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PART
ONE

Wealth,
Health,
and
Happiness

CHAPTER 1

Wealth



The Future of Economic Growth: Slowing to a Crawl

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Fortune in 1955 forecast a fabulous future for the subsequent twenty-five years, and it was right. Real gross domestic product (GDP) per capita between 1955 and 1980 grew at 2.15 percent per year, enough for the standard of living to double in a mere thirty-two years. Americans have become used to a doubling of the standard of living every generation, but future growth will be much slower. Today's American youth will struggle to achieve the standard of living of their parents.

Future Growth in the Context of Three Industrial Revolutions

The gloomy forecast for the next twenty-five years—between 2015 and 2040—recognizes that there is no law of history that economic growth must continue at a constant rate. There was virtually no economic growth between the time of the Roman Empire and around 1750, when peasants tilled their land with tools and equipment little different from Roman times. Over the past two and a half centuries, life has been utterly transformed by three industrial revolutions, and to

forecast out to the year 2040, we need to understand what these revolutions contributed and where we now stand in the arc of the history of technological progress.

Economists conventionally distinguish among three industrial revolutions. The first (IR1) began around 1780 and consisted of steam, cotton spinning, railroads, and steamships. The second (IR2) began in 1875 and included electricity, the internal combustion engine, running water and sewers, communication and entertainment, and the conquest of infant mortality. The third (IR3) began in 1960 and included the impact of computers, electronics, and digitalization, often abbreviated “ICT” for information and communications technology. The first two revolutions required at least one hundred years for the subsidiary inventions that were made possible by the initial discoveries to become pervasive. The jury is still out on how long the benefits of IR3 will persist, and this question is at the heart of debates about the future state of technology in 2040.

The nineteenth century began with travel limited to the speed of the “hoof and sail,” whereas it ended with relatively rapid travel by train and steamships by 1900. More than a century after James Watt’s workable steam engine, invented in 1781, the effects of IR1 were still benefitting humankind. For instance, 85 percent of American railway mileage was built between 1860 and 1910.

IR2 was the most transformative of the industrial revolutions. Within a few weeks in 1879 three of the most fundamental “general purpose technologies” were invented, later to spin off scores of world-changing inventions, including electric light and power, the internal combustion engine, and wireless transmission. Between 1890 and 1930 the American urban household became fully “networked,” replacing its previous isolation by five types of connections—electricity, gas, telephone, running water, and sewer pipes. Running water and sewers in turn contributed not just to the first phase of female liberation but also to the conquest of infant mortality.

The third industrial revolution (IR3), involving everything about electronics, computers, and the digital age, has also been transformative, but along only one dimension compared to the multiple dimensions of IR2. The initial applications of the mainframe computer for bank statements, telephone bills, airline reservation systems, cash-dispensing automated teller machines (ATMs), and retail bar code scanning spanned the in-

terval 1960 to 1990. Then came the invention of the personal computer, email, the Internet, and e-commerce during the period from 1980 to 2000. By 2000 the nature of office work had been transformed, and paper catalogs at libraries, mail order vendors, and automotive parts departments had disappeared, to be replaced by networked flat screens.

A simple piece of evidence demonstrates that IR2 was more important than IR3. Output per hour (labor productivity) grew at an annual rate of 2.3 percent between 1890 and 1972, but it registered a lower growth rate of 1.6 percent during the four decades since 1972. This is our starting point for a prediction that future growth will be slower than in the past.

Innovation and the Headwinds

Will the American standard of living in 2040 double from that of 2015, or will the ratio of future to present rise by 50, 30, or perhaps only 10 percent? The answer depends not only on the future pace of innovation but also on four “headwinds” that are currently in the process of slowing American economic growth—demography, education, inequality, and government debt.

The scope of this chapter is necessarily limited to the United States. Don't other countries matter? The future of U.S. growth matters for everyone else because the United States has been the technological leader since 1875—other nations, such as China, may grow faster as they catch up to the standard of living that Americans have already achieved, but any faltering of growth at the U.S. frontier would diminish opportunities available for the rest of the world. Subsequently, we discuss the worrying possibility that by 2040 other nations may have already moved ahead of the United States, ending its long-standing position at the frontier of technology.

Future Innovation as Viewed from 1955 and 2015

Some economic historians scoff at the notion that it is possible to predict future innovations, but they are wrong. There are many historical precedents of correct predictions made fifty or one hundred years in advance. Will these examples of accurate forecasting allow us a glimpse of economic life in 2040?

An early forecast of the future of technology is contained in Jules Verne's 1863 manuscript *Paris in the Twentieth Century*, in which Verne made bold predictions about the Paris of 1960.¹ In that early year, before Edison or Benz, Verne had already conceived of the basics of the twentieth century. He predicted rapid-transit cars running on overhead viaducts, motor cars with gas combustion engines, and streetlights connected by underground wires.

Much of IR2 was not a surprise. Looking ahead in the year 1875, inventors were feverishly working on turning the telegraph into the telephone, trying to harness electricity coming from batteries as the power source to create electric light, and trying to find a way of using the power of petroleum to create a lightweight and powerful internal combustion engine. The 1875 diaries of Edison, Bell, and Benz are full of such "we're almost there" speculation. Some of the most important sources of human progress over the 1890–1930 period were not new inventions at all, including running water and sewer pipes.

A remarkable forecast was published in November 1900 in an unlikely publication medium, the *Ladies' Home Journal*.² Some of the more interesting predictions in this 1900 article include the following:

- Hot and cold air will be turned on from spigots to regulate the temperature of the air just as we now turn on hot and cold water from spigots to regulate the temperature of the bath.
- Ready-cooked meals will be purchased from establishments much like our bakeries of today.
- Liquid-air refrigerators will keep large quantities of food fresh for long intervals.
- Photographs will be telegraphed from any distance. If there is a battle in China a century hence, photographs of the events will be published in newspapers an hour later.
- Automobiles will be cheaper than horses are today. Farmers will own automobile hay-wagons, automobile truck-wagons . . . automobiles will have been substituted for every horse-vehicle now known.
- Wireless telephone and telegraph circuits will span the world. We will be able to telephone to China just as readily as we can now talk from New York to Brooklyn.

The Jules Verne 1863 and the *Ladies' Home Journal* 1900 visions of future technological progress were true leaps of imagination. Somewhat less challenging were predictions of the future made at the 1939–40 New York World's Fair. By 1939–40, IR2 was almost complete in urban America, so it is no surprise that the exhibits at the fair could predict quite accurately the further complements to IR2 inventions, such as superhighways and air-conditioning, that came into fruition in the twenty-five-year period after 1940.

What was missing at the 1939–40 New York World's Fair was any vision of the computer revolution that created IR3. But Norbert Wiener, a visionary, in a 1949 essay that was ultimately rejected by the *New York Times*, got a lot of the future of IR3 right. Among his 1949 predictions:

These new machines have a great capacity for upsetting the present basis of industry, and of reducing the economic value of the routine factory employee to a point at which he is not worth hiring at any price. . . . If we move in the direction of making machines which learn and whose behavior is modified by experience, we must face the fact that every degree of independence we give the machine is a degree of possible defiance of our wishes. The genie in the bottle will not willingly go back in the bottle, nor have we any reason to expect them to be well-disposed to us.³

Just as some future inventions have been a surprise, other anticipated inventions never came to pass. The cartoon Jetsons' vertical commuting car/plane never happened, and in fact high fuel costs caused many local helicopter short-haul aviation companies to shut down in the early 1970s. In the famous quip of Peter Theil, "we wanted flying cars, and they gave us 140 characters."⁴

Just as it was easy for visitors to the 1939 World's Fair to foresee the future, so it was to the contributors to the *Fortune* forecasts of 1955. By then the adoption of modern home appliances and air-conditioning was far along and could easily be predicted to become pervasive. Limited-access highways, such as the Pennsylvania Turnpike and Merritt Parkway, had been started before World War II, and so it was easy to forecast in 1955 that the interstate highway system was just over the horizon,

making possible travel from coast to coast without encountering a traffic light. Transcontinental nonstop piston aircraft flights had been introduced in 1953 and the first (British) commercial jet airliner in 1954, and so the future of commercial air transport was easy to foresee. Network live television was already in most living rooms, and color TV had already been invented, as had antibiotics.

Important for our forecasting challenge is to reflect on those aspects of future growth that could not have been correctly predicted in 1955. One involves innovation—in the primitive early years of mainframe computers, it was difficult to foresee much if any of the computer revolution that would by 1980 bring us electronic terminals and personal computers.

Several other “misses” for 1955 forecasters involved concepts that comprise today’s “headwinds.” In that year the fertility rate was near its post-war peak of 3.7, and it was hard to foresee that soon the birth rate would plummet as women moved from housework to market work. That influx of women raised hours per capita and allowed real gross domestic product (GDP) per capita to rise faster than productivity. Also, 1955 marks the peak of income equality, with the income share of the top 1 percent of the population at its lowest point of the twentieth century. It was hard to foresee the inexorable rise of inequality that began in the late 1970s.

What Has Been Achieved in the Past Forty Years?

Thus far we have concluded that the electronic IR3 has been less important than IR2, as measured by productivity growth of 2.3 percent per year before 1972 and just 1.6 percent since 1972. Put another way, the *level* of productivity has increased by a factor of twelve since 1891, and of that a factor of nine had already been achieved by 1972.

While my basic growth forecast assumes that innovation will percolate along in the next twenty-five years as in the last forty, caution is warranted. It just might be that the most fruitful applications of ICT technology and digitalization have already occurred. In 1970 the electronic calculator had just been invented, but the computer terminal was still in the future. Starting from this world of 1970, by the year 2000 every office was equipped with a web-linked personal computer that could do word-processing and spreadsheet calculations and gather information from around the world. Today the equipment used in office work and the

productivity of office employees closely resembles that of a decade ago, with little further improvement since then.

The scope of the electronic IR3 over the past forty years sets a hurdle for the next twenty-five years that is dauntingly high. The list of achievements extends outside the office as well and includes the following:

- Bar code scanning, ATM banking, cable and satellite TV
- Internet, email, web browsing, e-commerce
- Google, Amazon, Wikipedia, LinkedIn, Facebook
- Mobile phones, smartphones, iPads
- CDs, DVDs, iTunes, Netflix, movie streaming
- Airline reservation systems, supply-chain monitoring systems, electronic library catalogs

The Future of Innovation

The big question is: how important will innovations be over the next twenty-five years and how much will they impact future growth in productivity and the standard of living? Future advances that are widely anticipated can be grouped into four main categories—(1) medical and pharmaceutical advances, (2) small robots, artificial intelligence, and 3-D printing, (3) big data, and (4) driverless cars. It is worth examining the potential of each of these categories of future innovation.

Medical and Pharmaceutical Advances

Future advances in medicine related to the genome have already proved to be disappointing. The most important sources of higher life expectancy were achieved in the first half of the twentieth century, when infant mortality was conquered by the discovery of the germ theory of disease, the development of antitoxins for diphtheria, and the near elimination of air- and waterborne diseases through the construction of urban sanitation infrastructure.⁵

Many of the current basic tools of modern medicine were developed between 1940 and 1980, including antibiotics, heart procedures, chemotherapy, and radiation. The current status of science in medical treatment and pharmaceutical advance is well described by Jan Vijg.⁶ Progress on physical disease and ailments is progressing faster than on mental dis-

ease, so that we can look forward by 2040 to an exponential rise in the burden of taking care of elderly Americans who are physically alive but in a state of mental dementia. Pharmaceutical research has reached a brick wall of rapidly increasing costs and declining benefits.

Small Robots, Artificial Intelligence, and 3-D Printing

The lack of multitasking ability is a current defect of robots. No current robot can drive the UPS truck, choose the correct package, and run up to your front porch, knowing exactly where to leave it. Surely multiple-function robots will be developed, but it will be a long and gradual process before robots outside of the manufacturing and wholesaling sectors become a significant factor in replacing human jobs.

Most jobs are not going to be replaced by robots anytime soon, or even in 2040. Supermarket shelves are still stocked by hand, and although self-checkout has been offered in some areas, it has not been widely embraced by consumers. There will be little replacement by robots of the vast majority of jobs in the service sector, including waiters, bartenders, cooks, cashiers, pedicurists, barbers, educators, nurses, doctors, dentists, janitors, TV anchors and producers, and many more.

3-D printing is another revolution described by the techno-optimists, but its potential impact is limited. Recent reports suggest that 3-D printing is best suited for one-off customized products. 3-D printing represents custom production rather than mass production, and thus it retreats from the economies of scale and efficiency of Henry Ford's 1913 assembly line. Doubtless it will raise productivity in design labs that create models of new products, but it has less potential to raise economy-wide productivity growth.

Big Data

Optimists about future progress often point to the exponential explosion of digital data. What is lost by the enthusiasts for big data is that most of it is a zero-sum game because the vast majority of big data is being analyzed within large corporations for marketing purposes. The *Economist* reported recently that corporate information technology (IT) expenditures for marketing purposes were increasing at three times the rate of other IT expenditures. The marketing wizards use big data to figure out what their customers buy, why they change their purchases

from one category to another, and why they move from merchant to merchant.

The quantity of electronic data has been rising exponentially for decades. But diminishing returns have set in. The sharp slowdown in productivity growth in recent years has overlapped with the introduction of smartphones and iPads, which consume huge amounts of data. These sources of innovation have disappointed in what counts: their ability to boost output per hour in the American economy.

Driverless Cars

This category of future progress is demoted to last place because it offers benefits that are minor compared to the invention of the car itself, or the improvements in safety that have achieved a tenfold reduction in fatalities per vehicle-mile since 1950. The most important distinction is between cars and trucks. People are in cars to go from A to B, mainly for essential aspects of living such as commuting or shopping. Current drivers can already talk on the Bluetooth phone and listen to iPod music; only a minor increment in consumer surplus is provided by a driverless car that would allow passengers to surf the Web or watch movies. Driverless trucks and taxis are likely to become common by 2040 but will be handicapped by the difficulty that robot designers have faced in building multitasking ability into robots, since most truck drivers and taxi drivers don't just drive but also load and unload cargo and luggage.

The Headwinds Contribute to Slower Growth

The "headwinds" are an independent set of concerns about the future; they are like the biblical Four Horsemen of the Apocalypse, wrestling down the rate of growth no matter how inventive society may be in the future. Recall that growth in the standard of living equals growth in productivity plus the growth rate of hours worked per person. The first headwind concerns the inexorable downward pressure on hours per capita that will cause future growth in the standard of living to fall short of productivity growth.

Headwind 1: Demography

Forecasters have long recognized that the retirement of the baby boom generation will reduce hours per capita. Whenever a person retires, he

or she remains in the population while making a transition from positive to zero hours of market work. But that is not all. Hours per employee have been pushed down in part by the dysfunctional traditional American medical care insurance system, which ties medical insurance to employment rather than providing it as a right of citizenship. Firms have forced employees into part-time status to avoid paying medical insurance costs.

A unique feature of the slow 2009–2014 economic recovery has been the fact that the unemployment rate has been steadily improving (from 10.0 percent in November 2009 to 5.7 percent in January 2015), while the participation rate has been declining as fast, so that there has been no improvement in the employment-to-population ratio. In fact, over the 4.5 years of recovery between April 2010 and January 2015, that ratio barely budged from 58.7 to 59.3 percent, compared to its prior peaks of 64.4 percent in 2000 and 63.0 percent in 2007.⁷ Because jobs have been so scarce, many job seekers have given up and have dropped out of the labor force, making the official unemployment rate an increasingly misleading measure of labor market distress.

The decline in the participation rate involves more than just baby boomers' retirement. The devastating effect of manufacturing plant closures throughout the Midwest is captured by remarks of the newly appointed British consul general in Chicago, who toured the Midwest during the autumn of 2013 in the first three months of a four-year term. Asked for impressions of his travels, he said that "what surprised me most was the utter devastation and decay of the former one-factory small and middle-sized manufacturing towns."⁸ Often people cannot move due to family ties or financial restrictions, and so they stay in the town with no jobs, and if they are lucky they will qualify for Social Security disability.

Headwind 2: Education

Since Edward Denison's first attempt in 1962, experts on economic growth have recognized the role of increasing educational attainment as a primary source of growth.⁹ Goldin and Katz in 2008 estimated that educational attainment increased by 0.8 years per decade over the eight decades between 1890 and 1970.¹⁰

The increase of educational attainment has two parts, one referring

to secondary education and the other relevant for higher education. 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 percentage of eighteen-year-olds receiving bona fide high school diplomas had fallen to 74 percent by 2000, according to James Heckman.¹¹ 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 twenty-five through thirty-four is no higher than those aged fifty-five through sixty-four.¹² The role of education in holding back future economic growth is evident in the poor quality of educational outcomes at the secondary level. The international PISA tests of fifteen-year-olds in 2013 rated the United States as ranked seventeenth in reading, twentieth in science, and twenty-seventh in math.¹³

At the college level, long-standing problems of quality are joined with the newer issues of affordability and student debt. In most of the post-World War II period, a low-cost college education was within reach of a larger fraction of the population of the United States 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 and junior colleges. The United States led the world during most of the last century in the percentage of youth completing college. The percentage of twenty-five-year-olds who have earned a B.A. degree from a four-year college in the United States has inched up in the past fifteen years from 25 to 30 percent, but that percentage is now ranked twelfth among developed nations.¹⁴

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 trillion in college debt. While a four-year college degree still pays off in a much higher income and lower risk of unemployment than for high school graduates, still about one-quarter of college graduates will not obtain a college-level job in the first few years after graduation, leaving them to face their future as an indebted taxicab driver or barista.

To place the historic contribution of education to economic growth in perspective, Goldin and Katz have calculated that during most of the

twentieth century, education's contribution to economic growth was around 0.35 percent per year. Estimates by Harvard's Dale Jorgenson suggest that education's growth contribution will decline by 0.27 percent in the future as compared to the past.¹⁵

Headwind 3: Inequality

What matters for most Americans is not average growth in real GDP per capita but the growth rate in the portion available to the bottom 99 percent of the income distribution. The Berkeley website of Emmanuel Saez reports that between 1993 and 2013, the average growth rate of real income for the bottom 99 percent of the income distribution was 0.35 percent slower than for the average of all real income.¹⁶ Another indicator of the sharp divide between median and average real income growth is provided in the U.S. Census series on median real household income. Expressed in 2011 dollars, median real household income in 2012 was \$52,100, below the 1998 level of \$53,700.¹⁷ Real income growth in middle America has already reached zero.

Will inequality continue to increase until 2040? Holding down wages is an explicit corporate strategy at retail firms like Walmart, which hires only temporary workers to fill job openings and forces many of its workers onto part-time shifts.¹⁸ The Caterpillar corporation has become the poster child of rising inequality. It has broken strikes to enforce a two-tier wage system in which new hires are paid half of what existing workers make, even though both groups are members of the same labor union. In contrast, there was an 80 percent increase over two years in the compensation of Caterpillar's CEO, whose quoted mantra is "We can never make enough profit."¹⁹

Similarly, Boeing has threatened to move the manufacturing of its latest 777-X model from the unionized Seattle area to some other low-wage location. Only after facing an explicit threat that their jobs would be eliminated, members of Boeing's union in the Seattle area reluctantly agreed to a new contract that offers virtually no increases in real wages over the indefinite future as well as reductions in medical and pension benefit contributions.

The future of inequality is closely linked to the social breakdown in the bottom one-third of the income distribution, as family breakups deprive millions of children of the traditional support of a two-parent

household. Charles Murray's *Coming Apart* (2011) carefully documents the decline of every relevant social indicator for the bottom third of the white U.S. population, which he calls "Fishtown."²⁰

The Murray charts uniformly cover the five-decade interval from 1960 to 2010 and exhibit a consistent record of social breakdown and decay. The most devastating statistic of all is that in Fishtown for mothers age forty, the percentage of children living with both biological parents declined from 95 percent in 1960 to 34 percent in 2010. Children living in a single-parent family, usually with the mother as the head of household, are more likely to suffer from poverty and are more likely to drop out of high school.

The steady rise in the inequality of the American income distribution shows no sign of ending. Many of the new jobs created during the recent economic recovery have been low-paying jobs, often part-time. The push by employers to force employees into part-time jobs is accentuated by the increasing burden of medical insurance. Other countries avoid the destructive effect of rising medical care costs on insurance premiums and indirectly on job creation by making medical care coverage a right of citizenship paid for by a value-added tax that no one can avoid.

The rise of inequality shifts the forecasting task from a prediction of average income per capita in 2040 to the average income of the bottom 99 percent of the income distribution. Continuing trends of wealth accumulation at the top, a wage squeeze for the rest, and continuing pressure for shorter hours, lower benefits, and reduced pension plans all suggest that the rise of inequality will continue. Between 1993 and 2013 the growth of real income in the bottom 99 percent has been 0.35 percent per year slower than for the nationwide average. The growth of the "great divide" may even accelerate as the result of millions of fatherless children being unable to complete high school or make the transition to college.

Headwind 4: Repaying Debt

The future covered by these forecasts over the next twenty-five years includes the need to stop the rise of indebtedness of government at the federal, state, and local levels. The Congressional Budget Office (CBO) projects that trouble lies ahead beyond 2020. An inexorably rising debt-to-GDP ratio will be caused by the exploding costs of Medicare and Social Security. Many states also face large unfunded pension liabilities.

This is the fourth headwind, the near inevitability that over the next several decades taxes will rise faster and transfer payments rise more slowly than in the past. I estimate that the *disposable income* of the bottom 99 percent of the income distribution will decline by 0.2 percentage points per year relative to the before-taxes-transfers income of the same group.

Conclusion: Economic Life in 2040

When the post-1972 decline of innovation is combined with the four headwinds, the implication of this chapter is that future growth in the real disposable income of the bottom 99 percent of the income distribution between 2015 and 2040 will be about 0.2 percent per year, as compared to 2.0 percent in the 116 years before 2007. In 2040 the United States will be a more stratified society than today, with greater wealth among the top 1 percent and lower relative incomes and wealth for the bottom 99 percent. This implies that the standard of living of the bottom 99 percent will stagnate, rising by only 5 percent cumulatively over twenty-five years instead of the 64 percent cumulative increase that would have been made possible by a hypothetical future growth rate of 2.0 percent, the historical pre-2007 average.

There will be many new innovations, and the easiest to predict are a continuation of miniaturization made possible by advances in semiconductor technology. By 2040 our automobiles may contain hundreds of tiny computer devices instead of twenty to thirty on a current vehicle. There will be many sensors throughout our houses, and possibly robot-like vacuum cleaners. Home temperature and burglar alarm status will also be remotely viewable, including whether the dogs are sleeping or awake. Ever more sophisticated and inexpensive robots will replace human workers, especially in manufacturing and the wholesale sector, and robotic snowblowers may clear our driveways while we remain warm inside. Medical diagnosis equipment may become so much cheaper that doctors can administer computed tomography (CT) scans in their offices just as dentists can now create crowns on automatic computer-driven milling machines in their offices. Human-driven taxicabs may be partly replaced by driverless taxis summoned by smartphone.

Compared to the great leaps forward in the century before 1972, the standard of living is inching forward more slowly now. Looking back

twenty-five years to 1990, our life is very similar with the exception of web- and smartphone-related inventions. Our houses have been networked since the 1920s, except for the recent additions of cable TV and Internet. There have been no important new kitchen inventions since the microwave. We drive to work and shop using the same local streets and expressways as we did twenty-five years ago, and it is unlikely that this aspect of daily life will differ much in 2040. Improvements have mainly taken the form of more variety—more organic produce, more TV channels, more sports and movies, the vast variety of facts and information available on the Internet, and the alternative of e-commerce to traditional brick-and-mortar stores or mail-order catalogs with items ordered by phone.

Our retrospective on the 1955 *Fortune* predictions highlights the fact that technology was easier to forecast back then than demography, education, or inequality. The same may be true on the road to 2040. By 2040 the baby boomers will all have retired, reducing downward pressure on hours per capita. Some of the decline of the labor force due to giving up and dropping out may turn around. But the blight of children growing up in fatherless homes will erode U.S. academic performance at both the high school and college level, and the dream of college attainment will become ever more elusive as the inexorable machine of college cost inflation and exploding student debt continues. A vicious spiral of downward mobility, due to the interaction of college debt, delayed household formation and childbirth, and declining population growth, could further the economic and social decline of the bottom 99 percent relative to other nations.

This leaves the last and most difficult questions about 2040. Will the United States by then have lost its position as the nation with the highest per capita real GDP?²¹ By that year nations ranking high on international tests of student achievement and with more social equality, which allows all students to complete college instead of only a minority as in the United States, may well have caught up and surpassed the U.S. standard of living. Leading candidates are South Korea and the Nordic countries, and perhaps even Canada. The current socioeconomic decay of the United States would be hard to turn around even with a benevolent dictator carrying out the most effective policies that emerge from academic research. The current paralysis of the U.S. political system suggests

that any such set of reforms may lie too far in the future to boost the U.S. standard of living by the year 2040.

Notes

1. Details about the posthumously published Verne book and its predictions come from Jan Vijg, *The American Technological Challenge: Stagnation and Decline in the 21st Century* (New York: Algora Press, 2011), 35–36.

2. John Elfreth Watkins Jr., “What May Happen in the Next Hundred Years,” *Ladies’ Home Journal*, November 1900, 8.

3. John Markoff, “In 1949, He Imagined an Age of Robots,” *New York Times*, May 21, 2013, D8.

4. Peter Theil quoted in <http://www.businessinsider.com/founders-fund-the-future-2011-7>.

5. David M. Cutler and Grant Miller, “The Role of Public Health Improvements in Health Advances: The Twentieth Century United States,” *Demography* 42, no. 1 (February 2005): 1–22.

6. Vijg, *American Technological Challenge*, 74–75.

7. Bureau of Labor Statistics, “The Employment Situation – October 2014,” <http://www.bls.gov/news.release/pdf/empisit.pdf>.

8. This paragraph reports on a conversation at the author’s dinner with the British consul general on November 20, 2013.

9. Edward F. Denison, *The Sources of Economic Growth and the Alternatives Before Us* (New York: Committee for Economic Development, 1962).

10. Claudia Goldin and Lawrence F. Katz, *The Race between Education and Technology* (Cambridge, Mass.: Belknap Press of Harvard University Press, 2008).

11. Heckman found that the economic outcomes of those who earned not a high school diploma but rather a General Education Development (GED) certificate performed no better economically than high school dropouts and that the decline in graduation rates could be explained, in part, by the rising share of youth who are in prison rather than in school.

12. John Cookson, “How U.S. Graduation Rates Compare with the Rest of the World,” CNNWorld (blog), November 3, 2011, <http://globalpublicsquare.blogs.cnn.com/2011/11/03/how-u-s-graduation-rates-compare-with-the-rest-of-the-world/>.

13. <http://www.oecd.org/unitedstates/PISA-2012-results-US.pdf>.

14. <http://www.ed.gov/college>.

15. Jorgenson's estimate has become a consensus view, being adopted in the latest series of sources-of-growth projections by Bryne, Oliner, and Sichel (2013) and Gordon (2012). David M. Byrne, Stephen D. Oliner, and Daniel E. Sichel, "Is the Information Technology Revolution Over?" *International Productivity Monitor*, no. 25 (Spring 2013); Robert J. Gordon, "Is U.S. Economic Growth Over? Faltering Innovation Confronts the Six Headwinds" (NBER Working Paper 18315, August 2012).
16. <http://topincomes.parisschoolofeconomics.eu/>.
17. <http://www.census.gov/hhes/www/income/data/historical/people/>.
18. Facts in this and the next paragraph come from Steven Greenhouse, "Fighting Back against Wretched Wages," *New York Times*, July 28, 2013.
19. <http://www.chicagobusiness.com/article/20130517/BLOGS08/130519807/caterpillar-ceo-we-can-never-make-enough-profit>.
20. Charles Murray, *Coming Apart: The State of White America 1960–2010* (New York: Crown Forum, 2012).
21. We ignore the fact that certain nations with idiosyncratic advantages—for example, Luxembourg and Norway—currently have higher per capita real GDP than that of the United States.

