

## THE ECONOMICS OF SECULAR STAGNATION‡

### Secular Stagnation: A Supply-Side View†

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Alvin Hansen (1939) popularized the term “secular stagnation,” and we are now, at the suggestion of Larry Summers (2014), considering the application of Hansen’s term to the current US economy, because the pace of output recovery in the five years since the business cycle trough of 2009 has been so slow. Yet, the conditions of aggregate demand and supply in 2015 are the mirror image of those when Hansen wrote. The nation in 1938 faced a crisis of woefully inadequate aggregate demand but not of aggregate supply, because the underlying rate of productivity growth in the late 1930s was as fast as at any time in US economic history. In contrast, in early 2015 the output gap is small and shrinking, while productivity growth over the past five years has been only a fraction of the rate achieved in the late 1930s.

The supply side of secular stagnation refers to potential real GDP growth, the growth rate of output consistent with steady nonaccelerating inflation. During the five years ending in 2014:III, actual real GDP grew at 2.4 percent per annum, while the unemployment rate declined from 10 to 6 percent, implying that potential real GDP grew substantially less than actual output over that period. Slow potential real GDP growth matters both because of its direct impact on the standard of living and also because of its indirect effect in reducing net investment, which in turn feeds back to slower productivity growth.

Secular stagnation in the form of slow potential output growth over the past half-decade

reflects the slowness of growth in both labor productivity and in aggregate hours of work, and slow growth in the latter is due both to slowing population growth and to a decline in the Labor Force Participation Rate (LFPR). Because the behavior of the LFPR has received ample research attention lately, this paper focuses on the sources of slow productivity growth.<sup>1</sup> The central argument is that the digital electronics revolution has begun to encounter diminishing returns. Further evidence is cited that suggests a decline in the “dynamism” of the economy as measured by the rate of creation of new firms. The paper concludes by examining some of the long-term implications of slow potential real GDP growth.

#### I. Labor Productivity Growth, TFP Growth, and the Three Industrial Revolutions

The magnitude of the slowdown in productivity growth is shown in Table 1, which displays for five time intervals the annual growth rates of real GDP, aggregate hours of work, real GDP per hour (i.e., labor productivity), and Total Factor Productivity (TFP).<sup>2</sup> By subtracting from labor productivity growth the effects of capital deepening and of improved educational attainment, TFP growth provides the best available measure of the underlying pace of innovation and technological change. TFP growth since 1972 pales in comparison with the middle of the twentieth century (1920–1972). Average TFP growth of

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<sup>1</sup>On the sources of the decline in the LFPR see Aaronson et al. (2014)

<sup>2</sup>Real GDP is from the Bureau of Economic Analysis (BEA) back to 1929 and from Kendrick (1961, Table A-XIX) for 1920–1929. Total economy hours of work are from an unpublished series obtained from the Bureau of Labor Statistics for 1950–2014 and from the same Kendrick table for 1920–1950. The TFP growth rates are derived in Chapter 6 of my book (Gordon forthcoming).

TABLE 1—ANNUAL GROWTH RATES SELECTED INTERVALS

	Real GDP	Aggregate hours	Output per hour	TFP
1920–1950	3.58	0.61	2.97	2.17
1950–1972	3.89	1.24	2.65	1.79
1972–1996	3.01	1.63	1.38	0.52
1996–2004	3.32	0.81	2.51	1.43
2004–2014	1.58	0.36	1.22	0.54

Note: 2004 and 2014 data refer to third quarter of each year.

0.70 percent for 1972–2014 was barely one-third of the 2.01 growth rate achieved between 1920 and 1972. Labor productivity growth after 1972 also fell short of 1920–1972 growth by the same difference of 1.3 percent. In the past five years, labor productivity growth has declined further to only 0.87 percent per year, while TFP growth has further slowed to 0.48 percent per year.

The rapidity of TFP growth during 1920–1972 reflects the dynamics of the industrial revolutions that created the modern economy. The first industrial revolution (IR #1) of steam engines created railroads, steamships, and the transition from wood to metal, with effects felt throughout the nineteenth century. The second industrial revolution (IR #2) combined the nearly simultaneous invention of a host of general purpose technologies, including electricity, the internal combustion engine, the telephone, wireless, chemical engineering, and the conquest of infectious diseases. Paul David (1990) has argued persuasively with his “delay hypothesis” that there were good reasons for the long delay between the first electric power station in 1882 and the revolutionary introduction of electric machinery in the early 1920s. A similar argument can be made regarding the internal combustion engine; two decades after its 1879 discovery were required to develop the drive chain that transmitted power to the wheels. The productivity impact of motor vehicles awaited sufficient numbers as the total number of motor vehicles in the United States grew from 4,000 in 1900 to 26.7 million in 1929. And rapid improvements continued after 1920 along every dimension of IR #2, including the electrification of industry, the development of the vertical city, the sensation caused by radio and by motion picture “talkies,” the spread of air conditioning, the development of petroleum-based

plastics, the conquest of infant mortality, the invention of antibiotics, and the spread of commercial air transport.

At about the same time as the impact of IR #2 began to encounter diminishing returns after 1970, along came the digital electronic third industrial revolution (IR #3). The benefits of IR #3 began in the 1960s and 1970s with main-frame computers replacing the tedious clerical work of manually preparing bank statements and telephone bills, and continued into the 1980s with the PC, the ATM machine, and retail bar-code scanning. Yet the growth of output per hour was relatively slow in the 1970s and 1980s, as shown in the middle row of Table 1. Soon after David (1990) developed his delay hypothesis, there was an upsurge of growth in output per hour to 2.51 percent per year during 1996–2004, as shown in Table 1. Productivity analysts have credited the dot.com revolution, which married the computer with communications and developed e-commerce and search engines, for the productivity growth revival of 1996–2004.

As we can see in Table 1, however, the productivity upsurge of 1996–2004 was followed by mediocre productivity growth of only 1.22 percent per year in the decade after 2004. TFP growth barely exceeded 0.5 percent per year during both 1972–1996 and 2004–2014, interrupted by the temporary eight-year upsurge to 1.43 percent (still well short of the pre-1972 rate) during 1996–2004. A comparison of the two intervals with slow productivity and TFP growth, that is, 1972–1996 and 2004–2014, shows that while both had relatively slow rates of productivity growth (1.38 and 1.22 percent per year, respectively), they differed markedly in their growth rates of output (3.01 versus 1.58) and of aggregate hours (1.63 and 0.36). When we decompose this 1.27 percentage point slowdown in hours growth, we find that most of it (0.91 percentage points) is due to a shift from positive to negative growth in the LFPR and the remainder (0.39 points) to slower growth in the working-age population.<sup>3</sup> For our subject of secular stagnation in potential output growth, a given percentage-point contribution to slowing potential output growth is equally important,

<sup>3</sup>Other components of the ratio of payroll hours of work to the working-age population net out almost to zero.

whether it originates in labor productivity or in aggregate hours of work.

## II. Could the Third Industrial Revolution Almost Be Over?

To understand the sources of today's secular stagnation, we need to reflect on the decline in the growth rate of labor productivity in the past decade as displayed in Table 1. What factors caused the productivity revival of the late 1990s to be so temporary and to die out so quickly?

Most of the economy has already benefited from the Internet and web revolution, and methods of production have been little changed over the past decade. The revolutions in everyday life made possible by e-commerce and search engines were already well established—Amazon dates back to 1994, Google to 1998, and Wikipedia as well as iTunes to 2001.

### A. Stasis in the Office

The digital revolution centered on 1970–2000 utterly changed the way offices function. In 1970 the electronic calculator had just been invented but the computer terminal was still in the future. Office work required innumerable clerks to operate the keyboards of electric typewriters that had no ability to download content from the rest of the world. Starting from this world of 1970, by the year 2000 every office was equipped with web-linked personal computers that could do not just word-processing without repetitive retyping, but could download multiple varieties of content and perform any type of calculation at blinding speed. By 2005 flat screens had completed the transition to the modern office. But then progress stopped. Throughout the world, the equipment used in office work and the productivity of office employees closely resembles that of a decade ago.

### B. Stasis in Retailing

Since the development of “big box” retailers in the 1980s and 1990s, and the conversion of check-out aisles to bar-code scanners, little has changed in the retail sector. Payment methods gradually changed from cash and checks to credit and debit cards, and the process of card authorization became almost instantaneous by the late 1990s. Wal-Mart and other big-box chains

transformed supply chains, wholesale distribution, inventory management, pricing, and product selection, but that productivity-enhancing shift away from traditional small-scale retailing is largely over. The retail productivity revolution counts as among the many accomplishments of IR #3 that are largely completed.

### C. Decline in Business Dynamism

Recent research has used the word “dynamism” to describe the process of creative destruction by which new start-up and young firms are the source of productivity gains that occur when they introduce best-practice technologies as they shift resources away from old low-productivity firms. The share of total employment accounted for by firms no older than five years declined by almost half from 19.2 percent in 1982 to 10.7 percent in 2011. This decline was pervasive across retailing and services, and after 2000 even the high-tech sector experienced a large decline in startups and fast-growing young firms.<sup>4</sup>

## III. Education and Social Decay Subtract from Future Productivity Growth

What about the future? The historic contribution to labor productivity growth of rising educational attainment has almost come to an end, and the increased number of children growing up in single-parent households is likely to cause further erosion in educational achievement.

### A. The Contribution of Education to Productivity Growth

Growth accounting has long recognized the role of increasing educational attainment as a source of economic growth. Goldin and Katz (2008) estimate that educational attainment increased by 0.8 years per decade over the eight decades between 1890 and 1970. Over this period they also estimate that the improvement in educational attainment contributed 0.35 percentage points per year to the growth of productivity and output per capita. To the extent that American educational attainment is rising less rapidly than in the past, the future growth rate of productivity will tend to be slower.

<sup>4</sup>Davis and Haltiwanger (2014, p. 14).

The surge in high-school graduation rates—from less than 10 percent of youth in 1900 to 80 percent by 1970—was a central driver of twentieth century economic growth, but the graduation rate has stagnated since 1970. The United States currently ranks eleventh among the developed nations in high school graduation rates and is the only country in which the graduation rates of those aged 25–34 is no higher than those aged 55–64.<sup>5</sup> Educational outcomes at the secondary level are poor by international standards; the 2012 OECD international PISA test scores ranked the United States among the 34 OECD countries as seventeenth in reading, twentieth in science, and twenty-seventh in mathematics.<sup>6</sup>

At the college level, longstanding problems of quality are joined with the newer issues of affordability and student debt. In most of the postwar period a low-cost college education was within reach of a larger fraction of the population than in any other nation, thanks to free college education made possible by the GI Bill, and also minimal tuition for in-state students at state public universities. The United States led the world during most of the last century in the percentage of youth completing college. The percentage of 25-year-olds who have earned a BA degree from a four-year college has inched up in the past 15 years from 25 to 30 percent, but that is ranked now twelfth among developed nations.

And the future does not look promising. The cost of a university education has risen since 1972 at more than triple the overall rate of inflation. Even when account is taken of the discounts from full-tuition made possible by scholarships and fellowships, the current level of American college completion has been made possible only by a dramatic rise in student borrowing. Americans owe \$1.2 trillion in college debt, and an increased fraction of the next generation may choose not to complete college as they are priced out of the market for higher education.

<sup>5</sup>“How U.S. graduation rates compare with the rest of the world,” CNN, November 3, 2011, <http://globalpublicsquare.blogs.cnn.com/2011/11/03/how-u-s-graduation-rates-compare-with-the-rest-of-the-world/>.

<sup>6</sup>“Programme For International Student Assessment (PISA) Results From PISA 2012,” OECD, [www.oecd.org/pisa/keyfindings/PISA-2012-results-US.pdf](http://www.oecd.org/pisa/keyfindings/PISA-2012-results-US.pdf).

## B. Socioeconomic Decay

The decline of marriage as an institution among Americans who lack a college education is relevant to the future rate of productivity growth, because children—particularly boys—who grow up in households lacking a father are less likely to graduate from high school and more likely to become engaged in criminal activity. An important source of this sociological change is the evaporation of good, steady, high-paying blue-collar jobs. Partly because men without a college education have lacked the incomes and steady employment to be attractive marriage partners, and partly because women have become more independent as opportunities in the labor market have opened up for them, fewer couples are getting married and as a result an ever-larger share of children are growing up without a father in the household.

Murray (2012) documents changes in social indicators for the bottom third of the white population. His most devastating statistic is that for mothers aged 40, the percentage of children living with both biological parents declined from 95 percent in 1963 to 34 percent in 2004.<sup>7</sup> For white high-school graduates the percentage of children born out of wedlock increased from four percent in 1982 to 34 percent in 2008 and from 21 to 42 percent for white high-school dropouts. Carbone and Cahn (2014, p. 1) conclude “The American family is changing—and the changes guarantee that inequality will be greater in the next generation. For the first time, America’s children will almost certainly not be as well educated, healthy, or wealthy as their parents.”

An obstacle to future employment is the growing share of young men with prison records. A recent study showed that between 1979 and 2009 the percentage of white male high-school dropouts who had been in prison rose from 3.8 to 28.0 percent. For blacks over the same time interval the percentage who had been in prison rose from 14.7 percent to 68.0 percent.<sup>8</sup> Any kind of criminal record and especially time in prison severely limit the employment opportunities available to those whose prison sentences

<sup>7</sup>Murray (2012, Figure 8.11, p. 167)

<sup>8</sup>Data in this paragraph come from Pettit (2012, Table 1.4).

are ending. According to the FBI no less than one-third of all adult Americans have criminal records, and this stands as a major barrier to employment.<sup>9</sup>

#### IV. Will the Temporary Productivity Revival of the Late 1990s Be Repeated?

In the productivity history of Table 1, the 1996–2004 revival is notable both for its magnitude, but also because it was temporary and could not sustain itself for more than eight years. There are other performance indicators of the US economy that support the view that the 1996–2004 economic environment was unique and will not be repeated anytime soon.

First, the temporary productivity revival of the late 1990s was accompanied by an equally temporary acceleration of growth in manufacturing capacity from 2.5 percent during 1972–1995 to 6.5 percent in 1999–2000. Then there was a collapse in capacity growth to negative values in 2011–2012.

Second, net private investment as a share of the private capital stock, measured as a five-year moving average, fell from 3.8 percent during 2000–2001 to only 1.0 percent in 2013.

Third, the rate of decline of computer prices per unit of performance became steadily more rapid with a peak rate of decline of 14 percent in 1998–1999, followed by a retreat back to a decline of only one percent per year in 2014. The waning pace of performance-adjusted price declines for computers was accompanied by the post-2006 demise of Moore's Law, a relationship that since 1965 had reliably predicted that the number of transistors on a computer chip would double every two years. But since 2006 the doubling time has exceeded four years.

#### V. Conclusion

Secular stagnation is evident in every measure of economic performance over the past five years, most notably the growth rates of output, labor productivity, and aggregate hours of work, which during the past decade through 2014:III averaged 1.6, 1.2, and 0.4 percent, respectively. Potential real GDP appears to be running at about half of the actual output growth rate of 3.1

percent achieved during 1972–2004. The repercussions of such slow growth are significant. Growth in real per capita income over the past ten years has been only 0.6 percent per year, less than one-third of the 2.1 percent achieved from 1890 to 2007. The ratio of net investment to the capital stock has declined over the past five years to 1.0 percent, less than one-third of the average ratio achieved between 1950 and 2007. The Congressional Budget Office estimates that the federal debt to GDP ratio in 2024 with current tax and spending policy will be 78 percent, but slower real GDP growth implies that the ratio will instead be 87 percent.

The paper provides three separate arguments to explain slow productivity growth in the past decade. The first is that fundamental changes in business methods were concentrated in the dot.com era of rapid productivity growth and, once new equipment was installed and new business practices were adopted, the impact on productivity growth of the ICT revolution began to encounter diminishing returns. A second argument points to the measures of economic performance which all had the same timing, peaking in the late 1990s and declining to low levels in the last few years, including the growth in manufacturing capacity, the ratio of net investment to the capital stock, the rate of decline in the ICT price deflator, and the speed of improvement of microchip technology. Another measure of waning economic performance includes the rate of new business start-ups.

Slower growth in potential output from the supply side, emanating not just from slow productivity growth but from slower population growth and declining labor-force participation, reduces the need for capital formation, and this in turn subtracts from aggregate demand and reinforces the decline in productivity growth. In the end, secular stagnation is not about just demand or supply but also about the interaction between demand and supply.

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