the 20th century, particularly its first half, than all measured consumption (Nordhaus, 2003). The list goes on. The invention of air conditioning and commercial air travel may have created more consumer surplus for more people than the provision of free information over the Internet.

While Mokyr is not concerned about the destruction of jobs implied by his hypothetical technological revolution, Brynjolfsson and McAfee are overly worried because they are too optimistic about the future reach of robots into the vast American service sector. Retail supermarkets are in stasis—the one-time benefit of the bar code scanner 30

years ago has not changed the need for a human checkout clerk, and supermarket shelves are still restocked by humans, not robots. The higher education sector has vastly inflated its costs by adding layers of administration without changing the nature of instruction. One wonders why the U.S. needs 97,000 bank branches, but the 1977 invention of the ATM machine has apparently not eliminated them.

The Future of Growth in the United States

The end of U.S. economic growth has already happened. There is an uncanny similarity between the long-run growth rates that I have long predicted for 2007-32 and the actual outcome 2003-13.

TABLE 1. LONG-RUN FORECAST VS. SHORT-TERM OUTCOME, GROWTH RATES PER ANNUM (PERCENT)

	2003-2013	2007-2032
Real GDP	1.72	1.65
Population Growth	0.84	0.75
Real GDP per Capita	0.88	0.90

Ever since my initial speech on the topic “Is U.S. Economic Growth Over?” I have estimated future growth of per capita real GDP to be 0.9, and then I subtract 0.5 percentage points for rising inequality and a final 0.2 points for the inevitable need to raise future tax revenues or to cut back entitlement spending. Surprisingly, the U.S. economy over the past decade “delivered” exactly what I have been forecasting for the future.⁹ The 0.5 percentage point subtraction for inequality comes from the standard data source on equality compiled by Emmanuel Saez and Thomas Piketty. Their data show that in the two decades 1993-2013 the average growth rate of real income for the bottom 99 percent of the income distribution was 0.8 percent per year, 0.5 percent less than the 1.3 percent growth rate of the entire distribution (the growth rate was about 3.8 percent per year in the top 1 percent).

Now is the time to start trying to understand why the future pace of potential real GDP appears to be so slow, and whether anything can be done about the headwinds, particularly demography, inequality, and debt, that drag down income growth for the bottom 99 percent so far below the slowing rate of overall growth. The techno-optimists are whistling in the dark, ignoring the rise and fall of TFP growth over the past 120 years. The techno-optimists ignore the headwinds, which seems ostrich-like in their refusal to face reality.

The Economist of July 19, 2014 got it right. America is riding on a slow-moving turtle. There is little that politicians can do about it. My standard list of policy recommendations includes raising the retirement age in line with life expectancy, drastically raising the quotas for legal immigration, legalizing drugs and emptying the prisons of non-violent offenders, and learning from Canada how to finance higher education. The U.S. would be a much better place with a medical system as a right of citizenship, a value-added tax to pay for it, a massive tax reform to eliminate the omnipresent loopholes, and an increase in the tax rate on dividends and capital gains back to the 1993-97 Clinton levels.

But hypothetical legislation, however politically improbable, has its limits. The headwinds that are slowing the pace of America's future economic growth have been decades in the making, entrenched in many aspects of our society. The reduction of inequality and the eradication of roadblocks in our educational system defy the cure-all of any legislation signed at the stroke of a pen. Innovation, even at the pace of 1972-2014, cannot overcome the ongoing momentum of the headwinds. Future generations of Americans who by then will have become accustomed to turtle-like growth may marvel in retrospect that there was so much growth in the 200 years before 2007, especially in the core half-century between 1920 and 1970 when America created the modern age.

References

- Aaronson, Stephanie, Cajner, Tomas, Fallick, Bruce, Reig, Gaibis-Reig, Felix, and Wascher, William. 2014. "Labor Force Participation: Recent Developments and Future Prospects." *Brookings Papers on Economic Activity*, no. 2, forthcoming.
- Brynjolfsson, Erik, and McAfee, Andre. 2013. *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. New York and London: Norton.
- Field, Alexander J. 2003. "The Most Technologically Progressive Decade of the Century." *American Economic Review* 93 (September, no. 4), 1399-1413.
- Gordon, Robert J. 2014). "The Demise of U.S. Economic Growth: Restatement, Rebuttal, and Reflections." NBER Working Paper 19895, February.
- Gordon, Robert J. 2014b. "A New Technique for Estimating Potential Output: Implications for the Labor Market and the Debt/GDP ratio." NBER Working Paper, September.
- Gordon, Robert J. 2015. *Beyond the Rainbow: The Rise and Fall of Growth in the American Standard of Living Since 1870*. Princeton NJ: Princeton University Press, forthcoming.
- Gordon, Robert J., and Krenn, Robert. 2010. "The End of the Great Depression 1939-41: Fiscal Multipliers and Policy Contributions." NBER Working Paper 16380, September.
- Hall, Robert E. 2014. "Quantifying the Lasting Harm to the U.S. Economy from the Financial Crisis." NBER Working Paper 20183, May.
- Hansen, Alvin H. 1934. "Capital Goods and the Restoration of Purchasing Power." *Proceedings of the Academy of Political Science* 16 (no. 1, April), 11-19.
- Hansen, Alvin H. 1939. "Economic Progress and Declining Population Growth." *American Economic Review* 29 (no. 1, March), 1-15.
- Krueger, Alan B., and Mueller, Andreas. 2011. "Job Search, Emotional Well-Being, and Job Finding in a Period of Mass Unemployment: Evidence from High-Frequency Longitudinal Data." *Brookings Papers on Economic Activity*, Spring, 1-57.
- Mokyr, Joel (2014). "The Next Age of Invention: Technology's Future Is Brighter Than Pessimists Allow." *City Journal* (Winter), 12-20.
- Nordhaus, William D. 2003. "The Health of Nations: The Contribution of Improved Health to Living Standards." in Kevin M Murphy and Robert H. Topel, eds., *Measuring the Gains from medical Research: An Economic Approach*. Chicago: University of Chicago Press for NBER, 9-40.

Summers, Lawrence H. 2014a. “Reflections on the ‘New Secular Stagnation Hypothesis’”, in Teulings, Coen, and Baldwin, Richard, eds. *Secular Stagnation: Facts, Causes and Cures*. London, CEPR Press, pp. 27-40.

Summers, Lawrence H. 2014b. “Bold Reform Is the Only Answer to Secular Stagnation.” *Financial Times*, September 8.

Syversen, Chad. 2013. “Will History Repeat Itself? Comments on “Is the Information Technology Revolution Over?” *International Productivity Monitor* No. 35, Spring, 37-40.

Endnotes

1. Erik and I each gave TED talks on February 26, 2013, followed by a debate between us. Erik, the techno-optimist, won 99 percent of the votes prior to the debate and 98 percent after the debate. In a slightly less lopsided debate with Andy conducted by *The Economist* on its blog, I lost by a more respectable 71 to 29.
2. Aaronson et al. (2014).
3. Summers (2014b).
4. The term “secular stagnation” was introduced not in Hansen’s Presidential Address but rather four years earlier in Hansen (1934, p. 19).
5. Current NIPA data for nominal GDP register \$104.6 billion in 1929, \$57.2 in 1933, and \$87.4 in 1938. Gordon-Krenn (2010) estimate the GDP gap for 1938:Q4 to be 23.1 percent, implying that nominal potential GDP was \$113 billion in 1938. Potential GDP grew between 1928 and 1941 at 3.1 percent per year, and labor productivity grew at 2.7 percent per year, more than double the rate achieved in 2004-14.
6. Syversen (2013, Chart 1) cleverly displays the level of labor productivity with two horizontal axes, one extending from 1890 to 1940 and the other aligned 80 years later to extend from 1970 to 2020. This 80-year displacement implies a parallel between 1932 and 2012 and overtly suggests that productivity growth will speed up radically after 2012 as it did after 1932. He ignores the fact that much of the upsurge of productivity growth after 1932 was cyclical and related to the doubling of real GDP between 1939 and 1944.
7. Total Factor Productivity (TFP) is defined as a weighted average of the ratio of output to labor input and the ratio of output to capital input, where both types of input are adjusted for quality changes. The TFP data displayed in Figure 1 are derived from scratch in Chapter 10 of my forthcoming book (2015). They combine labor and GDP data from the BEA, BLS, and Kendrick (1961), but they are also revised to change the concept of capital input to allow for variable retirement ages and to include certain types of government-financed capital input.
8. Mokyr’s claim that valuable leisure time partly or entirely offsets the lost income of the unemployed (and of those out of the labor force who would prefer to work) is sharply contradicted by a recent survey of the emotional well-being of the unemployed during the recent recession and slow recovery. See Krueger and Mueller (2011).
9. My first speech on the topic “Is U.S. Economic Growth Over?” was given at Sciences Po in Paris on September 12, 2011.