In 1946, as the cold war was just beginning to stir, George Kennan, deputy head of the U.S. mission in Moscow, wrote his now famous "long telegram" warning the United States of the growing Soviet threat and arguing that by taking up the mantle to respond to the challenge, America could become even more secure. America did accept those responsibilities and in so doing made the world freer, more democratic, and more prosperous than it otherwise would have been.

Today, America faces a similar challenge. But this time it is not from a totalitarian nation with imperialistic ambitions. Rather, the challenge we face is, on the one hand, our own shortsightedness and selfishness, and on the other, a global economic system in which too many nations have embraced a destructive innovation mercantilism. But Kennan's words fifty-five years ago are as apt today with regard to the new global innovation challenge: "We should experience a certain gratitude to a Providence, which by providing the American people with this implacable challenge, has made their entire security as a nation dependent on their pulling themselves together and accepting the responsibilities of moral and political leadership that history plainly intended them to bear." For there is no nation better positioned today to lead the world in innovation than the United States, both through reasserting its own innovation leadership and by leading the way toward a new global framework for innovation. But before America can do that, it will need to recognize that its leadership position has been lost, at least for the time being.

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Explaining U.S. Economic Decline

It will be many years before we truly understand the nature of the current economic downturn. Is it a typical but severe downturn caused by a financial crisis, the kind that the world has seen many times in many different nations?[1] Or should it be seen as more akin to the Great Depression, although moderated this time by better fiscal and monetary policy? Or might it be an inflection point in U.S. economic history? Looking back, will future generations point to this period and say, yes, this was when U.S. postwar economic dominance ended and the United States stood poised at the threshold of a decidedly less robust economic era?

We believe, and show in this chapter, that the latter is indeed the case—unless the United States takes dramatic steps to arrest and reverse its decline. But first, it is worth examining the nature and causes of the economic crisis more deeply. Why did the financial collapse happen? We believe that the conventional explanations (greed, incompetence, lack of regulation, and so forth) are not sufficient. Rather, a core contributing factor was the decline in the competitive performance of the U.S. economy, particularly after the mid-1990s.

Clearly, for the United States, Greece, Iceland, Ireland, Spain, and a number of other countries and regions, this has been a financially induced crisis, not a conventional economic downturn triggered by normal business cycle swings (for example, buildup of excess inventory or an overly restrictive monetary policy). The failure of assets (mostly housing mortgages) held by banks and other financial institutions was too much for them to absorb with their limited reserve requirements. The cascading effect of freezing credit markets, fear on the part of investors and businesses, reduced housing starts, and decreased consumer spending and business investment all led to a spectacular economic collapse. Between October 2007 and March 2009, U.S. real gross domestic product (GDP) fell by 4.7 percent and more than 5.7 million net jobs were lost.[2]

But why did this crisis occur when it did? Wall Street greed is usually trotted out as the explanation: greedy bankers who wanted too much too fast caused the whole house of cards to collapse. But there is nothing to suggest that Wall Street's motivations have changed in recent years. At least since the 1980s, if not before, Wall Street has focused on maximizing short-term profits, its excesses of greed well chronicled in Tom Wolfe's *The Bonfire of the Vanities.*

Others point to the rise of all sorts of complicated financial instruments—especially collateralized debt obligations (CDOs)—that made it hard for investors to understand what they were investing in. To be sure, CDOs were too complicated for many (even sophisticated) investors, who bought financial assets that were largely worthless from investment banks that were simultaneously shorting the investments they were selling. But CDOs and other instruments only made it easier for money from around the world to flow into underperforming and often fraudulent mortgage markets.

At the end of the day, the core cause of the financial collapse was the housing price collapse and the fact that so much money went into mortgages, particularly to people who couldn't or wouldn't pay their debts when prices collapsed. This elicits two main questions: (1) Why did so much money flow into mortgage markets, particularly into subprime mortgages with high risks of failure; and (2) Why did investors not realize sooner that these assets (and the housing they were based on) were dramatically overvalued?

To answer the first question, it's important to distinguish between capitalized consumption and investment. From an investor's perspective, and that of some economists, they are the same thing. In both cases, the investor either loans or invests money, enabling a borrower to buy something and hopefully to pay off the investment over its lifetime, ideally in excess of the costs in net present value terms.

But from a societal perspective, capitalized consumption and investment are fundamentally different. An investment is an expenditure that yields a future stream of societal returns greater than the cost of the initial investment. A classic example is investment in scientific research (for example, paying the salary of a scientist or buying research equipment). Such investment makes society poorer today (that is, able to consume less in the present) in the hope of becoming richer tomorrow. If that scientist is able to discover a cure for cancer or a way to produce energy without carbon emissions, the investment yields the future benefits of better human health or a cleaner environment.

In contrast, taking out a loan to buy capitalized consumption items—a new car, a new house, a backyard swimming pool—doesn't produce future economic value. Even if such loans are paid back with interest, the economy as a whole is not more productive or innovative because someone has a fancy car, a bigger house, or a pool to sit beside in the summer.

So from a societal standpoint, investments are critical as a nation's way of forgoing current consumption (on TVs, clothing, vacations, houses, cars, and so forth) to help ensure that the future economy can be more productive and innovative. If any society spent all its money on current consumption (including capitalized consumption) and none on investing in the future, its economy would not grow or become more innovative. Conversely, if society spent all of its resources on investments for the future, it could not meet basic human needs today (for food, clothing, and heat, among other things). As we discuss in chapter 10, getting the right balance between investment and consumption is key. Too little investment means that the future economy will be smaller and less innovative than it would be otherwise.

Returning to the financial crisis, the real question is why capital markets poured so much money into capitalized consumption—housing markets—especially in the six years before the collapse. In the last half of the 1990s,

spending on U.S. housing averaged $360 billion per year. But in the first half of the 2000s, it increased by almost 50 percent, to an average of $538 billion annually. No wonder Wall Street cranked up the housing CDO market. Just as Willie Sutton said that he robbed banks because "that's where the money was," Wall Street invested in mortgages because that's where the profits were.[3]

But why was there so much money in the housing sector? The standard answer for most economists is that money was going into housing because that's where the largest societal returns were. How could it be otherwise, they argue, since markets acting independently of government allocate capital most efficiently? Most neoclassical economists view Wall Street (the nation's financial intermediation sector) as a highly rational system for transferring money from savers and investors to borrowers in a way that maximizes returns for all parties (savers, borrowers, financial intermediaries, and the economy as a whole).[4] But as we so painfully saw, this was not what happened with housing. Housing assets were not, it turned out, the best place to put investors' money.

Why did housing appear to be such an attractive investment? The short answer is because the demand for capital from the investment side of the economy shrank while the supply of capital (especially from China) surged. There was significantly reduced demand for capital to fund real wealth-creating activities in the United States—capital that would go to finance new mines, farms, factories, software and content firms, and the equipment needed to modernize and expand; money to finance new creative and fast-growing start-up companies; and money to finance research and development (R&D) to create the next generation of products and services. The entities that used to go to Wall Street for money to finance these kinds of wealth-creating activities were now doing it less frequently because the United States was losing the race for global innovation advantage.

The shortfall in demand for real investment capital in the United States was, in fact, quite significant. This can be seen by contrasting the demand for capital investment from 1995 to 2000 and from 2000 to 2005. Between 1995 and 2000, corporate investment in new capital equipment ("cap ex") exceeded spending on new housing by 173 percent. During these five years, annual corporate investment increased by $537 billion (73 percent), while

spending on housing increased by $147 billion (49 percent). This is generally consistent with the historic relationship between corporate expenditures on capital and housing expenditures. However, from 2000 to 2005, corporate cap ex investment exceeded housing investments by only 112 percent. More worryingly, corporate investment increased by just 17 percent ($192 billion), while spending on housing increased 82 percent. In other words, U.S. capital expenditures by companies—a key source of productivity and prosperity—began to stagnate and banks shifted capital into housing instead. We see the same trend when looking at bank balance sheets. When examining the assets of commercial banks in the United States, the ratio of industrial and commercial loans to real estate and consumer loans fell precipitously, from more than 80 percent in the early 1980s to around 52 percent at the end of the 1990s and then to just 28 percent five years later, as figure 2.1 shows.[5] In other words, banks used to funnel capital to productive investments; now they direct it to capitalized consumption (housing and consumer loans).

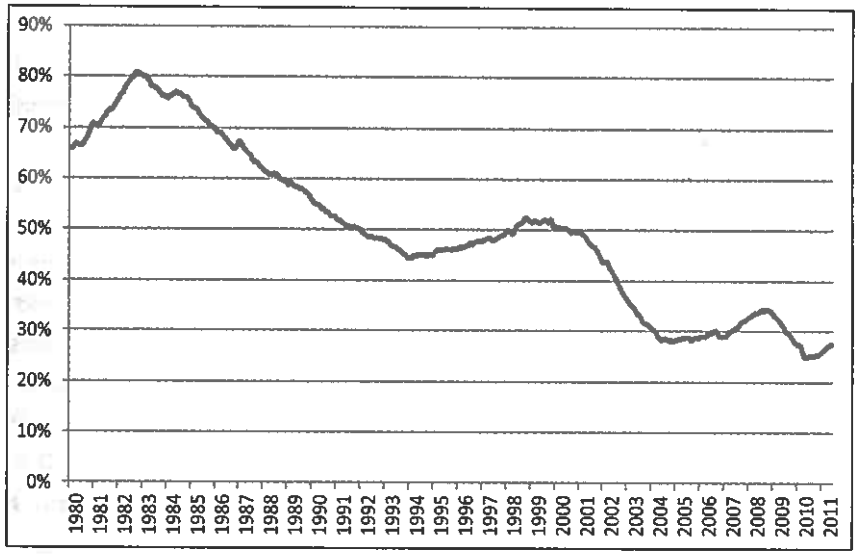

Figure 2.1 Ratio of U.S. Banks' Industrial and Commercial Loans to Real Estate and Consumer Loans, 1980 to 2011

This stagnation was actually an outright decline when it came to manufacturing. Historically, manufacturing drove both demand for investment capital and the broader U.S. economy. But from 2000 to 2010, capital investment within the United States by U.S. manufacturers declined more than 21 percent. These declines were even steeper for particular industries. Motor vehicles declined by 40 percent, paper by 44 percent, furniture by 53 percent, and apparel by 69 percent. Even sectors that the United States is supposed to lead in saw declines: capital investment in computers and electronic products declined 49 percent, while investment in electrical equipment and appliances decreased 35 percent. In the two years following the 2001 recession, manufacturing cap ex fell 22 percent. In the five years following 2003, manufacturing cap ex increased by 34 percent before dropping by 25 percent in 2009. As of 2010, it was still only 79 percent of its year 2000 level. Some might argue that this was because of the high level of investment in the boom year 2000. But between 1989 and 1998, manufacturing investment grew by 72 percent.[6] It wasn't that manufacturers weren't investing, they were just doing it overseas. In 2000, U.S.-headquartered manufacturing multinationals invested thirty-three cents overseas for every dollar invested domestically; in 2009, they invested seventy-one cents overseas for every dollar invested here, as figure 2.2 shows.[7] When looked at as a share of gross national product (GNP), manufacturing multinational corporations' overseas capital expenditure increased by 9 percent between 2000 and 2009, while their domestic expenditure decreased by nearly 50 percent.

Well, apologists will contend, manufacturing isn't today's economic engine anyway, for the United States specializes in innovation and in creating products and services on the front end, rather than production. But even here we see a similar picture of decline in demand for capital. While corporate R&D as a share of GDP increased by just 3 percent in the United States from 1999 to 2006, it increased 11 percent in Germany, 27 percent in Japan, 28 percent in Finland, 58 percent in Korea, 66 percent in Spain, 90 percent in Hungary, and a stunning 187 percent in China.[8] As a result, the U.S. share of global R&D fell from 39 percent in 1999 to 34 percent in 2011, a period during which China's share increased fourfold.[9] Why did U.S. corporate R&D grow so slowly? For the same reason that manufacturing cap ex grew so slowly: U.S. multinationals were investing in R&D overseas.

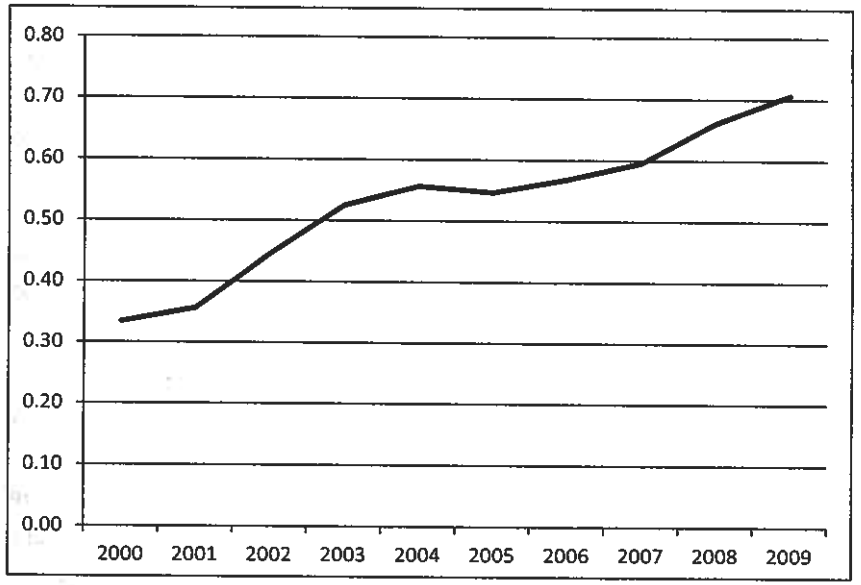

Figure 2.2 Ratio of U.S.-Headquartered Multinational Manufacturing Corporations' Foreign Investment to Domestic Investment
Source: Based on statistics from the U.S. Bureau of Economic Analysis.

From 1998 to 2007, investment by U.S. corporations in R&D increased more than two and a half times as fast overseas as all corporate investment (by U.S. and foreign corporations investing in the United States) did domestically.[10] In fact, the share of R&D spending by U.S.-headquartered multinational corporations going to foreign subsidiaries rose from 9 percent in 1989 to 15.6 percent in 2009.[11]

Demand for capital to fund other investments that create real wealth also shrank in the first half of the 2000s. From the second half of the 1990s to the first half of the 2000s, corporate outward foreign direct investment (the amount of money U.S. corporations invest in other nations) increased by $29.2 billion, or 20 percent, while foreign corporations' inward direct investment to the United States decreased by $7.6 billion, or 4 percent. The value of initial public offerings (the first time a company lists its stock on an equities market) declined from $108.6 billion in 1999 to just $19.9 billion in 2009. Venture capital investments fell by 78 percent between 2000 and 2008. In short, the corporate engine of investment stalled in the 2000s

at home while it was revving up overseas, especially in China and India. Instead of investing in the United States and creating demand for U.S. investment bank services and capital, corporations invested overseas, in large part because other nations had much more attractive investment and innovation climates, including much better corporate tax systems.

But rather than downsizing in the face of declining demand for its services (e.g., investment capital) and seeing their profits, jobs, and bonuses shrink, Wall Street actually expanded, largely by increasing "investments" in mortgages for people with little income and even less credit, and by dramatically ratcheting up their casino-like trading functions. Indeed, by the 1990s, Wall Street had become a machine on autopilot, bringing in hefty returns for its investors and delivering big salaries and bonuses to partners and employees. Ever since most Wall Street investment banks went public (with the last major investment bank, Goldman Sachs, going public in 1999), they were essentially required by financial markets to keep generating high returns. Any manager who did not come through was at risk of losing his or her job. And the expected high returns depended on making deals. As John Cassidy writes in the *New Yorker*, "Think of all the profits produced by businesses operating in the U.S. as a cake. Twenty-five years ago, the slice taken by financial firms was about a seventh of the whole. . . . In 2006, at the peak of the boom, it was about a third. . . . From the end of the Second World War until 1980 or thereabouts, people working in finance earned about the same, on average and taking account of their qualifications, as people in other industries. By 2006, wages in the financial sector were about 60 percent higher than wages elsewhere."[12] By 2008, the assets of the six largest U.S. banks, taken together, equaled a stunning 60 percent of the United States' overall GDP, significantly more than before the great panic of 1929.[13]

In this environment, housing deals were as good as or better than corporate deals (such as mergers and acquisitions, IPOs, or corporate bond underwriting). If Wall Street couldn't make money from real wealth-creation efforts, it thought it could make money from capitalized consumption (e.g., housing), and it proceeded to try. Thus, given reduced demand for capital from corporate America, U.S. investment banks went looking for other deals to make up for the missing income and, in the process, figured out how to

transform the housing market into corporate finance. Or, as Richard McCormack, editor of the newsletter *Manufacturing News* puts it, "the United States replaced traditional engineering with financial engineering."[14] In fact, as Ron Suskind notes in *Confidence Men*, even after the U.S. government's Troubled Asset Relief Program (TARP) would help bail out the U.S. banks, "Investing in the U.S. manufacturing or industrial sectors, and even in high tech, remained negligible, and there was no discernible bump in credit. The banks and their financial subsidiaries went back to earning money the way they had for much of the decade: through exotic, often computer driven, trading."[15]

In a way, Wall Street couldn't help itself. The machine was programmed to generate deal flow, and if traditional societal wealth-enhancing deals were lacking, capitalized consumption deals would suffice—both generated fat bonuses. So the real question isn't why Wall Street did this, but instead: Why did the U.S. economy evolve in such a way that the financial industry got locked into a CDO corner? In other words, why did corporate wealth-generating activities contract? The answer to that, as we describe below and in chapter 3, was that the U.S. economy lost international competitiveness, including on its longtime strength: technology and innovation.

But it wasn't enough that U.S. demand for capital was declining; the supply of capital was expanding. While the sagging fortunes of the U.S. economy in the first half of the 2000s led to a surfeit of good investment opportunities, the exploding U.S. trade deficit ironically created a glut of capital looking for a home. As other countries ramped up their mercantilist, export-oriented economic policies while limiting U.S. imports, the U.S. trade deficit exploded from $120 billion a year in the early to mid-1990s to around $600 billion a year by the mid-2000s. And this meant that large amounts of capital now flowed back into U.S. financial markets.

Normal investors would not have been jamming all that money back into the United States, where there were fewer good deals needing investment capital. But these were not normal investors. These were national governments, particularly China and Japan (but also Korea, Malaysia, Singapore, Taiwan, and others), desperate to keep their currencies from appreciating as normal market forces would have effected. It's important to remember that if these nations did not buy dollars (that is, invest in the United States)

their currencies would naturally rise relative to the dollar. Had this happened, the United States, in response, would have exported more and imported less, thereby reducing its trade deficit and creating millions of good-paying jobs. This not only would have created the demand for hundreds of billions of dollars worth of capital investments in wealth-creating activities but also would have increased wages for workers, enabling more to actually pay their mortgages, all the while reducing the flow of capital into mortgage markets and limiting the growth of the housing bubble.

All that foreign money seeking to keep the dollar high had to find a home, in this case, literally. And coupled with faulty policies from the Federal Reserve, which kept interest rates too low for too long (which it felt was necessary because the underlying U.S. economic engine was sputtering precisely because of faltering U.S. competitiveness), investors saw subprime mortgages as now worth the risk. With few good deals in the real economy, money now flowed into the Ponzi economy of housing. As *Businessweek* reported, "Overbuilding isn't the culprit in this bust. An oversupply of money is what pushed commercial real estate over the edge."[16] In fact, while there was a modest correlation of 0.35 between growth in spending on housing and growth in the trade deficit between 1996 and 2000, there was an almost one-to-one correlation (0.94) during the period from 2001 to 2005. In other words, expansion of the trade deficit almost perfectly matched expansion in spending on housing. Americans who were no longer working in high-wage manufacturing jobs (or jobs supplying manufacturers) were now buying DVD players, clothes, and cars made in China, Germany, Japan, or elsewhere and then borrowing money from Chinese, German, and Japanese workers (through Wall Street financial intermediaries) to buy houses they couldn't afford. But since capitalized consumption doesn't create wealth, these "investments" were only valuable if the next "sucker" kept buying, the essential feature of a Ponzi scheme. Eventually, the next sucker didn't buy, and the entire rotten edifice came tumbling down.

It should thus be clear that the financial crisis was not an isolated situation caused by greed, a lack of financial regulation, or any other single issue. This is not to say that a more regulated, transparent, ethical, and astute Wall Street would not have reduced the flow of money into the housing

Ponzi bubble. But at the end of the day, the key problem was the decline of demand for real wealth-creating investments in the United States and the expansion of foreign capital coming into America to keep the U.S. currency uncompetitive.

That was a problem Wall Street couldn't solve. Although it would be nice to think Wall Street would have lobbied for U.S. innovation and competitiveness policies, but they didn't. Wall Street's job is to channel savings into wealth-creating investments, not to ensure that there are enough of those investments to generate sustainable prosperity. Nor is it a problem that "Main Street" could solve either, if by Main Street we mean the millions of small and midsized businesses providing goods and services largely to local customers. Main Street is almost completely dependent for its economic vitality on "Manufacturing Street," "Research Park Street," and "Office Complex Street" (in other words, manufacturing, technology, and advanced office functions like corporate headquarters, globally traded engineering services, and so on). Nor is it a problem that Manufacturing Street, Research Park Street, or Office Complex Street could solve on their own. While some parts of Manufacturing Street were poorly managed (think General Motors), many U.S. companies are highly competitive internationally (think Boeing, Intel, and Microsoft). Thus, the problem has not been Manufacturing Street, Research Park Street, or Office Complex Street; the problem is that, in recent years, the United States has not been as attractive a place in which to make investments in innovation and productivity as other nations.

As such it was society's job, in particular the federal government's job, to create the conditions for sustainable prosperity. And, as we demonstrate, it's a job at which the federal government has failed. This has happened not because the federal government is incompetent or incapable, but because American voters and their elected representatives have not made it a priority for the federal government to take the steps needed to ensure that the United States remains the leader in the global innovation economy.

Finally, it's one thing to show that the fundamental building blocks of innovation and economic prosperity are not as strong as they used to be. But the real question is why didn't Wall Street (and so many economic

leaders such as Alan Greenspan and Ben Bernanke) see that investing in capitalized consumption was creating an unsustainable housing bubble? Even though Wall Street managers are focused on short-term returns and maximizing their own end-of-year bonuses, almost none of them would have done what they did if they thought their investments would collapse less than a year later, regardless of how big their bonus was. As Michael Lewis notes in his masterful analysis of the process of collapse, *The Big Short*, they did what they did because most of them believed these were good investments.

Certainly, evidence to the contrary existed. Wall Street has access to more and better financial data than any place on the planet. New York Federal Reserve Bank economists Himmelberg, Mayer, and Sinai wrote in their 2005 article "Assessing High House Prices: Bubbles, Fundamentals, and Misperceptions": "Between 1975 and 1995, real single-family house prices in the United States increased an average of 0.5 percent per year, or 10 percent over the course of two decades. By contrast, from 1995 to 2004, national real house prices grew 3.6 percent per year (40 percent for the decade), a more than seven-fold increase in the annual rate of real appreciation. In some individual cities, such as San Francisco and Boston, real home prices grew about 75 percent from 1995 to 2004."[17] Since housing does not produce wealth (in fact, real housing, as opposed to land, prices should fall because of depreciation), this means that home buyers had to devote 40 percent more of their resources to housing at a time when median household incomes were increasing at just 0.9 percent per year from 1995 to 2004.[18]

As figure 2.3 shows, housing prices from 1987 to around 2000 were actually fairly stable and on track.[19] But after 2001, prices accelerated—and continued to do so for another year after the Federal Reserve economists published their study.

Although such data painted a stark picture of an expanding bubble that would likely pop, few in government or the financial industry were willing to entertain the thought that this was a bubble (Nouriel Roubini, an economics professor at New York University's Stern School of Business, was a notable exception). In 2005, Ben Bernanke, current chairman of

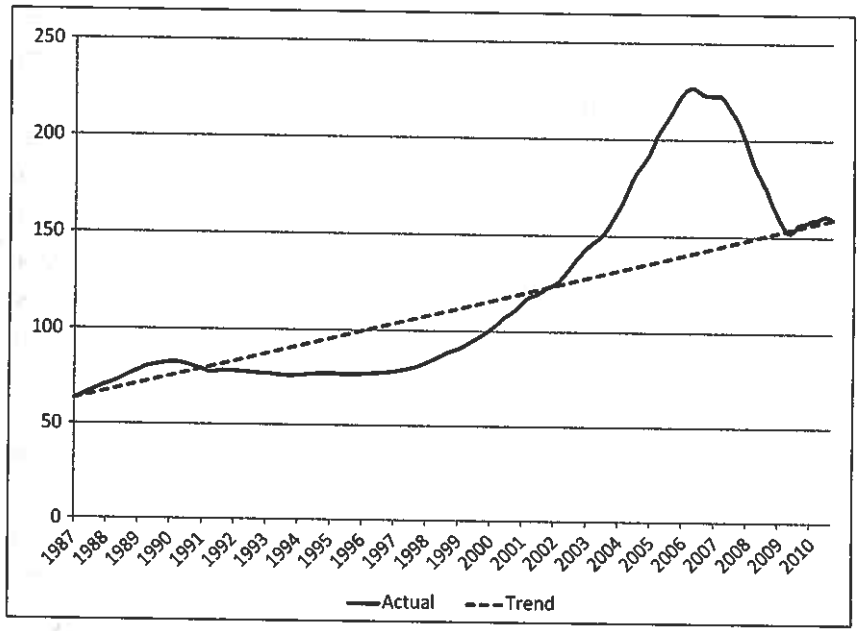

Figure 2.3 Case-Shiller Ten-City U.S. Home Price Index, 1987–2010

the Federal Reserve and then head of President Bush's Council of Economic Advisors, stated that rising home prices "largely reflect strong economic fundamentals," although the fundamentals were, in fact, anything but strong.[20] Likewise, then Federal Reserve chairman Alan Greenspan stated, "It doesn't appear likely that a national housing bubble, which could pop and send prices tumbling, will develop."[21] Amazingly, he said this when the ten-city-composite Standard & Poor's (S&P) Case-Shiller Housing Price Index was twice as high as it had been in 2000. Wall Street was equally oblivious. Unfortunately, the authors of the above-noted Federal Reserve Bank article—who were paid by taxpayers to advise the Federal Reserve Bank and others in the financial market to make better decisions—were also completely wrong. Even as they documented unprecedented increases in housing prices, they wrote: "As of the end of 2004, our analysis reveals little evidence of a housing bubble. In high-appreciation markets like San Francisco, Boston, and New York . . . recent price growth is

supported by basic economic factors such as low real, long-term interest rates, high income growth, and housing price levels that had fallen to unusually low levels during the mid-1990s."[22]

They did give themselves an out, however, if things really turned south for their assessment: "Our evidence does not suggest that house prices cannot fall in the future if fundamental factors change. An unexpected rise in real interest rates that raises housing costs, or a negative shock to a local economy, would lower housing demand, slowing the growth of house prices, and possibly even lead to a house price decline."[23] But between 2004 and 2007, mortgage interest rates did not appreciably rise. And while some economies may have had local difficulties, the overall U.S economy grew at 8 percent in real terms. Yet notwithstanding these favorable conditions, housing prices collapsed, falling approximately 40 percent from their peak, and thus drove the economy over the cliff.

To be fair, it wasn't only the Ph.D. economists paid to assess the housing market who failed. The companies who still issued mortgages and bought and sold mortgage-backed securities at the height of the boom failed as well, and their mistakes directly cost society trillions of dollars. The fundamental mistake was that economists, bankers, and policymakers did not believe housing prices would go down. As *Businessweek* stated, "loans were made based on an unshakeable belief that the market would never go down."[24] Indeed, some investment banks like UBS bought the lion's share of their underperforming CDOs just months before the collapse.[25]

Why was there such misplaced, almost childlike trust in housing markets? The easy answer is that since housing prices hadn't gone down before, at least on a nationwide basis, the possibility that they would go down now was a "black swan" (although, as they say, past performance is not a guarantee of future performance). But the real answer is that virtually all economists and financial industry analysts subscribed to the theory that in an efficient market, all the information that would allow an investor to predict the next price move is already reflected in the current price. In other words, under efficient-market theory, the price of an asset accurately reflects its value. As Yves Smith documents, many of the players drank the Kool-Aid that markets always get it right.[26] Indeed, neoclassical economists

and their fellow travelers in finance refused to acknowledge the reality that markets might misprice assets.

On average, and over the long term, efficient-market theory is valid. But its claim that all assets are perfectly, accurately priced at any given point in time is unrealistic. How can efficient-market theory explain dramatic swings in market prices, like the precipitous 508-point fall of the stock market on Black Monday, October 19, 1987? What piece of information presented that morning could have clued investors that all the assets they owned were overvalued by 22.6 percent? The answer is, of course, none.

As many of the advocates of what has become known as behavioral economics know, efficient-market theory is fundamentally flawed. But economists, investors, and regulators who rely on neoclassical-economics thinking bought into it and largely still do. If the market says that something is priced at a dollar, it's worth a dollar. If housing prices increase 40 percent in just a few years, then their actual worth increased 40 percent. If this is not true, it shakes the entire foundation of economics. A bit like the reaction of someone being told that the laws of gravity only work at certain times of the day, failure to believe the doctrine of efficient-market theory upsets an entire comforting way of looking at the economic universe. Because of this, believers in efficient-market theory will contort any analysis of data (even data showing that the real, inflation-adjusted price of housing grew seven times faster than before) to come up with the conclusion that the laws of gravity (efficient-market theory) still apply.

In summary, the U.S. financial crisis brought into sharp relief two major problems going forward. And unless both are solved, the long-term prospects for the U.S. economy are troubling. First, the fundamental investment environment in the United States is not good compared to that in other nations. Other nations have put in place the tax, trade, talent, and technology policies both to draw in and to grow innovation and productivity-enhancing investment. The United States has performed relatively poorly in these areas. Second, those in charge of guiding U.S. economic policy are caught up in a failed economic doctrine—neoclassical economics. They resist admitting that there is a problem (just as they resisted admitting that a housing bubble was forming), and worse, they

believe that much-needed government action to solve it will just make things more difficult. We might as well ask Newtonian physicists to design microchips.

A deeper look into the nature of U.S. economic decline can help put these critical issues into perspective.

America's Long-Term Structural Economic Decline

Since the Great Recession was clearly a financially induced crisis, many believe that once bad mortgage loans and other troubled assets are worked out of the financial system and the banks stabilized, the U.S. economy will return to a course of revitalized and sustained growth, just as it has for almost 250 years. But while the U.S. economy retains many strengths, what contributed to the Great Recession, and what the Great Recession itself has since masked—and further amplified—is a deeper and more serious problem: an unprecedented long-term structural decline of U.S. economic competitiveness. To paraphrase Rogoff and Reinhart (authors of the 2009 book *This Time It's Different: Eight Centuries of Financial Folly*), "this time it really is different."

This decline has two underlying causes. The first is the deterioration domestically of fundamental sources of U.S. competitiveness, from decaying industries and infrastructure to an erosion of U.S. innovation capacity reflected by a weakened innovation ecosystem, a faltering education system, and a relatively poor environment for innovation and investment. The second cause is that foreign countries are competing more fiercely and strategically than ever to attain the standards of living and wealth that American citizens have come to take for granted. They want what Americans have. This is not simply the rebalancing of global economic activity to a more even distribution as seen in the decades after World War II (WWII), as the U.S. share of global GDP slid from 46 percent in 1946 to 24 percent in 2009.[27] Such a rebalancing can happen without the United States losing millions of high-paying jobs in manufacturing and technology and without U.S. growth rates being anemic. Rather, this is about the United States losing its presumptive leadership in many of the highest-value-added, often technology-based sectors of economic activity. It's a competition for the future, particularly

for the kinds of jobs capable of sustaining the standards of living to which American citizens have grown accustomed.

Evidence of America's long-term structural economic decline abounds. It is apparent with regard to the current state of the U.S. economy—for example, in the across-the-board decline in U.S. manufacturing industries, whether in low-value-added industries such as textiles and furniture, medium-value-added industries such as automobiles or consumer electronics, or high-value-added industries such as advanced displays or printed circuit boards. It is seen in the nation's worsening trade balances, high unemployment rate, stagnant wages and slipping median incomes, and unsustainable debt loads.

Given the erosion of the country's underlying innovation capacity, America's ability to compete for the future is in doubt. The deterioration of U.S. innovation capacity is evidenced by underinvestment in R&D; an underperforming education system, particularly in science, technology, engineering, and math (STEM) fields; a decaying physical infrastructure; and an increasingly middling (by global standards) digital infrastructure—all within a public policy framework that does not comprehend the essential role of innovation and innovation policy in driving economic growth. The net result is that the United States has already lost a range of high-tech industries, from desktop and notebook PCs to liquid crystal displays (LCDs), advanced batteries, and compact fluorescent lightbulbs (CFLs). Moreover, U.S. leadership in the industries that will define the future—including high-performance computing, artificial intelligence, biotechnology, nanotechnology, robotics, energy storage, and clean energy production—is by no means assured.

Most, however, believe the financial crisis that sparked the Great Recession is a separate phenomenon from long-term U.S. structural economic decline. A case in point is the 2010 update of an original 2005 report issued by the National Academies of Science, *Rising Above the Gathering Storm, Revisited: Rapidly Approaching Category 5*, which states: "While the *Gathering Storm* report warned of an impending financial crisis, it was not addressing the type of crisis that subsequently occurred. It appears that the latter was relatively unique—triggered by government policy that encouraged excessive mortgage borrowing; poor judgment in assessing

risk on the parts of both borrowers and lenders; overly aggressive practices by investment banks when creating new financial instruments; and a lack of diligence on the part of regulators. This produced what has been a severe downturn. But it is not the long-term crisis of which the *Gathering Storm* committee sought to warn and avert."[28] They see the Great Recession as "not rooted in the same fundamental causes" of long-term economic decline.[29] But, as stated above, we argue that the Great Recession in fact did result in large part from a fundamental deterioration of U.S. innovation capacity that led to "investing" in consumption rather than wealth-creating innovation. In other words, the Great Recession was but the first wave in the gathering storm of U.S. economic decline.

So what is the evidence for and what are the causes of long-term structural U.S. economic decline and erosion of U.S. innovation capacity?

Decimation of U.S. Manufacturing

Perhaps the most apparent sign of U.S. economic decline has been the decimation of the country's manufacturing base. In the 1980s and 1990s, many saw this as a "rust belt" phenomena with old, dirty factories in places like Akron, Ohio, and Pittsburgh, Pennsylvania, being closed down to make way for shiny new tech complexes in places like Austin, Texas, and Portland, Oregon. But overall manufacturing was expected to continue to be pretty stable. In 1996, in its ten-year forecast of jobs, the federal Bureau of Labor Statistics (BLS) estimated that by 2006, U.S. manufacturing would lose only about 350,000 jobs.[30] In fact, the U.S. economy lost 3.1 million manufacturing jobs from 1996 to 2006—and another 2.4 million from 2007 to 2011—for a loss of 5.5 million manufacturing jobs since 1996, or about one-third of the U.S. manufacturing workforce, as figure 2.4 shows.[31] Figure 2.5 shows annual job gains and losses in U.S. manufacturing industries from 1992 to 2010, vividly illustrating how U.S. manufacturing firms have lost far more jobs than they've created in almost every year since 1998.[32]

However, as figures 2.4 and 2.5 graphically illustrate, it was really in the 2000s that U.S. manufacturing jobs collapsed, as more than 54,000 U.S.

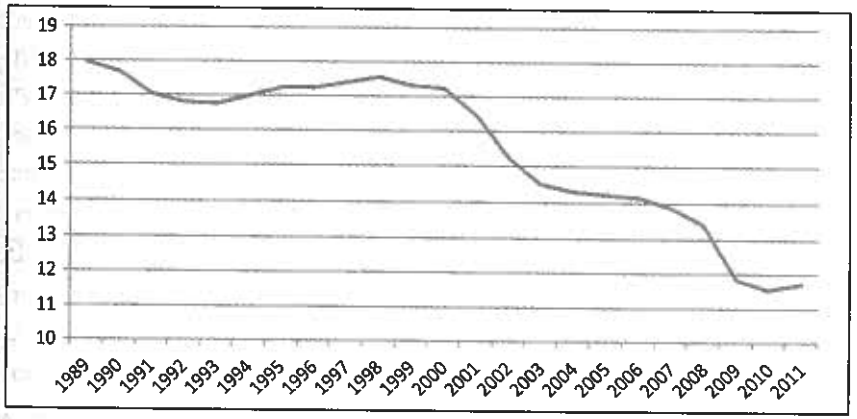

Figure 2.4 Decline in U.S. Manufacturing Employment (millions), 1989–2011
Source: Based on statistics from the U.S. Bureau of Labor Statistics.

factories closed. In fact, of the ten nations the BLS tracks, only the United Kingdom lost a greater share of its manufacturing jobs than the United States between 1997 and 2010 (see figure 2.6).[33] This is not a "rust belt" phenomenon, it's a "rust nation" debacle, with every single state except Alaska losing manufacturing jobs in the 2000s. What's more, in no previous decade has the United States ever lost such a large share of its manufacturing jobs. Even with the destruction of the Great Depression in the 1930s, the rate of manufacturing job loss was less than it was in the 2000s.[34] How could this devastation not have a broader effect on the macroeconomy?

As a result, in 2011, there were more unemployed Americans (15.7 million) than worked in manufacturing (just under 12 million). The last time fewer Americans worked in manufacturing was before WWII.[35] Capacity utilization in America's factories is nearly as low as it has been in any period since WWII.[36] And, in early 2011, the United States ceded its title as the world's leading manufacturer—a position it has held for the last 111 years, since 1900—to China.[37]

Nevertheless, many continue to argue that there's little cause for concern over the state of U.S. manufacturing because, after all, the United States is still one of the world's largest manufacturers and because output and productivity growth in manufacturing supposedly remains strong. As the

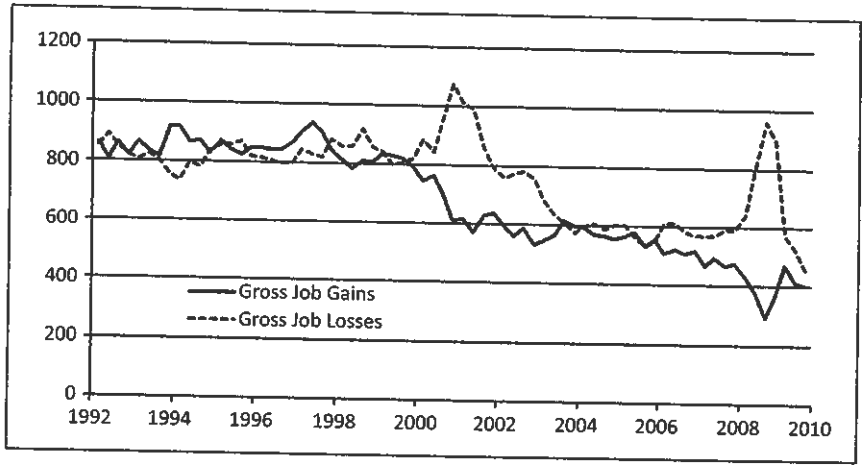

Figure 2.5 Job Gains and Losses in U.S. Manufacturing (thousands), 1992–2010
Source: Based on statistics from Stone and Associates and the Center for Regional Economic Competitiveness.

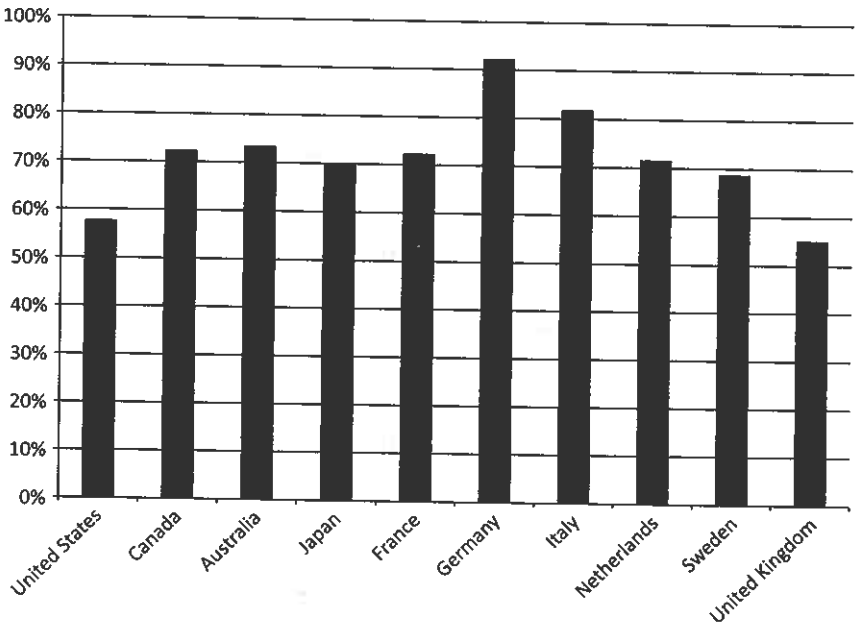

Figure 2.6 Manufacturing Job Change as a Share of Adult Population Growth, 1997 to 2010
Source: Based on statistics from the U.S. Bureau of Labor Statistics.

Economist writes, "For all the bellyaching about the 'decline of American manufacturing' and the shifting of production en masse to China, real output has been growing at an annual pace of almost 4 percent since 1991 [to 2005], faster than overall GDP growth." They continue, "Since, contrary to conventional wisdom, manufacturing output has been growing strongly, not declining, the fall in [manufacturing] employment in America and elsewhere should be seen as a good thing."[38] Kevin Williamson, deputy managing editor of *National Review*, also points to productivity growth in U.S. manufacturing to allay concern, maintaining that "the real productivity of U.S. businesses overall grew at an average rate of 1.5 percent per year from 1973 to 1995, which is a really robust number. But the productivity of U.S. manufacturing businesses grew by 3.5 percent in those same years, which is enormous."[39]

The largely consensus view among U.S. economic elites is that the massive U.S. job loss in manufacturing is simply a reflection of manufacturing doing well: using technology to automate work and to become more efficient. It's the agriculture story they tell us. The United States produces more food than ever, but because farming has gotten so efficient, it requires very few farmworkers to produce this output. So while manufacturing productivity may be tough on workers, the consensus goes, it's not a sign of U.S. economic decline, it's a sign of strength. "So," they ask, "what's the problem?" Other than the recession, U.S. manufacturing appears quite healthy.

There are two big problems with this view. The first is that it's not supported by the official government data. In fact, U.S. manufacturing lost jobs much faster in the 2000s than in the 1990s, even though productivity growth was similar during the two decades. In the 1990s, U.S. manufacturing employment fell 1 percent, while productivity increased 56 percent. Yet, in the 2000s, manufacturing employment fell 32 percent while productivity increased only slightly faster, 61 percent. So, clearly, higher productivity was not the main cause of the manufacturing employment collapse.

But there is an even deeper problem. The official government measurement of manufacturing output, the very data so many analysts cite for their rosy views, vastly overstates the output of a key manufacturing sector—NAICS (North American Industry Classification System) 334, the computers and electronics industry. To see how, consider that the federal government

classifies manufacturing into two major groups: durable goods (industries like automobiles, machines, and computers) and nondurables (industries like food, chemicals, apparel, and petroleum products). From 1987 to 2010, increases in the output of nondurables added just 1.96 percent to overall GDP growth. This is just over half of the approximately 3.73 percent they should have added to GDP had they contributed their "fair share" (that is, if they had grown at the same rate as the overall economy). Durables, in contrast, added 81 percent more than their fair share. However, a closer look reveals that every durable goods industry grew more slowly in output than GDP except one: computers/electronics which grew a whopping 720 percent faster than GDP. In fact, close to 8 percent of total U.S. GDP growth came from this one sector, which accounted for less than 1.6 percent of GDP. Does anyone really believe that the computers and electronics industry in America is actually 5,734 percent larger than it was in 1990? To put this in perspective, this one sector accounted for 113 percent of U.S. manufacturing output growth in the 2000s, even though, in 1997, it accounted for just 12 percent of manufacturing output.

What's going on? In part, the answer is the rapid technological improvement that is inherent in the computer and electronics industry. In a sense, Moore's Law (the prediction that the price of computing power falls by half and doubles in power every twenty-four months) makes it look like the industry is producing much more output than it really is. This poses a problem for output and productivity statistics because, although the rapid quality improvement may indeed accurately represent the increased computing value experienced by consumers, from an industry perspective it falsely implies a rapidly expanding industry.

When we look at durables minus computers and electronics, we see that they performed even worse than nondurables. In fact, when we look at manufacturing trends since 2000, the picture is much worse, one not just of slow growth, but actual decline. Between 2001 and 2010, the sum of yearly changes in GDP was 15.8 percent (in other words, if GDP grew 2 percent in one year and 3 percent the next, the sum would be 5 percent).[40] Manufacturing accounted for about 12 percent of the U.S. economy, on average, over this time period. Had manufacturing contributed its fair share to

GDP growth, it would have added a sum of changes of 1.91 percent (12 percent of 15.8 percent). In fact, it contributed 1.86 percent. But when we take out the inflated output of computers, the expected contribution to growth is 1.7 percentage points, but manufacturing minus computers actually subtracted 0.5 percentage points from GDP. This is because, during 2001–2010, manufacturing minus computers actually lost 6 percent of its value-added. Output of the electrical equipment and wood products industries declined by 7 percent, plastics by 8 percent, fabricated metals by 10 percent, printing by 12 percent, furniture by 19 percent, nonmetallic minerals and primary metals and paper by 31 percent, apparel by 34 percent, and textiles and motor vehicles by 39 percent. In other words, thirteen manufacturing sectors that made up 58 percent of U.S. manufacturing employment all produced less in 2010 than in 2001, all at a time when the overall economy grew 15.8 percent.[41]

Yet the government tells us that computers and electronics increased its output by 419 percent, even though the number of workers in the industry declined from 1.75 million to 1.09 million. In their study, "Offshoring and the State of American Manufacturing," economists Susan Houseman and colleagues report similar findings, with overall manufacturing output growing 1.18 percent per year from 1997 to 2007, but just 0.46 percent per year once computers are removed.[42] The failure of the Department of Commerce to accurately measure manufacturing output, and the fact that economists do not drill down into the data more carefully to tell the real story of what has happened is a breakdown of significant proportions since it has allowed policymakers to believe that all is well with U.S. manufacturing.

So where was all the growth in the U.S. economy if manufacturing was declining? Many conservatives will assert that it must have been in government. But, in fact, from 1987 to 2010, federal government output grew at just 11 percent the rate of growth in GDP, while state and local government grew just 57 percent as fast. (Growth in entitlements is not counted as government output since entitlements are a transfer payment.) Well, surely given the increased litigiousness of America, the legal industry must have exploded. In fact, legal services grew at just 36 percent the rate of overall GDP growth.

What industries, then, did assume a bigger share of the economy? Some of the expanders added real value to the economy. Computer systems services grew seventeen times faster than the rate of GDP growth. Information processing grew twelve times faster. But other fast-growing sectors arguably contributed less real value to the economy. Wholesale trade almost doubled, warehousing outpaced GDP by 175 percent, and water transportation increased twelve times faster, in part to handle the massive increase in manufacturing imports. And, of course, health care grew 63 percent faster than its share as the population aged. But the big growth was in financial services. The securities industry added over eleven times more to GDP than it would have if it grew at the national average. Funds, trusts, and other financial vehicles—think of your 401(k) plan—grew almost six times faster. In fact, while the ratio of banking profits to manufacturing profits was generally about 20 percent for most of the postwar period until the late 1970s, after that it grew rapidly to around 60 percent in the 1990s, reaching an astounding 317 percent in 2002. In other words, in 2002, the banking sector made more than three times the profits of manufacturing. And while the ratio went down during the financial crisis, it rebounded to 145 percent in 2010.[43]

Both a cause and an effect of this decline can be seen in trends in capital investment; that is, the amount invested every year in new plant and equipment. Unless the amount of new machines, equipment, and buildings put in place each year exceeds the amount of depreciation on existing machines, equipment, and buildings, overall capital stock (the aggregate value of the plant and equipment) will decline. Since WWII and through the 1970s, manufacturing capital stock increased at a robust pace as companies built new factories and added new machines in America. But since about 1980, a different picture has emerged. Table 2.1 shows the years in which the overall capital stock peaked in various industries, and the change from that peak year to 2009. For example, the capital stock of the primary metals industry (that is, the steel and aluminum industries) peaked long ago, in 1981, and has fallen by 27 percent since. Other industries peaked later, but in some cases saw a similarly steep fall in capital stock. For example, in just eight years, the value of buildings, machines, and equipment in the apparel industry fell by 21 percent. Contrast that to some other industries, such as

Table 2.1. Year of Peak Capital Stock by Manufacturing Industry and Level of Decline to 2009

Industry	Year of peak capital stock	Decline to 2009
Primary metals	1981	–27%
Paper products	1996	–19%
Textile mills and textile product mills	1997	–29%
Wood products	2000	–6%
Food, beverage, and tobacco products	2000	–2%
Apparel and leather and allied products	2001	–21%
Computer and electronic products	2001	–1%
Electrical equipment, appliances, and components	2002	–5%
Plastics and rubber products	2002	–3%
Motor vehicles, bodies and trailers, and parts	2003	–7%
Furniture and related products	2007	–4%
Nonmetallic mineral products	2007	–2%
Printing and related support activities	2007	–2%
Wholesale trade	2008	–3%
Miscellaneous manufacturing	2008	–1%
Retail trade	2008	–1%
Chemical products	2008	0%
Fabricated metal products	2008	0%
Ambulatory health-care services	2009	0%
Funds, trusts, and other financial vehicles	2009	0%
Machinery	2009	0%
Other transportation equipment	2009	0%
Petroleum and coal products	2009	0%
Real estate	2009	0%
Securities, commodity contracts, and investments	2009	0%

Source: Bureau of Economic Analysis, Fixed Assets Accounts Tables (Table 3.2ES; chain-type quantity indexes for net stock of private fixed assets by industry), http://www.bea.gov/national/FA2004/index.asp (accessed February 11, 2011).

the securities and health-care industries, which have more capital stock than ever in their history.

Another way to view this is to look at the rate of change of fixed assets (equipment, software, and buildings) by industry and by decade, as table 2.2 does. In the 1960s and 1970s, manufacturers expanded their capital stock by 59 and 55 percent, respectively. In other words, in the 1960s, American manufacturers expanded their buildings and machines by close to 60 percent and almost did it again in the 1970s. In the 1980s, in part due to the severe recession at the start of the decade and the emergence of tough international competition, the growth of manufacturing capital stock fixed assets slowed to 23 percent, but picked up to 36 percent in the 1990s. However, from 1999 to 2009, manufacturing fixed assets actually fell by 1.2 percent, the first time they declined since the Great Depression.

But some sectors were booming. While the 2000s saw a decline in manufacturing capital stock, there were at least two industries where the 2000s marked the fastest growth: funds and trusts, and performing arts and spectator sports. More than 8 percent of Americans may not have jobs, but at least they can watch what retirement savings they have grow (hopefully) while watching the football game at the expensive new stadium built with taxpayer funds.

Indeed, the reality is that the United States has seen its global share of manufacturing production eviscerated. While the decimation of America's manufacturing base has occurred over several phases, the common theme has been that the industries lost are in ever higher value-added sectors, as foreign competitors move up the value chain and increasingly pick off high-technology manufacturing sectors from the United States.

Of course, it all began with the well-documented offshoring of low-technology, low-value-added, labor-intensive manufacturing industries such as textiles, apparel, and luggage to East Asian and Latin American countries starting in the mid-1970s. For example, today American producers account for just 1 percent of the U.S. luggage market and 1.7 percent of the outerwear apparel market. And the trend has continued. Between 2000 and 2008, the U.S. furniture industry has also been gutted, with the closure of 270 major factories. Imports of wood furniture accounted for 68 percent of the U.S. market in 2008, up from 38 percent in 2000.[44]

Table 2.2. Rate of Change of Fixed Assets by Industry and by Decade

	1959–1969	1969–1979	1979–1989	1989–1999	1999–2009
Total private fixed assets	69%	69%	39%	54%	38%
Manufacturing	59%	55%	23%	36%	–1%
Funds, trusts, and other financial vehicles	160%	82%	95%	164%	357%
Performing arts and spectator sports	64%	62%	–26%	69%	97%

Source: Bureau of Economic Analysis, Fixed Assets Accounts Tables (Table 3.2ES; chain-type quantity indexes for net stock of private fixed assets by industry), http://www.bea.gov/national/FA2004/index.asp (accessed February 11, 2011).

It would have been one thing if the United States was only losing employment in such labor-intensive, low-tech manufacturing industries (the kind people would see in movies like *Norma Rae*), for that could have represented a restructuring of U.S. manufacturing toward more high-tech, high-value-added manufacturing. This is essentially the story of German manufacturing, which lost some low-tech industries but more than made up for them with increased higher-tech production in industries like solar panels, machine tools, and autos. But the U.S. manufacturing sector was not restructuring, it was declining.

Throughout the 1980s, manufacturing of consumer electronic products left the United States almost entirely, as Asian players came to dominate production of personal cassette players, stereos, video recorders, TVs, digital cameras, and the like. Next, the United States started losing market share in capital goods industries. After WWII, with America being the arsenal of democracy, the United States became the world's leader in machine tools, the backbone of an industrial economy and the means by which all other products are manufactured. But by 2008, the U.S. share of global machine tool production had fallen to 5 percent, as China's rose to 35 percent. From 2005 to 2008, 80 percent of five-axis machine tools (the most sophisticated)

sold in the United States were imported, with Japanese and German products comprising the vast majority of models.[45]

Meanwhile, since the mid-1970s, the U.S. share of domestic passenger vehicle production has been declining. The U.S. share of global passenger vehicle production fell by almost half from 1999 to 2008 (from 14.5 percent to 7.5 percent), as the Chinese share rocketed from 1.5 percent to 12.7 percent. China is now the world's largest passenger vehicle manufacturer (in addition to now having the world's largest passenger vehicle market). The bankruptcies of General Motors (GM) and Chrysler were clearly emblematic of this ongoing loss of U.S. manufacturing competitiveness.

Then, in the 2000s, the United States began losing out in the development and manufacturing of the next generation of high-technology products. Without a printed circuit board (PCB) industry, a country cannot expect to have an industrial foundation for high-tech innovation. But whereas the United States claimed 29 percent of global printed circuit board production in 1998, by 2009, that share had plummeted to 8 percent. Meanwhile, China's market share of global PCB production has been the exact inverse, growing from 7 percent in 1999 to more than 31 percent in 2008.[46] In fact, Asian countries now control 84 percent of the global production of PCBs. Similarly, in 2007, 40 percent of the semiconductor fabrication plants under construction in the world were located in China, with just 8 percent being built in the United States. Table 2.3 shows the nearly perfectly inverse relationship between the decline in U.S. and corresponding increase in Chinese manufacturing for several industries between the late 1990s and 2008.

The same story holds for the next generation of clean/green energy products. In an industry America pioneered, the U.S. share of global photovoltaics (solar panels) production cratered from more than 40 percent in 1995 to 7 percent in 2011. High-profile bankruptcies in 2011 and 2012 of solar panel companies like Evergreen Solar (which first moved to China before going bankrupt), Solyndra (which received a loan of $535 million from the federal government that became controversial after its bankruptcy), SpectraWatt, and Energy Conversion Devices, are indicative of the decline. Meanwhile, China's share of the photovoltaics market grew from 5 percent in the mid-2000s to more than 50 percent in 2011, largely due to massive subsidies to the industry, including no-interest loans, free electricity, free land for factories, and other incentives. In fact, China became the world's leading producer of solar panels in 2009, the leading producer of wind turbines in 2010, and intends to become the world's largest manufacturer of lithium ion (Li-ion) batteries sometime between 2015 and 2020.

Table 2.3. U.S. Decline and Chinese Rise in Global Manufacturing

	U.S. share global manufacturing		Chinese share global manufacturing	
Industry	Late 1990s	2008	Late 1990s	2008
Printed circuit boards	29% (1998)	8%	7% (1998)	31.4%
Semiconductor plants under construction		8% (2007)		40% (2007)
Photovoltaics	30% (1999)	5.6%	1% (1999)	32%
Passenger vehicles	14.5% (1999)	7.5%	1.5% (1999)	12.7%
Machine tools		5.1%		35%

Meanwhile, investment in these technologies continues to flow into Asia, not the United States. In fact, ITIF estimates that over the years 2009 to 2013, the governments of Asia's "clean technology tigers"—China, Japan, and Korea—will invest three times more than the United States in clean technology, with those nations investing a total of $509 billion, while the United States invests $172 billion.[47] This became clear as early as March 2010, when a U.S. company, Applied Materials, opened the world's largest private solar research and development facility—but in Xian, China. Likewise, in November 2010, General Electric (GE) made a $2 billion investment in clean technologies in China, expanding its R&D and customer support capabilities in the field of low-carbon technologies, particularly in smart grid and rail infrastructure. GE will spend $500 million on customer innovation centers in six Chinese cities, and within two years its investment will add one thousand jobs in the country.[48]

The story is the same for the next generation of advanced vehicles. A single Japanese automobile, the Toyota Prius, constitutes about half of the U.S. hybrid market, and a single Japanese company produces more than 75 percent of the world's nickel-metal hydride batteries used in vehicles.[49] GM's all-electric Volt has been much touted as the leading-edge of next-generation

U.S. advanced vehicle development, but the rechargeable lithium-ion batteries at its heart were designed and manufactured in Korea.

Chapters 3 and 4 explore in fuller depth the causes of the decline of U.S. manufacturing industries since the early 1980s, including how the loss of one high-tech manufactured product industry sows the loss of future industries in subsequent technology life cycles. For the moment, suffice it to say that the primary causes have been a combination of misguided economic beliefs in the United States and the intentional result of foreign countries' strategies, legitimate and illegitimate, to relocate R&D and manufacturing activity from the United States to their nations. Regardless of why, the loss of U.S. manufacturing industries has been a critical factor contributing not just to the financial crisis but also to the anemic U.S. jobs recovery through 2011. This is in part because manufacturing jobs have the highest employment multiplier of any sector, meaning that the loss of 5.7 million manufacturing jobs led to significant job loss in the rest of the economy, with the result being no net job creation in the United States from 2000 to 2011.[50]

Deteriorating Trade Balances

A large share of the decline of U.S. manufacturing jobs and output has stemmed from the increase in the U.S. trade deficit. While the United States has been running a trade deficit in manufacturing for more than three decades, it grew considerably worse after 2000. During the ensuing decade, the United States accumulated an astounding aggregate negative $5.5 trillion trade balance in goods and services with the rest of the world.[51] In no year in the 2000s did the United States have a negative global trade balance of better than negative $360 billion; and in five of those years, the annual trade deficit topped $600 billion. To put this in perspective, during each of those five years, on average, each American household imported $5,450 in goods and services that was not matched by equivalent exports. In just five years, every American household got the equivalent of a new BMW essentially on credit, since we were not exporting an equivalent amount. At 5 percent of U.S. GDP in 2010, the current account deficit remains at extremely high levels.

But the story has been even worse with regard to the balance of trade in goods: from 2006 to 2008, the United States accrued a trade deficit in goods of at least $823 billion annually. The goods trade balance for the 2000s decade was negative $7 trillion.[52] Thanks to this, since 2000, the U.S. share of world exports has declined from 17 percent to 11 percent, even as the European Union's share held steady at 17 percent over that time period.[53] In fact, between 1999 and 2009, America's share of world exports fell in almost every industry: by thirty-six percentage points in aerospace, nine in information technology (IT), eight in communications equipment, and three in cars.[54]

Many Americans comfort themselves by thinking that the vast majority of the U.S. trade deficit in goods is comprised of oil; cheap, low-value items, such as clothes, toys, or knickknacks; or the mass-market consumer electronics we've gotten used to importing from Asia. Surely, the United States must have a positive trade balance in advanced technology products from industries such as life sciences, medical devices, optoelectronics, information technology, aerospace, and nuclear power. But no, as figure 2.7 illustrates, the United States has run a deficit in advanced technology products since 2001. In fact, in the ten-year period from the beginning of 2002 to the end of 2011, the United States ran a trade deficit in advanced technology products every year, tallying a $526 billion deficit in advanced technology products over that time period.[55] And over that period the trend worsened virtually every year; indeed, the United States ran an $81 billion trade deficit in advanced technology products in 2010 and a $99 billion deficit in 2011.[56]

Even in industries where one might expect the United States to surely run a trade surplus, such as renewable energy products, the country runs a trade deficit. In fact, from 2004 to 2008, the U.S. trade deficit in renewable energy products increased by 1,400 percent, to nearly $5.7 billion.[57] And in a number of the advanced technology sectors, such as medical devices, where the United States still runs a trade surplus, that surplus is shrinking. Overall, from 2005 to 2010, the U.S. share of global high-tech exports dropped from 21 percent to 14 percent, while China's share grew from 7 percent to 20 percent.[58] China has now replaced the United States as the world's number one high-technology exporter.

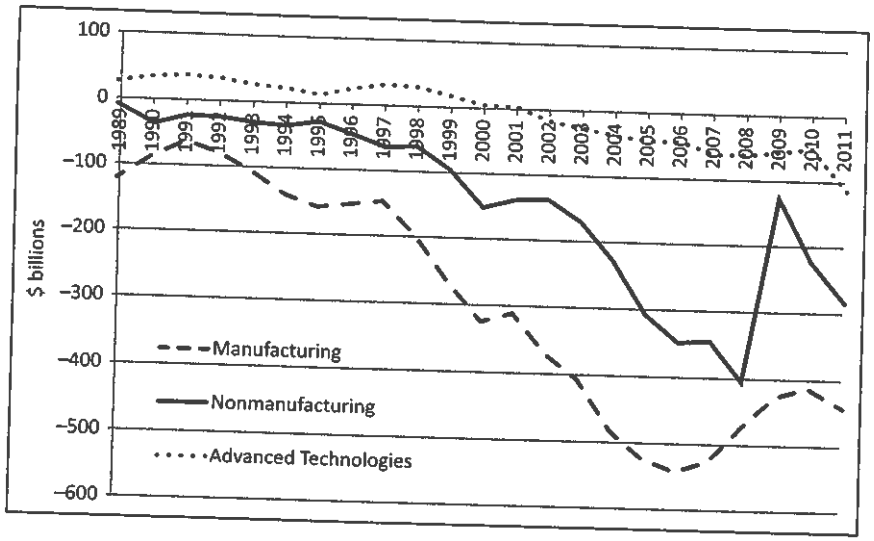

Figure 2.7 U.S. Trade Balances for Manufactured, Nonmanufactured, and Advanced Technology Products, 1989–2011
Source: Based on statistics from the U.S. Census Bureau.

So just what does the United States manufacture and export these days? It turns out that its two largest exports (by value) via ocean container are wastepaper and scrap metal. Moreover, the largest U.S. exporter via ocean container in 2007 was not even an American company, but Chinese: American Chung Nam, which exported 211,300 containers of wastepaper to its Chinese sister company, Nine Dragons Paper. By comparison, in 2007, Walmart imported 720,000 containers of sophisticated manufactured products from overseas factories into the United States, followed by Target (435,000 containers), Home Depot (365,300 containers), and Sears, which owns Kmart (248,600 containers).[59]

These figures recall Winwood Reade's 1872 book *The Martyrdom of Man*, which chronicled the economy of ancient Rome: "By day the Ostia road was crowded with carts and muleteers, carrying to the great city the silks and spices of the East, the marble of Asia Minor, the timber of the Atlas, the grain of Africa and Egypt; and the carts brought nothing out but loads of dung. That was their return cargo."[60] Dung for the Romans; scrap metal and wastepaper for the United States.

To be sure, semiconductors remain the largest U.S. export industry by absolute value, accounting for $48 billion in exports from 2005 to 2009, $10 billion ahead of automobiles, in second place.[61] And despite the declines in its share of the global market, aerospace also remains a strong export industry for the United States. But having just a few strong export industries has not been enough to offset the massive trade deficits the United States has generated over the past decade. And while the United States has had a positive trade balance in services over the past decade, services trade is still much smaller than manufactured goods trade, and therefore the U.S. trade deficit will not diminish absent a significant increase in domestic manufacturing. Unfortunately, every year America runs a trade deficit, it passes on debt to the next generation of Americans. While this generation has been enjoying its BMWs that it didn't work for, the next generation will be stuck with the bill—in other words, stuck having to produce more than it consumes and shipping the rest to other nations.

Erosion of U.S. Innovation Capacity

Some who acknowledge that America is losing manufacturing will counter with the claim that the United States is still strong in innovation and that this will power its future competitiveness. For more than fifty years after WWII, the United States was the undisputed global innovation leader. America's global leadership in technology innovation was taken as a given. Research from U.S. corporate and government laboratories spawned a string of transformative innovations, everything from transistors, mobile phones, and personal computers to lasers, graphical user interfaces, search engines, the Internet, and genetic sequencing. However, the United States has lost its innovation lead and its rank appears to be rapidly slipping.

In 2011, the Information Technology and Innovation Foundation (ITIF) released a report, *The Atlantic Century II*, which benchmarked forty-four nations and regions on sixteen core indicators of innovation-based capacity (using mostly 2009 data).[62] In addition to the United States, countries assessed included twenty-five European Union nations along with Brazil, Canada, Chile, and Mexico, and leading Asian economies including Australia, China, Japan, Korea, and Singapore. Among the indicators evaluated

were higher-education attainment, researchers per capita, levels of government and corporate R&D, entrepreneurship (new firms and venture capital), corporate tax levels, and ease of doing business as well as innovation outputs, such as levels of per capita GDP growth, foreign direct investment (FDI), productivity, and trade balances.

The report found that a coterie of hard-charging Asian and Western European countries, headlined by Singapore and Korea from Asia, which placed first and fifth, respectively, as well as Finland and Sweden from Europe, which ranked second and third, is pacing the world in the race for global innovation advantage. The United States ranked fourth.[63] The United Kingdom, Canada, Denmark, Holland, and Japan rounded out the top ten countries.

Many will say, "Well the United States still ranks close to the top, in fourth place; that's close enough, so what's the big cause for concern?" The first cause is that when one benchmarks these forty-four countries on the same sixteen indicators using 1999 data, the United States stands out as the clear leader, far ahead of then number two Sweden. But in ten short years, the United States lost its top perch, slipping to number four behind Singapore, Finland, and Sweden. Nor is ITIF alone in finding that the United States has lost its world-leading position in innovation: a March 2009 Boston Consulting Group study ranked the United States eighth out of 110 countries in innovation capacity.

But while that's concerning enough, *The Atlantic Century II* report found a far more disturbing trend. When assessing rates of change in innovation capacity during 2000–2009 (that is, the rate of improvement on these sixteen indicators), the United States ranked second to last, ahead of only Italy.[64] China ranked number one. But other advanced nations like Australia, Austria, Japan, and the United Kingdom also significantly outpaced the United States. In other words, forty-two nations or regions made faster progress than the United States did at bolstering their innovation competitiveness.

In fact, the United States placed near the bottom for rates of change at enhancing its levels of higher-education attainment, number of scientific researchers per capita, and number of scientific publications per capita, while also scoring poorly at increasing its levels of corporate R&D, increasing broadband Internet and e-government usage and penetration, and improving its trade balances. The report should be seen as both a backward- and forward-looking indicator. That is, it clearly shows a dramatic erosion of U.S. innovation capacity during the 2000s. But as the report includes a number of inputs to the innovation process—levels of government and corporate R&D investment, higher educational attainment, levels of venture capital, and so forth—it also suggests weakened U.S. innovation competitiveness continuing into the future.

We see signs of U.S. innovation decline particularly in four categories: R&D intensity; shares of scientific publications and scientific researchers; patenting activity; and numbers of bachelors, graduates, and doctorates in STEM fields. In total, these trends reinforce the reality that the United States is not as attractive a location for investment as it used to be or as other nations increasingly are.

A nation's investments in R&D are vital to its ability to develop the next-generation technologies, products, and services that keep a country and its firms competitive in global markets. A nation's R&D intensity measures its aggregate investments in R&D as a share of its total GDP, enabling comparisons to other countries. While the United States still leads the world in aggregate R&D dollars invested, on a per capita basis it is falling behind. The United States ranks just eighth among Organization for Economic Cooperation and Development (OECD) countries in the percentage of GDP devoted to R&D expenditures (2.8 percent), behind Israel (4.3 percent), Finland (4.0 percent), Sweden (3.6 percent), Korea (3.4 percent), Japan (3.3 percent), Denmark (3.0 percent), and Switzerland (3.0 percent), with Germany and Austria both less than .04 percent behind the United States.[65] Worse, the United States is one of the few nations where total investment in R&D as a share of GDP fell from 1990 to 2005, largely because of a decline in public R&D support over that time frame. And in 2008, for the first time, Asian nations as a group surpassed the United States in R&D investment, investing $387 billion to the United States' $384 billion.[66]

The Great Recession has further eroded U.S. corporate R&D activity. According to the European Commission's *2010 EU Industrial R&D Investment Scoreboard*, R&D by top U.S. companies fell by 5.1 percent compared to the year prior, a decline twice as sharp as EU corporations experienced.[67] In

contrast, major companies headquartered in Asian countries continued their high R&D growth rates, with Chinese firms increasing their R&D investment activity by 40 percent, Indian firms by 27.3 percent, and those in Hong Kong and Korea by 14.8 percent and 9.1 percent, respectively. Japanese corporations maintained their R&D investment levels. While American firms have had to cut back on R&D into the technologies and products of the future, Asian firms are using the opportunity to put themselves on a stronger competitive footing for the future.

As another example, business R&D expenditures by U.S. IT manufacturing and IT services industries as a share of GDP fell substantially compared to twenty-one other OECD peer countries between 1997 and 2005. While at first glance the United States appears to score fairly well on these measures—fifth in business R&D expenditures in IT manufacturing and sixth in IT services—the data reveal a striking decrease of almost 50 percent in the amount of U.S. IT manufacturing industry R&D as a percentage of GDP from 1997 to 2005.[68] Moreover, during this time, businesses in IT manufacturing and services industries in countries such as Finland, Korea, Denmark, Ireland, and the Czech Republic substantially increased their IT R&D investment as a percentage of their countries' GDP. Finland and Korea increased their business R&D expenditures in IT manufacturing by 67 percent and 73 percent, respectively, and businesses in Denmark's IT services industries increased theirs by 189 percent.[69]

The United States has also slipped in the number of scientific publications per capita and global share of scientific publications. As a November 2010 Thomson Reuters Global Research Report concludes, "The United States is no longer the Colossus of Science, dominating the research landscape in its production of scientific papers, that it was 30 years ago. It now shares this realm, on an increasingly equal basis, with the EU-27 and Asia-Pacific."[70] The U.S. share of scientific papers in journals indexed by Thomson Reuters has fallen from 40 percent in 1980 to 29 percent in 2008. Moreover, Asian nations have surpassed the United States in share of annual total output of journal papers, with China now the second-largest single-producer nation behind the United States. The United States ranks just fourteenth among countries for which the National Science Foundation (NSF) tracks the number of science and engineering articles per million inhabitants. Sweden and Switzerland produce over 60 percent more science and engineering articles in relation to the size of their populations than does the United States.[71]

While the United States continues to lead in patents, other nations have encroached on the U.S. lead. In 2009, 51 percent of patents issued in the United States were awarded to non-U.S. companies. Only four of the top ten companies receiving U.S. patents in 2009 were based in the United States. In fact, nearly 60 percent of the patents filed with the U.S. Patent and Trademark Office (PTO) in the field of information technology now originate in Asia.[72] At the same time, the increase in patent litigation in the United States (120 percent between 1990 and 2005) imposes a significant tax on the U.S. innovation system.[73] In total, U.S. firms spend more than twice as much on patent and other litigation as they do on R&D.[74]

One of the most worrying signs of deteriorating U.S. innovation competitiveness has been the steep decline in American college graduate, master's, and doctoral students earning science and technology degrees. The United States ranks just twenty-seventh among developed nations in the proportion of college students receiving undergraduate degrees in science or engineering.[75] And although Americans (citizens and permanent residents) are getting graduate degrees at an all-time high rate, the increase in graduate degrees in natural science, technology, engineering, and math fields has been minimal since the early 1990s. According to the Department of Education, only 41 percent of students who enter STEM majors in higher education end up obtaining a STEM degree of some kind (certificate, associate's, or bachelor's) after six years.[76] In 2009, U.S. colleges awarded more undergraduate sports-exercise majors than electrical engineering majors.[77] At the same time, an increasing number of master's and Ph.D. recipients in STEM fields from U.S. universities are foreign-born. For example, almost three-quarters of electrical engineering and two-thirds of industrial engineering doctorates are awarded to foreign students.[78] Of course, these students are increasingly returning home after they graduate, either to capitalize on opportunities there or because U.S. immigration policies make it difficult for them to stay in the United States.

Of course, challenges with the U.S. educational system go far beyond STEM fields; they are seen broadly across secondary and tertiary education.

Thirty percent of Americans do not hold high school diplomas. In fact, the United States ranks just twentieth in high school completion rates among industrialized nations and sixteenth in college completion rates.[79] Even worse, literacy among those college graduates is quite low.[80] Among second semester seniors at four-year U.S. colleges, just 34, 38, and 40 percent were proficient in quantitative, document, and prose literacy, respectively.[81] In other words, 60 percent of students who have spent more than three years in college (hopefully taking some time away from partying to study) were not fully literate.

Overall, we should be deeply concerned that America's educational system is not adequately preparing the next generation with the skills it will need to be competitive in the globalized economy of tomorrow. As the authors of the *Rising Above the Gathering Storm* report concluded, the U.S. K–12 education system is on average "a laggard among industrial economies—while costing more per student than any other OECD country."[82] As we explore in chapter 8, a large part of the problem is that we have not brought sufficient innovation to the U.S. education system.

But even if the overall U.S. innovation ecosystem is sputtering, one would expect that Silicon Valley surely continues to do well and pace the world in innovation. Actually, as Russell Hancock, chief executive of the Joint Venture Silicon Valley Network, which has indexed the region's business climate each year since 1995, argues in the organization's 2010 report, "I'm not telling you the sky is falling, but I have a duty to report that some of the indicators are not good."[83]

Taken together—whether it's R&D intensity, scientific publications, patenting activity, higher education attainment, or a variety of other indicators—it's clear that there has been a stark erosion of U.S. innovation capacity, particularly since 2000. And it's no surprise that the erosion of U.S. innovation leadership has gone hand in hand with U.S. structural economic decline.

Losing the Race and Stagnating Incomes

It should be clear that a large part of the explanation for the loss of U.S. manufacturing jobs lies in increased global competition and the loss of not just low-value-added but also high-value-added manufacturing and R&D

activities to foreign countries. Likewise, we have not been able to fully offset these losses with higher-wage jobs in other sectors and functions related to technology and innovation. And so the United States' loss of global competitive advantage has led not just to job loss and slow GDP growth but also to income stagnation. We were already seeing evidence of this even before the Great Recession. A June 2009 study by the Bureau of Labor Statistics found that the average wage increase for all U.S. workers from 2000 to 2007 was eleven cents an hour. However, the average wage that companies paid their workers actually increased by twenty-two cents an hour during that time frame, meaning that there was an eleven-cent reduction in U.S. wages through occupational shift.[84] In other words, if the United States had the same composition of jobs in 2007 as in 2000, the average wages paid to U.S. workers would have increased twenty-two cents an hour, whereas on average U.S. workers only realized one-half that increase, because a larger share of workers in 2007 were in lower-paying occupations. To risk being flippant, the American workforce has increasingly moved from manufacturing high-technology products to manufacturing hamburgers. This is in part why the median annual income in the United States grew by an anemic 2 percent between 1990 and 2010.[85]

This is one reason why, according to the 2010 *Prosperity Index* published by the Legatum Institute, a London-based research firm, the United States ranked only the tenth most prosperous country in the world, continuing its downward slide from its ninth-place rank in 2009, fifth in 2008, and third in 2007, the initial year of the report. Likewise, the International Monetary Fund has assessed growth in GDP per capita (at purchasing power parity) for twenty-one of the world's largest (mostly OECD) economies since 1980.[86] Among these nations, the United States ranked eighth in growth in GDP per capita from 1980 to 1990. From 1990 to 2000, it slipped to eleventh. From 2000–2010, U.S. per capita GDP growth fell to seventeenth. At this rate, by 2020, it will be last.

It should be no mystery as to the relative decline. Relative incomes can and do shift across national economies in response to changes in competitive advantage for technological advantage. As Nobel Laureate Paul Samuelson puts it, "Invention abroad that gives to [other countries] some of the comparative advantage that had belonged to the United States can induce

for the United States permanent lost per-capita real income."[87] Or as Greg Tassey, senior economist at the National Institute of Standards and Technology (NIST), explains, "Technological change can not only shift comparative advantage through trade but also lower real incomes in the economies that do not develop and use new technologies to a sufficient degree."[88] When an economy loses such a large number of "traded jobs," the impact on the overall economy will be nothing less than severe.[89] The message is clear: relative American prosperity is waning.

But the United States is not the first country to experience such stunningly rapid industrial decline; the British economy charted that path from the 1950s to the 1970s. As we discuss in chapter 3, dreadfully poor economic policymaking largely begat both collapses.

Learning from the Wrong Master

LESSONS FROM U.K. INDUSTRIAL DECLINE

After being the global economic leader for more than a century, the experience of relative economic decline is new for the United States, a bit like waking up one morning to find that your mansion has termites and your Cadillac is leaking oil. This is not to say that some U.S. regions, particularly in the Northeast and Midwest, haven't had termites and leaking oil for some time. Places like western Pennsylvania saw their economies go into relative decline in the 1950s and 1960s. But for most of America, until fairly recently, the economic foundations were termite-free and the economic engine roared like new. And even though America faced increased international economic competition in the 1980s and 1990s—particularly from Japan and Germany, who took a large bite out of U.S. leadership in sectors such as steel, automobiles, and machine tools—the economy came surging back in the 1990s, powered by the information technology (IT) revolution. It has only been since the late 1990s that the United States as a whole began to experience what places like western Pennsylvania have long endured, and to see tangible ways in which it is losing ground to other nations, particularly in its ability to field a globally competitive, high-wage export sector.