CAPITALISM IN AMERICA

A HISTORY

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PENGUIN PRESS
New York
2018

PENGUIN PRESS

An imprint of Penguin Random House LLC
375 Hudson Street
New York, New York 10014
penguinrandomhouse.com

LIBRARY OF CONGRESS CATALOGING-IN-PUBLICATION DATA

Names: Greenspan, Alan, 1926- author. | Wooldridge, Adrian, author.
Title: Capitalism in America : a history / Alan Greenspan, Adrian Wooldridge.
Description: New York City : Penguin Press, 2018.
Identifiers: LCCN 2018020397 (print) | LCCN 2018022007 (ebook) |
ISBN 9780735222458 (ebook) | ISBN 9780735222441 (hardback)
Subjects: LCSH: Capitalism—United States—History. | United States—Economic conditions. | United States—Economic policy. | Economic history. | BISAC: BUSINESS & ECONOMICS / Economic History. | HISTORY / United States / General. | BUSINESS & ECONOMICS / Development / Economic Development.
Classification: LCC HB501 (ebook) | LCC HB501 .G6454 2018 (print) |
DDC 330.973—dc23
LC record available at https://lccn.loc.gov/2018020397

Printed in the United States of America
1 3 5 7 9 10 8 6 4 2

DESIGNED BY AMANDA DEWEY

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A COMMERCIAL REPUBLIC: 1776–1860

THE TERM "COLONY" CONJURES up images of exploitation and marginalization. Yet Colonial America was in many respects among the most fortunate places on earth, blessed by rich resources and a relatively liberal regime. From 1600 to 1766 the colonies enjoyed the world's fastest growth rate, growing more than twice as fast as the mother country. And by the time they were ready for divorce, Americans were the world's richest people, with an average output per head of $4.71 a day measured in 2017 dollars.[1] Americans were two to three inches taller than Europeans. They were also more fertile, with six to seven births for every woman compared with four to five in Britain, leading Benjamin Franklin to speculate that by the mid-1800s "the greater number of Englishmen will be on this side of the Water." Planted in a huge continent, Americans enjoyed a relative abundance of basic resources of life, land, game, fish, timber, and minerals. Cut off from their colonial master by three thousand miles of ocean, they were also relatively free to do their own thing.

The British colonists failed to reproduce Britain's closed society

on the other side of the Atlantic: there were simply too few colonial administrators or Anglican clergymen to impose their will on the natives.[2] In Britain, the learned professions and craftsmen's guilds could crush ideas and regulate competition. In America, they were too weak to get much purchase on society. Colonists were addicted to independence. "They acquire no attachment to place but wandering about seems engrafted in their nature," one observer commented, "and it is weakness incident to it that they should forever imagine the lands further off are still better than those upon which they are already settled."[3]

At the same time the colonies strived for sophistication. The "quality" tried their best to live like English gentry, importing furniture, china, clothes, and tea from the mother country. America was second to none when it came to higher education: by 1800 the new country had dozens of universities, at a time when England only had two. Twenty-nine of the fifty-six delegates to the Continental Congress had college degrees.[4] Educated Americans were as sophisticated as any in the world. They studied the great texts of Western thought—the Greek and Roman classics, the Bible and its various commentaries. They were particularly keen on immersing themselves in British thinkers, giving pride of place to jurists such as William Blackstone and philosophers such as John Locke, but also found some time for the French philosophes. When they finally decided that they needed to form a new country, they created the most impressive constitution the world has seen.

The Constitution addressed the most enduring questions in political philosophy. How can you secure a balance between wisdom and popular participation? How can you balance the rights of individuals against the will of the majority? It also addressed a new set of questions that were provoked by the dissolution of the old, stable world: How do you provide for the needs of commerce and pop-

ular power? And how do you provide certain fixed points in a world in flux?

The Constitution turned the United States into something unique in history: a fledgling democratic society that set strict limits on what the majority could do. The majority cannot trample on people's rights to own private property, engage in trade, and keep the fruits of their labor (including their mental labor). This did far more than anything else to guarantee America's future prosperity—far more than conventional economic advantages such as abundant land and raw materials. It encouraged people to engage in trade by reducing the risk that they could have the fruits of their labor stolen from them. The Founders got the details right as well as the architecture. They established the world's biggest single market by banning internal tariffs (something the Europeans didn't get around to until the 1980s). This allowed its industries to grow huge and its regions to specialize. They also extended property rights to the all-important world of ideas.

SCRAPING A LIVING

For all its advantages, the country that was born in the American Revolution was still, to a significant extent, a subsistence economy. Touring the country in 1794 to 1796, Talleyrand, the great French diplomat, was struck by America's backwardness. America is "but in her infancy with regard to manufactures: a few iron works, several glass houses, some tan yards, a considerable number of trifling and imperfect manufactories of kerseymere [a coarse kind of knitting] and, in some places, of cotton . . . point out the feeble efforts that have hitherto been made [to] furnish the country with manufactured articles of daily consumption."[5]

America's financial system was primitive compared with the mother country's. Britain established its national bank in 1694, when it gave the governor and company of the Bank of England a monopoly of issuing banknotes, and introduced the gold standard in 1717, when the master of the mint, Sir Isaac Newton, defined the pound in terms of gold weight (£4.25 per troy ounce). America didn't have any banks whatsoever until the 1780s, when Robert Morris chartered the Bank of North America (1781), Alexander Hamilton established the Bank of New York (1784), and John Hancock and Samuel Adams chartered the Massachusetts Bank (1784). It didn't adopt a clear monetary policy until the 1830s. The Constitution included a clause (Article I, Section 8) granting Congress the right to "coin money" and "regulate the value thereof." The Coinage Act of 1792 defined the U.S. "dollar" primarily in terms of silver rather than gold (a dollar equaled 371.25 grains of silver) but also made room for gold by authorizing gold coins for larger denominations ($2.50 and $10.00) and fixing the value of the dollar at 24.75 grains of pure gold and the ratio of the price of gold to silver at fifteen to one. This ratio proved unsustainable: as the relative market price of silver declined, gold, which was more valuable abroad than at home, was exported in such large quantities that it looked as if America might run out of circulating gold coin. In 1834, the federal government finally cleared up the mess by revising the ratio to sixteen to one and adopting Britain's gold standard.

More than 90 percent of Americans lived in the countryside, either on farms or plantations. Only three cities, Philadelphia, Boston, and New York, had populations of more than 16,000, making them flyspecks compared with London (750,000) or Peking (almost 3 million).[6] Most Americans grew their own food, spun their own cloth, made their own clothes, cobbled their own shoes, and most tiresomely of all, made their own soap and candles from vats of boiled

animal fat. They relied on wood for construction and fuel, animals for power, and when manufacturing began to take off, on water to drive their rudimentary mills. Their plows were no more sophisticated than the plows that the ancient Romans had used: branches of trees embellished with bits of iron and strips of cowhide. Their roads were rutted trails littered with rocks and tree stumps: a rainstorm could turn them into seas of mud; a prolonged drought could leave them dusty and dry.

For the most part, life was a slog, hard, relentless, and unforgiving. Farmers could only survive if all members of the family—children as well as adults, women as well as men, old as well as young—pulled their full weight. Slackers were punished or told to make their own way in the world. The most basic daily chores—getting water for a bath or washing clothes or disposing of household waste—were back-breaking and time-consuming. The rhythm of people's days was dictated by the rise and fall of the sun (the main sources of light, candles and whale-oil lamps, were inefficient and expensive). Their idea of speed was defined by "hoof and sail." Travelers had to endure endless inconveniences: they were jogged up and down on horseback, tossed around like sacks of potatoes in stagecoaches, shaken into sickness on boats, or left stranded when horses lost their shoes and stagecoaches lost their axles. Thomas Jefferson had to ford five rivers in order to travel from his home in Monticello, Virginia, to Washington, D.C., for his inauguration in 1801.[7]

Americans were the prisoners of climate. Modern historians, snug in their air-conditioned offices, tend to pooh-pooh Montesquieu's argument, in *The Spirit of the Laws* (1748), that climate is destiny. To George Washington and his contemporaries, it was a statement of the obvious. In the Northeast, the winter could leave people snowed in for months. In the Midwest, tornadoes could wreck communities. In the South, there were only two seasons: hot and hellish. (Slavery was

in some ways a horrific response to a basic climatic fact: you could not get free men to harvest labor-intensive crops in the heat and humidity.) The weather was a fickle master as well as an imperious one. A sudden flood could make the roads impassable. A late frost could destroy a crop.

In the early years after the Revolution Americans were also prisoners of a narrow sliver of land on the Eastern Seaboard. They didn't dare to venture inland because the territory was largely an unmapped wilderness controlled by competing European powers and private companies. The wilderness contained all manner of dangers—Native Americans angry at being displaced by white men; bears and wolves eager to taste human flesh; the soldiers and mercenaries of hostile powers. Above all, the wilderness contained emptiness: without accurate maps it was easy to get lost.

Americans were prisoners of ignorance as well as climate: they simply didn't have up-to-date information about what was going on in the world. News about important events could take weeks to travel from one region to another, let alone from Europe to the United States. It took nearly a week for the news of George Washington's death to reach New York. It took over a month for the news that Napoleon was willing to sell "Louisiana" to travel from James Monroe in Paris to Thomas Jefferson in Washington, D.C.

Robert McNamara talked about the "fog of war." In the early decades of the republic, Americans tried to make their living surrounded by the fog of everyday life. They fought battles when the war was already won. They paid over the top for "rare" commodities even when ships loaded with those commodities were about to arrive. This was all the more dangerous because life was so volatile. The flow of imports into the East Coast depended on a small number of ships, which might be disrupted by wars between rival powers or bad weather.

This fog of ignorance applied to the government as well as to

ordinary people. During the American Revolution the rebels didn't have the basic information about the country they were freeing. How many people were there? How did they make their living? Were they capable of supporting themselves? The new government was quick to start collecting data on the population: the Constitution included a provision for a decennial census in order to apportion congressional seats, and America conducted its first census soon after its birth, in 1790. The government didn't start collecting data on manufacturing and agriculture until 1840. Paul David of Stanford University labeled the era before 1840 a "statistical dark age."

People's most important economic relationship was with the natural world, particularly with animals, water, and wind. Americans, urban as well as rural, were surrounded by a menagerie of creatures: pigs, sheep, hens, ducks, and horses. Pigs scavenged in the streets. Dogs ran wild. Every house above a hovel had a horse. These animals were small and sinewy compared with today's specimens, adapted to surviving in tough conditions rather than producing the maximum amount of meat, milk, or eggs. In 1800, the average cow probably produced a thousand pounds of milk a year compared with sixteen thousand pounds today.[8] At the same time they were used for a lot more than just food: their hides provided clothes and shoes, their trotters could be turned into glue. "Everything but the squeal" was the rule in these far from sentimental times. Americans as a people were hunters as well as farmers. The great outdoors was full of free food and clothes in the form of elk, deer, and ducks. John Jacob Astor succeeded in amassing America's biggest fortune by trading in the furs of beavers, otters, muskrats, and bears (though he wisely used some of the money he made from hunting in America's great wilderness to buy real estate in Manhattan).

The most important animals by far were horses: indeed, horses were arguably the most important part of the country's capital stock

at this time. In 1800, America probably had a million horses and mules. The human-horse combination was as central to economic life as the human-computer combination is to economic life today. Pedigree horses functioned as stores of wealth as well as sources of entertainment: in Virginia and Kentucky, in particular, discussing bloodlines was a commonplace activity.

Americans were fortunate in having a network of rivers and lakes that functioned like watery highways: the Mississippi River in particular was a four-thousand-mile superhighway that linked the South and the Midwest. Goods easily flowed down these highways and across lakes. The settlers harnessed waterpower by building mills next to fast-moving streams, or even better, harnessed a combination of gravity and waterpower by building mills next to waterfalls, such as the falls on the Charles River in Waltham, Massachusetts. Francis Cabot Lowell and a group of Boston merchants even created a company, the Proprietors of the Locks and Canals on the Merrimack River, to control the flow of the river and sell the resulting waterpower to the local mill and factory owners.[9] The watery highways had their limitations, however. Moving things upstream, against the current, particularly a mighty current like the Mississippi's, was often impossible.

Americans were also fortunate in having the great Atlantic Ocean to provide them with both a ready supply of fish and a thoroughfare to the European continent. The New England fishing industry was so successful that no less a figure than Adam Smith described it in *The Wealth of Nations* as "one of the most important, perhaps, in the world."[10] Communities sustained themselves on lobster, oysters, herring, sturgeon, haddock, crabs, and scrod; indeed, the codfish was to Massachusetts what tobacco was to Virginia. The "cradle of American liberty," Faneuil Hall, was the gift of Peter Faneuil, a Boston merchant who had made a fortune selling New England codfish around the world.

The most valuable "watery beast" was not a fish but a mammal:

demand for whale oil was so insatiable that returns in the whaling business in America's leading whaling port, New Bedford, Massachusetts, averaged 14 percent a year from 1817 to 1892, and Gideon Allen & Sons, a whaling syndicate based there, made returns of 60 percent a year during much of the nineteenth century by financing whaling voyages—perhaps the best performance of any firm in American history.[11]

America was as rich in trees as it was in sea life, with some 900 million acres of forest across the continent. English settlers commented on how many more trees there were than in deforested England: pines, oaks, maples, elms, willows, conifers, and many more. A settler in Virginia said that it looked "like a forest standing in water." A settler in Maryland wrote that "we are pretty closely seated together, yet we cannot see our Neighbours House for trees." Settlers looked at America's mass of trees and saw the lineaments of civilized life: furniture for their houses, fuel for their hearths and smithies, masts and hulls for their boats, parts for their machines, false teeth for the toothless.[12]

Walt Whitman held up the ax as a symbol of what divided the Old World from the New. In Europe, the ax was used to chop off the heads of autocrats. In America, it was used to turn the forests into useful objects:[13]

> The axe leaps!
> The solid forest gives fluid utterances,
> They tumble forth, they rise and form,
> Hut, tent, landing, survey,
> Flail, plough, pick, crowbar, spade,
> Shingle, rail, prop, wainscot, jamb, lath, panel, gable. . . .

Americans weren't content to eke a modest living from these natural resources. They developed new ways of squeezing more wealth

from their environment. Jacob Perkins invented a machine capable of cutting and heading two hundred thousand nails a day in 1795. The nail machine made it possible to build "balloon frame" houses with a minimum of skill and effort. William Wordsworth made it more useful still when he invented a machine in the 1820s that could cut wood to specifications. By 1829, Americans were consuming 850 million board feet a year, three and a half times the amount of wood per head as the British.[14] Yet even as they transformed the natural world with their ingenuity, they continued to be dependent on it: by 1850, even the most sophisticated machines were made out of wood and employed belts made out of leather.

RIP VAN WINKLE

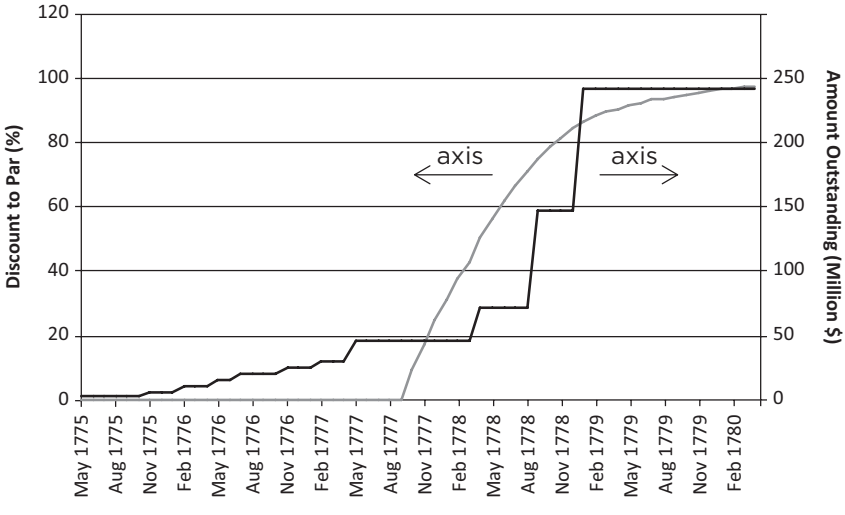
The War of Independence delivered a shock to America that makes the shock delivered to Britain by leaving the European Union look minor. During the eighteenth century, British America had become more closely enmeshed with the British economy. America imported manufactured goods from the workshop of the world and paid for them with its abundant natural resources, such as fish and wood, and its cash crops, such as tobacco and rice. The growing trade across three thousand miles of ocean was justified by the theory of mercantilism and reinforced by a surging economic struggle between the major European powers.

The war devastated America's fragile economy. Rival armies destroyed towns and homesteads. British warships disrupted trade. More than twenty-five thousand Americans died in battle. The Continental Congress's attempt to finance the war by firing up the printing presses, printing more than $242 million worth of fiat money in the form of continentals, worked well at first, allowing George

Washington to buy food and armaments, but eventually led to hyperinflation. By 1780, continentals traded at one-fortieth of par (hence the phrase "not worth a continental") and the government was forced to withdraw them from circulation. The new currency thus functioned as a hidden tax on ordinary, and particularly richer, Americans who, having translated their savings into continentals that progressively lost their value, ended up footing the bill for a substantial portion of the cost of the war. (See chart below.)

DISCOUNT ON CONTINENTAL CURRENCY VS. AMOUNT OUTSTANDING

PLOTTED QUARTERLY MAY 1775 – APR 1780



The aftermath of the war did further damage. As it struggled to find a new role in a changed world, America experienced what one historian has called its "greatest economic income slump ever," with a 30 percent decline in national income as reflected in international trade.[15] On top of all that, America had a huge war debt: the new U.S. government, established under the Articles of Confederation, owed $51 million (and the individual states owed another $25 million), yet the government lacked the ability to raise revenue in the form of taxes.

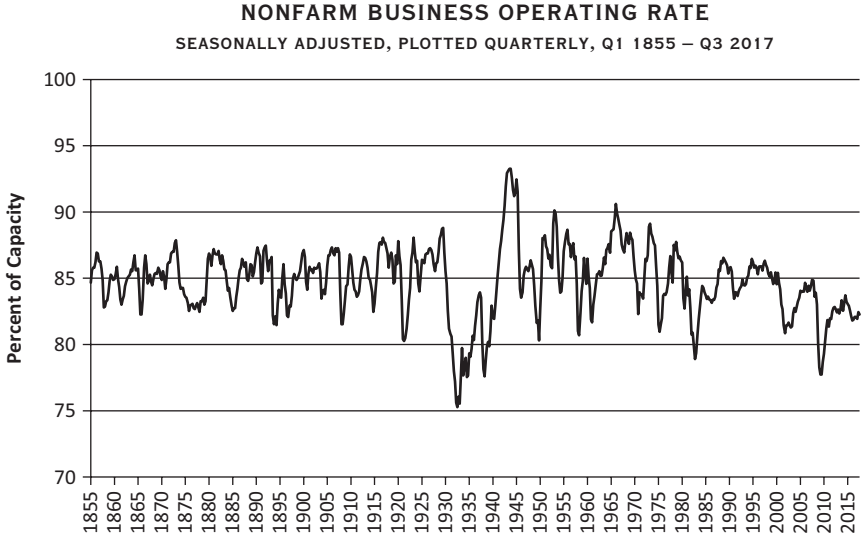
Nonetheless, thanks largely to Alexander Hamilton, America's treasury secretary, the new nation did an astonishingly good job of putting its public finances in order. The U.S. Constitution gave the federal government increased authority to raise revenue through customs fees. This gave Hamilton the wherewithal to establish trust in America's reliability by paying off old loans, particularly to France, and then to use that trust to negotiate new ones.[16]

Within a few years of independence, the American growth streak resumed. In 1819, Washington Irving published a story that captured the spirit of the new country, "Rip Van Winkle," about a man who goes to sleep for twenty years and awakens to find his world utterly transformed. Overall, America galloped ahead in the most important dimensions of economic life—territory, population, and material well-being. Americans quadrupled the size of their territory by purchasing, conquering, annexing, and settling land that had been occupied for millennia by indigenous peoples and subsequently claimed by France, Spain, Britain, and Mexico. In 1803, in the Louisiana Purchase, Thomas Jefferson purchased the entire river basin west of the Mississippi River from Napoleon Bonaparte for $15 million. The purchase, largely funded by Baring Brothers, reflected the recently enhanced credit status of the fledgling United States and turned New Orleans into an American port and the Mississippi into an American river.[17] In 1821, Andrew Jackson engineered the purchase of Florida from Spain. America added Texas (1845), California (1850), and much of today's Southwest to the Union. In 1846, it snuffed out the last British claims to American territory in Oregon.

The country's population increased from 3.9 million at the time of the first census in 1790 to 31.5 million in 1860—growing four times faster than Europe's and six times the world average. From 1815 to 1830, the population of the region west of the Appalachians grew three times as fast as the original thirteen colonies, and

America added a new state every three years. New cities were created to the south and west—Pittsburgh, Cincinnati, and Nashville, to name but three—as regional hubs and people magnets. America's capital stock grew even faster, more than tripling from 1774 to 1799 and increasing sixteenfold between then and the Civil War.[18]

America's real gross domestic product increased by an average of 3.7 percent a year from 1800 to 1850. Income per head increased by 40 percent. "No other nation in that era could match even a single component of this explosive growth," James McPherson noted in *Battle Cry of Freedom*. "The combination of all three made America the *Wunderkind* nation of the nineteenth century."[19] Growth was eventually accompanied by boom-bust cycles. In subsistence societies, economic problems are usually driven by either local conditions or natural forces. In mature economies, by contrast, business activity tends to move in tandem: a gradual but escalating increase in activity is followed by a dramatic collapse that is variously labeled a "crisis" or "panic."



The panic of 1819 was America's first experience of a financial crisis in peacetime. In August 1818, the Second Bank of the United States began to reject banknotes because it worried that credit was dangerously overextended. Then in October, the U.S. Treasury tightened the credit crunch still further by forcing the bank to transfer $2 million in specie to redeem bonds on the Louisiana Purchase. State banks across the South and West began to call in their loans on heavily mortgaged farms. The value of many farms fell by 50 percent or more. Local banks began foreclosing on farms and transferring the title deeds to the Second Bank of the United States. The price of cotton dropped by 25 percent in a single day in 1819. America did not recover from the subsequent recession until 1821.

This panic set the pattern for a succession of panics in 1837, 1857, 1873, 1884, 1893, 1896, and 1907. The specific causes of each boom-bust cycle varied widely. But the underlying pattern was always the same: expansions gathered pace until they were finally constrained by a "gold ceiling" that limited the supply of credit and forced businesses to retrench. Expansion led to euphoria and euphoria led to overexpansion. Overexpansion led to rising interest rates and rising interest rates to sharp stock market corrections and political furor. As can be seen in the chart on page 41, economic activity between 1855 and 1907 would consistently reach about 85 percent to 87 percent of capacity before collapsing shortly thereafter. This was a far cry from the eighteenth-century world, where the rhythm of life was largely dictated by the change of the seasons.

The gold ceiling was lifted a little in coming decades. The supply of gold increased with the discovery of gold in California in 1848, South Africa in 1886, and the Yukon in 1896. Technological innovations such as the use of cyanide leaching improved the yield of both new and established gold mines. The improvement in financial technology, such as check clearinghouses, increased the amount of credit

expansion that could be produced by a given supply of gold. But this was not without its side effects: the expansion in the supply of gold probably helped to produce one of the most severe economic contractions in American history, starting in 1893. Pressure to find a way of preventing such crises engendered the Aldrich-Vreeland Act of 1908, which eventually led to the formation of the Federal Reserve System in 1913, substituting the expendable sovereign credit of the United States for gold specie.

THE CULTURE OF GROWTH

The wunderkind had an unusually open and dynamic culture. The Founding Fathers did a good job of voicing the zeitgeist of the new culture. "A plowman on his legs is higher than a gentleman on his knees," said Benjamin Franklin. "The mass of mankind has not been born with saddles on their backs, nor a favored few booted and spurred ready to ride them," said Jefferson. And the new culture of openness became ever more deeply entrenched over the subsequent decades. Foreign visitors were impressed (or appalled) by America's bourgeois nature. They noted Americans' obsession with business and money. Lady Stuart-Wortley wrote, "No drones are admitted into the great Transatlantic hive." Francis Grund proclaimed, "Labor is essential to their well-being as food and raiment to a European." Tocqueville wrote, "I know of no country, indeed, where wealth has taken a stronger hold on the affections of men." On arriving in Ohio, he exclaimed that "the entire society is a factory." The visitors usually linked this energetic striving-cum-money-grubbing with the fact that, as Frances Trollope put it, "any man's son may become the equal of any other man's son."[20] Slavery, of course, would remain an abominable exception, as we will examine.

This open culture was reinforced by two powerful influences. Protestants valued hard work as a proof of virtue and education as a path to biblical understanding. The philosophes of the Enlightenment questioned the value of hierarchy and authority and encouraged people to rely on their own judgment. For all their differences, these two traditions were both friendly toward creative destruction: they taught Americans to challenge the established order in pursuit of personal betterment and to question received wisdom in pursuit of rational understanding.

Shortage of labor also did its bit. America enjoyed the lowest ratio of people to land in the world. (Indeed, one reason the British found it so difficult to defeat their colonial subjects was that they were so widely scattered: the British could capture the coastal cities with the mighty Royal Navy but lacked the manpower to subdue the countryside, where 95 percent of the people lived.) In Europe, Malthus's warning in his *Essay on the Principle of Population* (1798) that the population would expand faster than the land necessary to support it rang true. In America, it was an absurdity: there weren't enough hands to work the available land.[21] The ratio of people to land remained generous even as America was flooded with immigrants, because the country's territory expanded along with its population: the number of people per square mile fell from 6.1 in 1800 to 4.3 in 1810.

This combination of abundance of resources and scarcity of labor paid rich material dividends. Americans got married early because it was easier to find land to farm, and they bred prodigiously partly because they could and partly because they needed children to farm the land. The median age of the population was sixteen in 1815, with only one person in eight over forty-three years old.[22] For all this general youthfulness, Americans also had a longer life expectancy because diseases found it harder to spread than in Europe's dense cities

(the life expectancy was lower in the South because the humidity incubated diseases).

It also paid rich psychological dividends. Shortage of labor changed the balance of power: in Walter McDougall's words, "More than any other people on earth, Americans had the option of saying, 'Take this job and shove it.'"[23] The need to conquer so much space put a premium on organizational skills. The Mormons' Great Trek to Utah was perhaps the best example of this: brilliantly led by Brigham Young, the Saints built their own roads and bridges and even planted crops that could be harvested by the next wave of settlers.[24] At the same time, the availability of so much space took the sting out of the early stages of industrialization. In Europe, the Industrial Revolution was associated with urban overcrowding and "dark Satanic Mills." In the United States, the first shoots of industrialization grew in a green and pleasant land—usually by the side of rivers in small New England towns. In the 1830s, Michel Chevalier, a French economist, remarked that American factories were "new and fresh like an opera scene." In 1837, Harriet Martineau, an Englishwoman, opined that American workers were lucky to "have their dwellings and their occupation fixed in spots where the hills are heaped together, and the waters leap and whirl among rocks."[25]

America quickly took over from Britain as the world's leading factory of entrepreneurs, producing the most patents per capita by 1810, and excelling in industries that were at the heart of the productivity revolution, including steamboats, farm machinery, machine tools, and sewing machines. American entrepreneurs were drawn from every level of society but united by their common assumption that every problem was capable of solution so long as you thought hard enough.

Oliver Evans was the self-educated son of a Delaware farmer. In 1784–85, he built a flour mill outside Philadelphia run by gravity,

friction, and waterpower. Grain was moved from the loading bin through the mill's several levels by buckets and leather belts, without human beings doing anything more than guiding and regulating. Both Thomas Jefferson and George Washington installed Evans's mills on their farms and paid him a license fee for doing so. A few years later, he developed one of the first high-pressure steam engines and established a network of machine workshops to produce and repair popular inventions. In 1813, he even predicted a future when people would travel in stagecoaches "moved by steam" and guided by rails from one city to another.

Eli Whitney was a graduate of Yale University. In 1793, he developed a device that reduced the work involved in separating cottonseeds from cotton fiber by a factor of fifty: a roller studded with nails stripped the lint from the seeds by pulling it through a grid that was too narrow to let the seeds pass. The seeds fell into one compartment while a brush swept the lint off the nails and into another. A reasonably competent carpenter could build one in an hour. Frustrated in his attempts to patent his innovation, Whitney then moved on to manufacturing rifles and other weapons for the government.

Samuel Morse was an accomplished painter and professor of fine arts at New York University who was so furious when Congress denied him a commission to paint a historical mural for the Capitol Rotunda that he gave up painting and threw his energies into developing a way of using electromagnetism to send messages down wires. In 1843, Morse persuaded Congress to give him thirty thousand dollars to build a demonstration line from Baltimore to Washington using the new technology. On May 24, 1844, he sent his first message, "What hath God wrought."

Cyrus McCormick and John Deere were both agricultural workers who tinkered on the side. In 1833–34, McCormick invented a mechanical reaper that could harvest more grain than five men working

with hand scythes. In 1837, Deere invented a plow with a polished steel moldboard that successfully "scoured" itself as it pushed through the soil. A few years later, the addition of a seat on top of the plow allowed the farmer to ride along rather than walking behind, a veritable Prince of the Prairie. The "plough that broke the plains" was to be comfortable as well as efficient. Isaac Singer was a rogue who ran three households simultaneously and fathered at least twenty-four children. In the 1840s, he invented a sewing machine that did as much as any invention in the nineteenth century to liberate women, reducing the time it took to sew a shirt from fourteen hours and twenty minutes to one hour and sixteen minutes. Charles Goodyear was an obscure storekeeper in New Haven, Connecticut, who had no training whatsoever in chemistry but somehow became convinced that his Maker had chosen him to solve chemical problems that had defeated professional scientists. In 1844, after years of grinding poverty and spells in debtors' prison, he patented a process for using a blend of sulfur, latex, and white lead to "vulcanize" rubber.

A striking number of entrepreneurs combined technical ingenuity with commercial savvy. Deere drummed up demand for his plows by regularly entering them in plowing competitions, and satisfied that demand by creating a national network of "travelers" who sold the plows across the country.[26] McCormick recruited local businesspeople to act as "agents" to promote his reapers. He pioneered many of the staples of modern business: free trials to whet the appetite, money-back guarantees to assuage doubts, and "educational" ads in farm journals to create a new market.[27] As the price of advertising in other people's papers increased, he even published his own paper, stuffed full of infomercials for his products, the *Farmers' Advance*, which eventually had a circulation of 350,000. "Trying to do business without advertising is like winking at a pretty girl through a pair of green goggles," one of his editors quipped. "You may know what you

are doing, but no one else does."[28] Singer and his partner, Edward Clark, solidified their hold over the sewing-machine market with two innovations: long-term installment buying, allowing customers to buy a sewing machine for five dollars down followed by three dollars a month for sixteen months; and guaranteed buybacks of all used sewing machines, whether made by his company or not, in return for money off a new machine. The company then destroyed the trade-ins in order to kill the market in both secondhand machines and spare parts for broken machines.

Entrepreneurs were so productive in part because they had a reasonable confidence that they would enjoy the fruits of their labor. The Patent Act of 1790 turned America into a single intellectual market and gave inventors exclusive rights for fourteen years. The establishment of a patent office in 1836 provided the law with teeth. The office not only escaped the inefficiency and corruption that was common in the government at the time, it succeeded in embodying the new country's faith in innovation. Housed in a Greek temple on F Street in Washington, D.C., it was so full of models of the latest innovations that it became a major tourist attraction. Even Charles Dickens, who was frequently dismissive of the fledgling country, admitted that it was "an extraordinary example of American enterprise and ingenuity."

These pioneering entrepreneurs worked in a world that was being transformed by three productivity-boosting changes. The first was a resource revolution. Writing in 1790, Benjamin Franklin declared that "gold and silver are not the produce of North America, which has no mines."[29] Over the next few decades all that changed. Americans discovered a range of minerals such as iron ore, silver, copper, and of course gold, setting off the gold rush of the 1840s and 1850s. Americans also learned how to harness a widening range of materials to provide them with energy. In 1800, Americans relied on wood

for almost all of their energy. Eighty years later, 100 percent had become 57 percent.[30] Americans doubled their coal production by 1813 and trebled it by 1818. They also discovered in Pennsylvania huge deposits of "hard" (anthracite) coal, which produces less smoke and ash than "soft" (bituminous) coal. Coal became such an important source of energy that Freeman Hunt's *Merchants' Magazine* proclaimed in 1854, "Commerce is President of the Nation and Coal her Secretary of State."[31] Just five years later, the United States had a co–Secretary of State with the discovery of oil in Pennsylvania. Coal powered the locomotives and iron smelters. Oil provided kerosene for lighting and lubricants for machines.

Even as they introduced new sources of power, Americans found new ways of getting more out of old sources. The New England textile industry developed clever ways of using a combination of water and gravity to produce power at minimal cost, starting with waterwheels and later adding water turbines.

Americans were particularly successful at making horses more productive. There were clear limits to this. Horses are labor intensive: you have to feed them, groom them, and walk alongside them. They can carry only so much weight. But Americans nevertheless squeezed more out of them. They practiced horse eugenics with an enthusiasm that would have dazzled Francis Galton: by 1900, there was a much wider variety of physical types available than in 1800. They also put horses to work in all sorts of clever ways. Stagecoach companies used four to six horses to pull a "stage" that could be sixty feet or more in length. Stagecoaches could travel as fast as ten miles an hour and provided fairly reliable timetables. The Eastern Stage Company, based in Boston, owned more than a thousand horses and a complex of stables and blacksmith shops as well as a financial interest in a network of stopping places, inns, and hotels.[32] The Pony Express brought industrial-style planning to taming the West: it not only built an

express lane of roads and bridges across the country, so that the riders knew where they were going, it also built a network of inns, stables, and way stations, so that they had a supply of fresh horses to ride. At its peak the Pony Express employed over 400 horses, 125 riders, who had to keep detailed time sheets, and a support staff of another 275.[33]

The Pony Express was part of a second change: the transportation revolution.[34] If one great theme of America's first hundred years of life is its relentless geographic expansion as it added new territories, another great theme is temporal contraction, as new modes of transportation reduced the time it took to travel by factors of perhaps a hundred. Before 1815, the only cost-efficient means of carrying freight long distances was by water—in either sailing ships or flat-bottomed boats. It cost as much to transport a ton of goods thirty miles by wagon as it cost to ship it three thousand miles across the ocean.[35] After 1815, Americans improved transportation by three methods: making better use of existing physical resources (basically rivers), harnessing new sources of power such as steam, and adding new transportation routes such as roads, rails, and canals.

In the first few decades of the nineteenth century, hundreds of chartered companies built thousands of miles of turnpikes that offered improved surfaces (thanks to stone, gravel, or wooden planks) in return for a fee.[36] Albert Fishlow estimates that the average annual profit rates of the turnpikes were low, at only 3 to 5 percent, thanks in part to tight government regulation and in part to opportunism on the part of travelers, who cleverly alternated between turnpikes and free roads.[37] Soon the road-building craze was eclipsed by a canal-building craze: by 1850, America boasted 3,700 miles of canals. The cost of moving things by canal was between two and three cents per ton compared with over thirty cents by wagon, because the average horse can pull fifty tons on water compared with only a ton on land.

The canal era was triggered by New York State's construction of

the Erie Canal from Albany, New York, on the Hudson River, to Buffalo, New York, on Lake Erie. Constructing such a canal would be an enormous challenge today, let alone in the 1820s: the canal was 363 miles long and cut through swamps and ridges and vaulted over rivers (at Rochester the builders had to construct an 802-foot aqueduct). It took eight years to complete. Yet the canal recouped its cost of construction in tolls in the first year, quickly justifying the Canal Commission's extensive use of eminent domain to force private property holders to sell their land. And its broader economic benefits were huge. The canal cut the costs of shipping goods by 75 percent and the time involved by 67 percent. It settled the battle between Boston, New York, and New Orleans for the position of America's leading port, in favor of New York. It spurred westward expansion: Buffalo became a jumping-off point for the lakes and helped to turn lakeside cities such as Detroit, Cleveland, and Chicago into urban hubs. Canalside towns such as Albany, Syracuse, Rochester, and Buffalo all boomed. It also inspired yet more canal building: Maryland sponsored a canal between the Chesapeake and the Delaware River, and Pennsylvania started to build a canal to Pittsburgh.

Canals eventually linked the Great Lakes into the country's wider transportation system. In 1855, a group of businesspeople, in cahoots with Michigan's leading politicians, built a canal, complete with a set of locks, to link Lake Superior to the lower Great Lakes and provide a way around the twenty-seven-foot-high St. Mary's Falls. The Soo Locks boosted local freight from 14,503 tons in 1855 to 325,357 tons in 1867—an increase of about 30 percent a year. They made it much easier to carry grain from the granaries of the Midwest to the East Coast. They also opened up a two-way industrial trade that grew explosively over the coming decades: ships took Mesabi iron ore to Pittsburgh (where it was turned into steel) and returned loaded with Pennsylvania coal.

For most people, the nineteenth century is associated not with turnpikes or canals but with something more dramatic: the fire-breathing, steam-belching, earth-shaking iron horse. In the 1780s, America possessed a grand total of three steam engines. These were used to pump water—two to keep mines dry and one to provide New York City with water—rather than for locomotion. By 1838, when the Treasury Department produced a report on steam power, the country possessed two thousand steam engines with a collective horsepower of forty thousand. Oliver Evans laid the foundation of the boom by developing a high-pressure steam engine in 1801 and establishing the Pittsburgh Steam Engine Company, in Pittsburgh, Pennsylvania, in 1811.

The most exciting application of steam engines was to transportation. Steam was the first source of power that was entirely under human control: you didn't have to wait for the wind to blow in the right direction or the horse to be broken.[38] The first steam-driven transportation devices were boats rather than trains. America's first paddle-powered steamboat, the *North River*, made its first trip, from New York City to Albany, on August 17, 1807, using a low-pressure engine. By 1838, there were hundreds of steamboats on America's rivers, using high-pressure engines. Steamboats boasted a combination of romance and efficiency: they were majestic to behold with their vast waterwheels on their sides or backs, but they were also extremely efficient. They could move freight upstream as well as downstream. They could cope with powerful currents and even take on the mighty Mississippi. They got faster as the decades passed: the trip from New Orleans to Louisville was cut from twenty-five days in 1817, which was celebrated with much tub-thumping at the time, to eight days in 1826.[39] They reduced the cost of moving freight upstream by 90 percent between 1815 and 1860, and by nearly 40 percent downstream.

Applying the emerging steamboat technology to engines that could travel on land proved frustrating. Oliver Evans suggested creating a railway to connect New York and Philadelphia with "carriages drawn by steam engines" as early as 1813, but nothing came of it. At first, Americans were forced to import engines from the more technologically sophisticated United Kingdom, including the "Stourbridge Lion" in 1829 and the "John Bull" in 1831. But soon they succeeded in producing engines of their own, reengineering British models and adding innovations.

The first U.S. railroad, the Baltimore and Ohio, began operation in 1830, five years after Britain's Stockton and Darlington. Soon the new technology was spreading much faster in America than in Europe: American railway companies found it much easier to acquire rights-of-way than their European equivalents because the country was so empty, and the government gave them free, or cheap, land. America laid down five thousand miles of rail in the 1840s and twenty thousand in the 1850s. By the outbreak of the Civil War, America had more miles of railroad than the United Kingdom, France, and the German states combined. According to Fishlow, the amount of money invested in the railroads was more than five times the amount invested in canals.[40]

The railway boom proceeded in a very American way. There was a lot of creative destruction: railways quickly killed canals because rails could carry fifty times as much freight and didn't freeze over in winter. There was a lot of waste. Many rail barons overbuilt furiously before going spectacularly bust. There was no railroad system but a hodgepodge of rival companies that used different gauges, different-size cars, and even different time zones (though gauge standards and even time-zone standards were sometimes addressed regionally). There was also a lot of hypocrisy: while proclaiming its hostility to subsidies in the form of cash or bonds, the federal government used

its vast land holdings in the West to subsidize development. In 1851, for example, the government made a land grant of 3.75 million acres to encourage the creation of the Illinois Central Railroad.[41] The land-grant system worked because it offered railroads the chance of increasing the value of the land by many multiples: building rails in the middle of nowhere might be expensive and risky, but you might end up by turning a piece of nowhere into a part of the global economy.

Historians once confidently asserted that the railroads "opened up" America like nothing else. They were the perfect mode of transport for an economy that relied on moving bulky stuff around the country: mountains of wheat; tons of coke, copper, and ore; oceans of oil; forests of timber. A group of energetic revisionists, led by Robert Fogel and Albert Fishlow, has qualified this view, pointing out, for example, that the railroad was only one of several forms of transport.[42] But for all these qualifications, the railroads nevertheless deserve their garlands. Railroads were significantly more efficient than other forms of transport. They could be built almost anywhere. This meant that they could carve the shortest route rather than having to follow a meandering river, like steamboats, or admit defeat when confronted by high mountains, like canal boats. By river the distance from Pittsburgh to St. Louis was 1,164 miles. By rail it was 612 miles. The Alleghenies, which rose to 2,200 feet, formed an insuperable barrier between Pittsburgh and Cleveland during the canal age. Once a railroad was built, the route between the two cities became one of the most heavily trafficked in the world. On top of all this they offered predictability. They quickly adopted timetables that could predict when trains would arrive down to the minute.[43] Add to that superior speed and you have a winning formula.

That formula improved the productivity of the economy as a whole. Railroads slashed the unit cost of overland transportation: in 1890, the cost of railroad freight was 0.875 cent per ton-mile

compared with 24.5 cents per ton-mile for wagon freight, a reduction of 96 percent.[44] Railroads promoted economic specialization because farmers could specialize in crops for which the climate was most suitable and purchase the most efficient agricultural tools. They promoted labor arbitrage: workers could move to places where they got the highest pay for their labor. They even promoted industrial development because trains were resource-hungry beasts—they needed coal for fuel, iron and steel for rails, and rolling stock and skilled workers to run the whole show. Plenty of farmers abandoned the land and turned themselves into firemen, engineers, mechanics, brakemen, switchmen, and conductors.

Above all, they changed the entire tenor of life. When Andrew Jackson arrived in Washington in 1829, he traveled by horse-drawn carriage, moving at the same speed as the Roman emperors. When he left eight years later he traveled in a train, moving at roughly the same speed as today's presidents when they deign to travel by train. Nathaniel Hawthorne captured the speeding up of time and shrinking of space as well as any economic statistics when he wrote that "the whistle of the locomotive" "tells a story of busy men" and "brings the noisy world into the midst of our slumberous peace."[45]

The third revolution was an information revolution. Central to the process of creative destruction is knowledge of what combination of what resources yields maximum gains in living standards. Information-starved Americans recognized the importance of the old adage that in the land of the blind the one-eyed man is king. The *Journal of Commerce*, which started publishing in 1827 to provide information about the flow of imports into the United States, came up with the clever idea of deploying deepwater schooners to intercept incoming ships before they docked. The most important breakthrough in information was, of course, the telegraph. Railway companies installed telegraph lines wherever they went because they

needed to communicate quickly over vast distances in order to prevent trains from crashing into each other. The telegraph revolution quickly outpaced the railway revolution. Telegraph lines were much cheaper to construct than railway lines: by 1852, America had twenty-two thousand miles of telegraph lines compared with eleven thousand miles of tracks. They also had a more dramatic effect: information that once took weeks to travel from place A to place B now took seconds.

The invention of the telegraph was a much more revolutionary change than the invention of the telephone a few decades later. The telephone (rather like Facebook today) merely improved the quality of social life by making it easier for people to chat with each other. The telegraph changed the parameters of economic life—it broke the link between sending complicated messages and sending physical objects and radically reduced the time it took to send information. This was already evident in the early years of the telegraph: data collected in 1851 identified about 70 percent of telegraph traffic as commercial in nature, from checking credit references to "conveying secrets of the rise and fall of markets."[46]

The telegraph eventually turned America into a single market for financial information: Chicago was able to open its commodities exchange in 1848 because it enjoyed instant communication with the East Coast. San Francisco was able to flourish as a commercial city because it was in close communication with New York. When Leland Stanford hit the gold spike with his silver hammer, automatically sending a telegraph signal in two directions, east and west, and triggering bursts of cannon fire in both New York and San Francisco, he wasn't just engaging in a wonderful display.[47] He was ushering in a new age of business.

The expansion of the telegraph became global with the opening of the transatlantic cable on July 28, 1866. Laying a cable across a huge

ocean had inevitably proved difficult—five attempts between 1857 and 1866 had failed because the cable snapped—but it was, nevertheless, worth the effort. Before the cable it had taken about ten days to get a message across the Atlantic by ship—longer if there was severe weather. The cable reduced the time lag for sending a meaningful message to an hour or two, or even less (the first cable could handle about eight words a minute). The cable allowed for an integrated transatlantic financial market based in London, New York, and San Francisco. This market kept up a flow of information that made it possible to adjust supply to demand and thereby improve the allocation of global resources.

A RESTLESS PEOPLE

European visitors were almost always impressed by the *busyness* of the young country: this was a world in motion, with everybody moving hither and thither in pursuit of their fortunes. Frances Trollope talked of a "busy, bustling, industrious population, hacking and hewing their way" into a continent.[48] Tocqueville thought that there was a single underlying logic to all this movement: people were heading westward in pursuit of new territory. In fact, there were two great movements under way.

The first was from the East Coast to the interior. In 1790, the population was clustered along the Atlantic Coast, roughly evenly divided between the North (New England) and the Mid-Atlantic and the South. The American border was effectively the Appalachians, the mountain chain that runs some five hundred miles inland from the Atlantic. By 1850, in the space of a few decades, half of America's 31 million people and half of its thirty states lay beyond the Appalachians.

This vast internal colonization involved every resource that the new republic had to offer. The expansion started with collecting information. Surveying was a national obsession from the earliest days: George Washington, an enthusiastic amateur surveyor, studied the "land as a jeweler inspects a gemstone, with minute attention to its flaws, facets and values."[49] In 1814, the U.S. Army Medical Department began collecting systematic material on weather across the country. In 1847, the Smithsonian Institution began collecting information about minerals. Information was a prelude to settlement. America's various governments, federal, state, and local, actively tried to promote expansion by dredging rivers and streams, building turnpikes and canals, and offering inducements to private companies to move westward. Entrepreneurs also formed partnerships or even corporations to hasten the drive west.

The second movement was from rural to urban areas. The proportion of Americans living in cities increased from 5 percent in 1790 to 20 percent in 1860.[50] The proportion of the labor force engaged in nonagricultural pursuits grew from 26 percent to 47 percent. In 1810, there were only two cities with populations of more than fifty thousand (New York and Philadelphia). By 1860, there were sixteen.

Movement improved productivity. The most powerful boost came from reallocating people from farms to the cities and from agriculture to industry. Despite the fact that American agriculture was the most productive the world had seen, farmworkers could double their incomes, on average, simply by moving from the farm into the city.[51] Movement also brought new productive powers on stream as settlers commanded new resources and linked them, via canals and railways, to older population centers (and thence to the global economy). Movement also boosted a sense of national identity: people increasingly thought of themselves as "Americans" rather than just New Yorkers

or Virginians. The first half of the nineteenth century saw the birth of a succession of national societies such as the American Bible Society (1816), the American Education Society (1816), the American Colonization Society (1816), and, most significant for the future history of the country, the American Anti-Slavery Society (1833).

Growth also increased people's standard of living. Until the early nineteenth century, economic growth had been "extensive"—that is, almost the same as population growth. At some point after the War of 1812, economic growth became "intensive"—that is, the economy began to grow faster than the population. Economists estimate that real output per head increased by 1.25 percent a year from 1820 to 1860, compared with 0.24 percent from 1800 to 1820.[52]

This all sounds relatively simple: America was a young republic powered by revolutionary ideals and dedicated to the god of growth. In fact, the story was far from simple: America was divided by two different visions of the good society—one dynamic and the other static; and two different economies—one based on free labor and the other on slavery.