



Restoring Investment in America's Economy

BY ROBERT D. ATKINSON | JUNE 2016

There is a strong consensus among economists about the importance of investment to productivity. But the trends in the United States are troubling, to say the least.

The Information Technology and Innovation Foundation (ITIF) was founded in 2006. Looking back on the intervening decade, we have seen, in essence, a “tale of two cities”—dramatic progress in scientific and technological innovation, yet anemic productivity growth. This represents one of the most important challenges that policymakers must address in the years ahead, because productivity is a sine qua non for improving people’s living standards. How can we jumpstart productivity? Part of the answer is by spurring public and private investment in the underpinnings of the modern economy. ITIF will mark its 10-year anniversary with a half-day conference on June 14, 2016 devoted to this critical issue. The purpose of this report is to help frame the discussion.

RAPIDLY EVOLVING TECHNOLOGY, SPUTTERING PRODUCTIVITY

Ten years ago, there were a billion Internet users globally; today, there are 3.2 billion.¹ Ten years ago, 30 percent of Americans subscribed to broadband Internet service in their homes at an average speed of 1.5 megabits per second; today, more than 82 percent subscribe to broadband at an average speed of 14.2 megabits.² The first 3G wireless services were launched around five years ago with speeds of about 500 kilobytes per second. Data traffic was so low it wasn’t even measured. There were no app stores. Today, the United States leads in 4G LTE use, with speeds averaging 3 megabits per second or faster, while roughly 6 exabytes of traffic travel over the U.S. wireless networks annually. Meanwhile, someone has downloaded the 100 billionth app from Apple.³

Investing is spending on something now to generate returns in the future—ideally greater in net present value terms than the expenditure.

One reason for all this progress is that computing power has continued to improve, albeit at a somewhat slower rate than in the 1980s and 1990s. The fastest supercomputer in 2006 could perform calculations at a rate of 0.4 petaflops per second. (A petaflop is one thousand trillion floating point operations.⁴) Today, the fastest is 54.9 petaflops, almost 140 times faster. (Unfortunately for U.S. competitiveness, that computer is in China.) In 2006, ten gigabytes of data storage cost \$6. Today it's less than \$0.03.⁵ That's why our laptops can store hours of HD video—and why cloud computing has exploded.

Ten years ago, there was little experience with, much less talk of autonomous vehicles, 3D printing, drones, blockchains, deep-learning computing systems, big-data analytics, or the Internet of Things (IOT). Today these technologies are either on the market or in beta testing.

Information technology is not the only area of improvement; we also see progress in other technologies. For example, if you wanted to get your genome sequenced in 2006, it would have cost you \$12.5 million. Today, you can have it done for \$1,245.⁶

But while technology continues to improve, become more affordable, and make our lives better, we haven't been seeing the impact we would have expected in the economy. Since 2008, U.S. productivity growth sagged to just 1.2 percent per year, its lowest level since the government began reporting productivity statistics after World War II.⁷ Clearly, to quote economist Robert Solow, we are once again seeing technology “everywhere but in the productivity statistics.” This has profound implications. As Vice Chairman of the Federal Reserve Bank Stanley Fischer states, “There are few economic issues more important to our economy and others than productivity growth.”⁸

So why have we not seen the strong productivity growth we need? As explained in the recent ITIF e-book *Think Like an Enterprise: Why Nations Need Comprehensive Productivity Strategies*, there is solid research suggesting that the slowdown is not a cyclical phenomenon, nor is it because we are measuring output incorrectly. Rather, a key factor appears to be the slow growth of, or in some cases, an outright decline in both private and public investment. Indeed, there is a strong consensus among economists about the importance of investment to productivity. But the trends in the United States are troubling, to say the least.

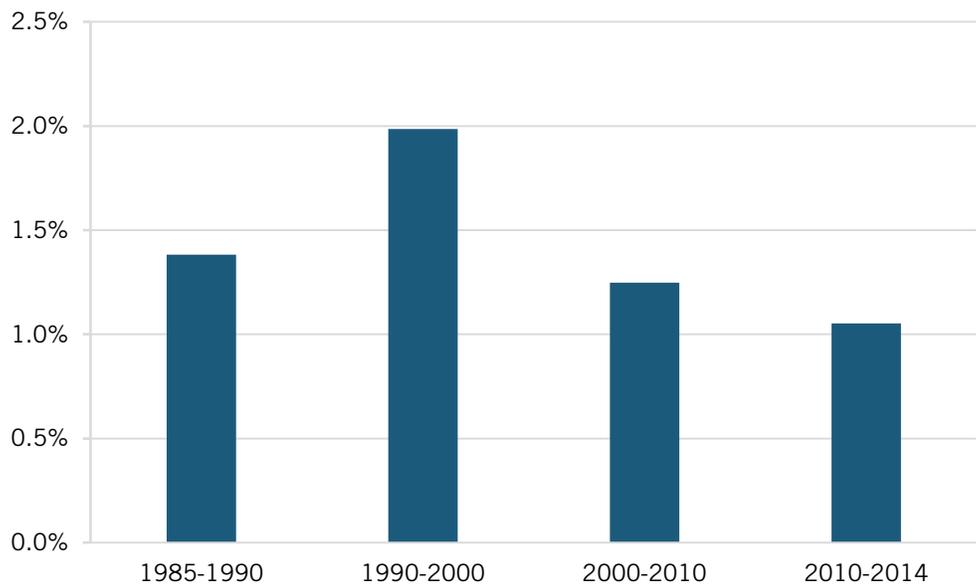
Before delving into the details, it's worth first defining investment. It is not necessarily something that companies or individuals buy and capitalize. For example, just because most people take out a mortgage to buy a home does not make it an investment. It is really just capitalized consumption, because housing, just like things such as clothing, televisions, and food, does not generate economic returns for society. But companies are investing when they pay cash for new machines. So investing is spending on something now to generate returns in the future—ideally greater in net present-value terms than the expenditure.

THE DECLINE IN PRIVATE INVESTMENT

There are three key categories of private-sector investment that drive productivity (and innovation): capital equipment, workforce training, and research and development. The trends for all three are troubling.

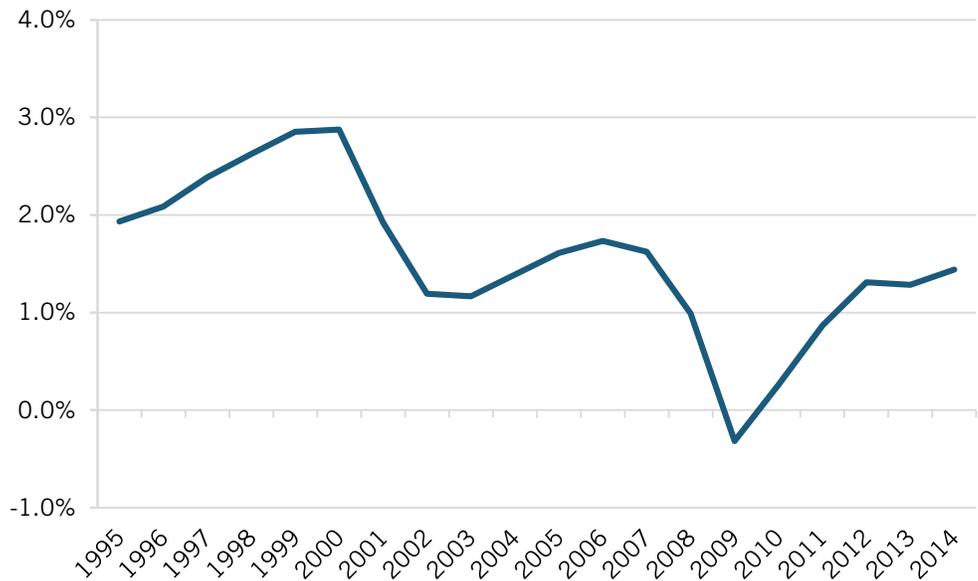
The broadest measure of investment that the Bureau of Economic Analysis tracks includes structures, equipment, and intellectual property (software, R&D, and artistic licenses). For the purposes of this discussion, we omit structures and artistic licenses, because they have little or no impact on productivity (although artistic licenses do have a significant impact on U.S. competitiveness), and we address R&D separately, thereby focusing on equipment and software. On this measure, net investment (gross investment minus depreciation) was around 2.0 percent of GDP in the 1990s, but it fell to less than 1.2 in the 2000s and then to 1.1 percent in the 2010s (figure 1). In fact, in 2009, at the depth of the Great Recession, net capital stock actually shrank as companies slashed investment (figure 2).

Figure 1: Average net private investment in equipment and software as a share of GDP.⁹



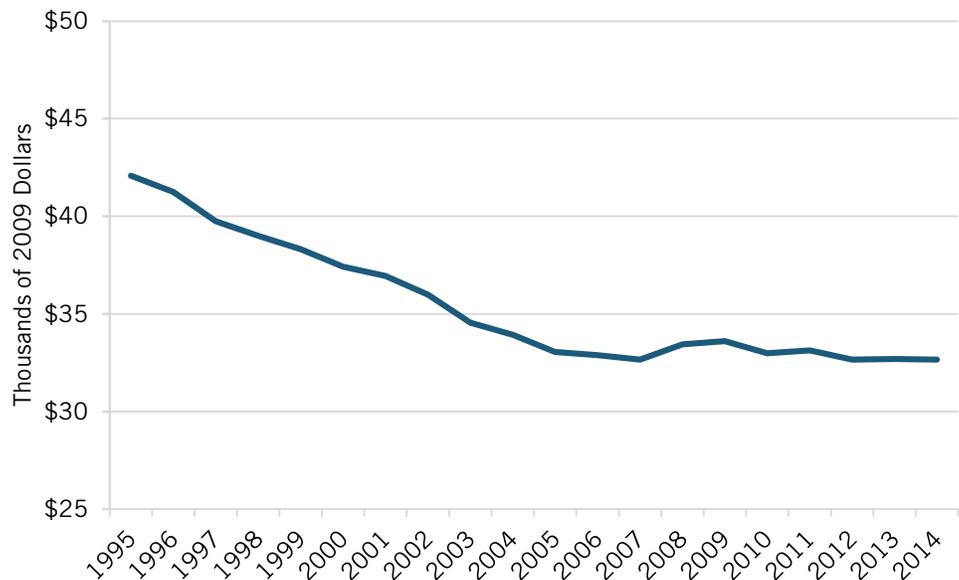
Investment has grown more slowly since the end of the Great Recession than in any other postwar recovery, according to an analysis by the Roosevelt Institute.¹⁰ The analysis found that it took six years after the worst of the recession for investment to reach its previous peak. In contrast, six years after the trough of all other post-war cycles, investment was up an average 20 percent. In the current period, we have also seen a decline in the rate of investment growth across many sectors. Compared to investment rates in 1999, investment in 2014 was 14 percent lower in the private sector overall (as a share of industry value added), 2 percent lower in manufacturing, 30 percent lower in computer and electronics manufacturing, 14 percent lower in chemical products (notwithstanding the rebound in natural gas production and the lower costs of feed stocks), 20 percent lower in the information industry, 18 percent lower in finance and insurance, and 52 percent lower in oil and gas production (notwithstanding the shale gas revolution).¹¹

Figure 2: Net investment in equipment and software as a share of GDP.¹²



In other words, companies in the United States are investing less than previously in the tools of productivity—machinery, equipment, and software. Not surprisingly then, the “tools” available to the average U.S. worker are worth less than they were 15 years ago. The stock of equipment available to workers has fallen from average value of \$42,000 in 1995 to around \$32,000 in 2014 (in constant 2009 dollars) (figure 3). With less and likely older technology at their disposal, no wonder productivity growth has slowed.

Figure 3: Stock of nonresidential equipment assets per worker.¹³

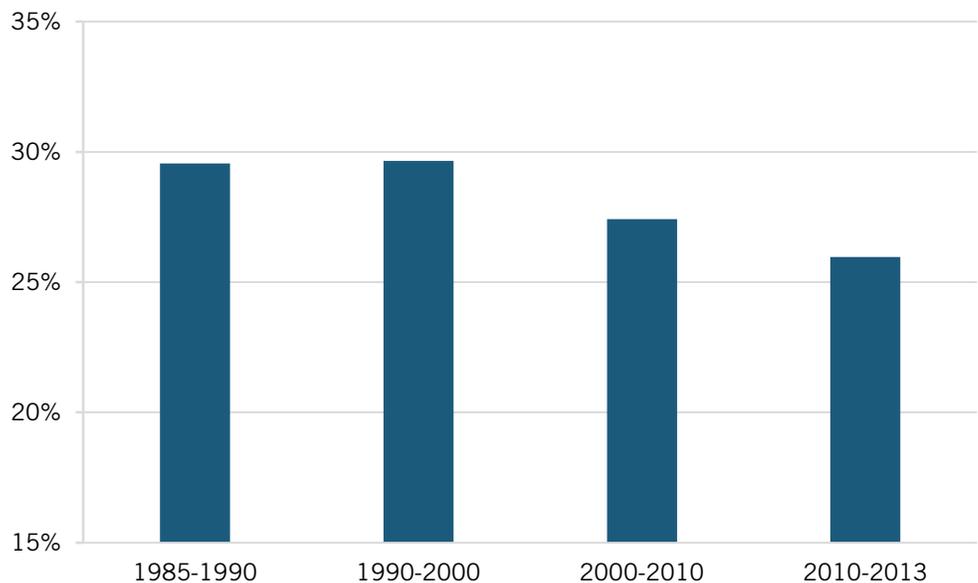


Not only have equipment assets fallen on a per-worker basis, but so too has corporate spending on training, by 30 percent as a share of GDP from 1999 to 2015.¹⁴ Again, with less training, it is harder to raise worker productivity.

We see a similar picture with “greenfield” foreign investment in the U.S. economy. This is foreign direct investment that builds something new, as opposed to investment to purchase existing U.S. facilities or companies. From 1987 to 1991, combined greenfield foreign direct investment averaged 0.167 percent of GDP. In the period from 2002 to 2007, it was down to 0.132 percent of GDP, and in 2014 (the only year measured since 2008) it fell even lower to 0.096 percent.¹⁵

The picture with regard to business spending on research and development is somewhat more mixed. On the one hand, total corporate R&D has grown steadily since 2000. But in 2013 (the latest year data was available from the National Science Foundation) it was still 0.03 percentage points lower than in 2000 as a share of GDP.¹⁶ Moreover, business investment in longer-term and riskier basic and applied research, as opposed to development, has fallen even more, from around 30 percent of total business R&D in the 1990s to approximately 26 percent today (figure 4). In other words, companies are spending relatively more on development, which overall has less positive impact on innovation than basic or applied research. One result of this could very well be fewer productivity-enhancing innovations emerging in the next decade than would otherwise be the case.

Figure 4: Average business-funded basic and applied R&D as a share of total business R&D.¹⁷

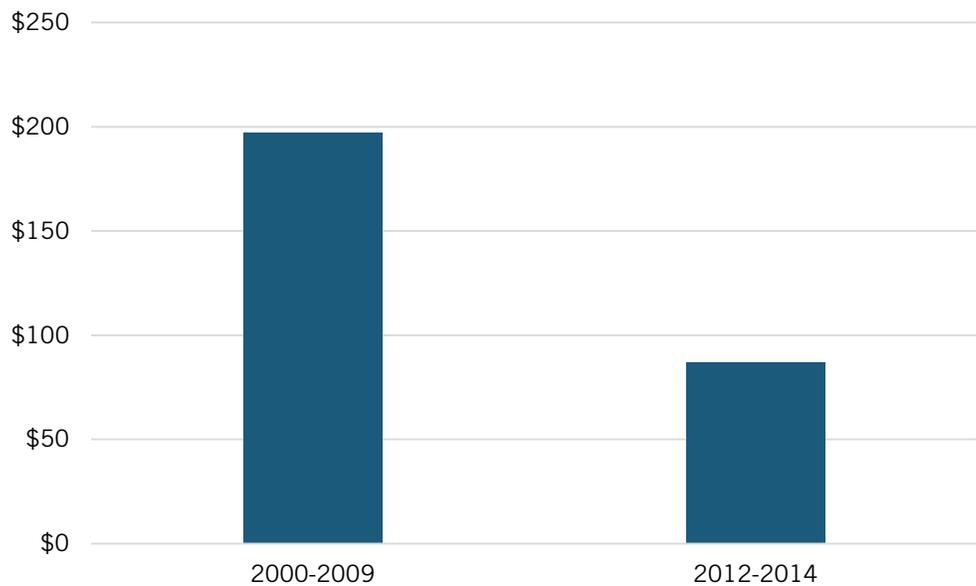


All of these weak investment trends are even more troubling because they are coming in a period when the Federal Reserve Bank has created the most favorable environment for investing in almost half a century by keeping interest rates very low.

THE DECLINE IN PUBLIC INVESTMENT

The story of private investment is troubling, but the story of public investment is even worse. In fact, annual net government investment was more than twice as high in the 2000s as it was in the years following the stimulus bump of 2010 and 2011. In the 2000s, net government investment (total investment minus depreciation) averaged \$197 billion per year; from 2012 to 2014, it was just \$88 billion in constant 2009 dollars (figure 5).¹⁸ This includes all federal (defense and non-defense), state, and local investments in structures (which include roads and bridges), equipment, and intellectual property products (which include R&D). Given that real GDP was 15 percent higher on average in the later period, the decline as a share of GDP is even greater.

Figure 5: Net public investment (billions of 2009 dollars).

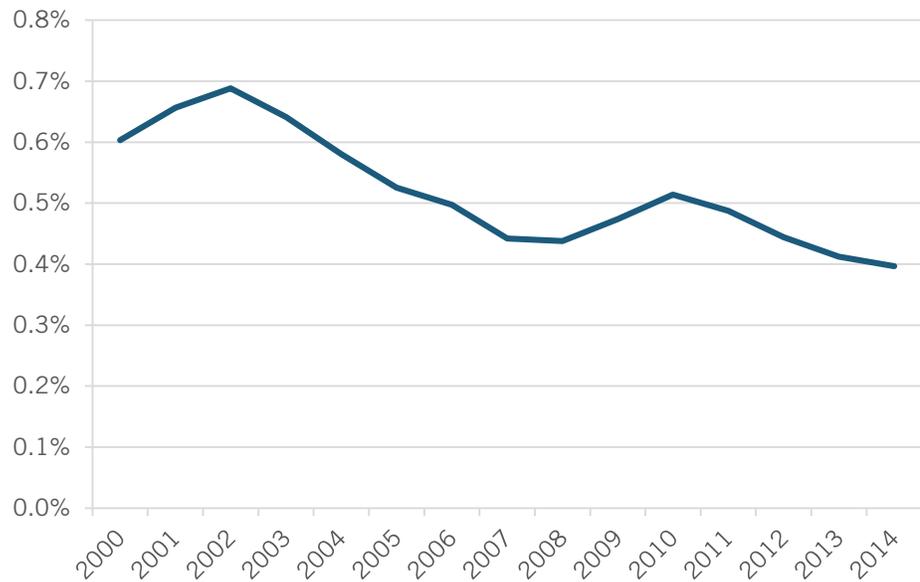


All areas have seen a decline. Let's start with government support for R&D, which has played a key role in driving many of the most important innovations of the last 60 years. This year, it will be the lowest as a share of GDP since the Russians launched Sputnik. In 2014 and 2015, it was 40 percent below what it was in the second half of the 1980s.¹⁹ To restore federal R&D to the levels it averaged in the 1980s as a share of GDP, the government would have to invest \$65 billion more per year. Studies indicate that a 1 percent increase in the R&D stock produces a 0.23 percent to 0.61 percent increase in productivity; thus, raising federal support for R&D by \$65 billion would increase productivity by between 0.4 and 1.1 percent per year—and grow the economy, by definition, the same amount.²⁰

Public (federal, state, and local) capital spending on transportation and water infrastructure has also fallen—by 7 percent, as a share of GDP, since the second half of the 1980s.²¹ To reach the levels of the late 1980s, investment would have to increase by \$12.7 billion per year. Federal investment in transportation and water infrastructure capital has fallen even more—from \$96 billion in 2002 to \$69 billion in 2014 (in constant 2014 dollars), an

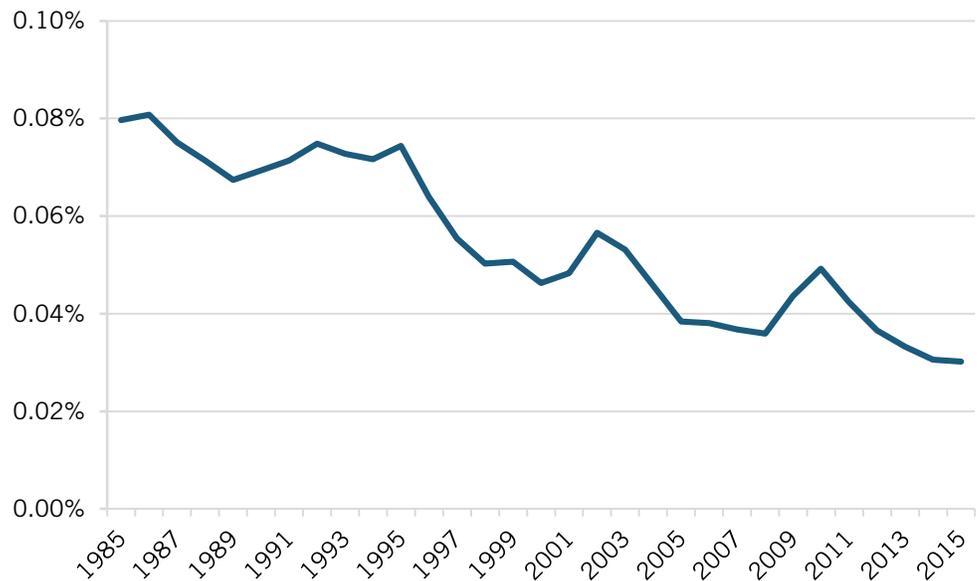
astounding 29 percent. It amounted to 0.40 percent of GDP in 2014, down from 0.69 percent in 2002 (figure 6). This is one reason why the American Society of Civil Engineers estimates that the states and federal government must invest \$1.1 trillion over the next five years simply to bring the nation’s infrastructure up to “good condition.”²² And it is why the National Surface Transportation Infrastructure Financing Commission calculated in 2008 that the federal government must invest an average of \$96 billion more than what is already being invested every year through the Highway Trust Fund to adequately maintain and improve U.S. infrastructure.²³

Figure 6: Federal investment in transportation and water infrastructure as a share of GDP.²⁴



At the same time, federal funding for employment and training has fallen by about half as a share of GDP from the mid-1980s to the present (figure 7). Furthermore, total federal investments in education—including federal grants to state and local governments as well as direct federal outlays—have declined over the past three decades. If federal investments in education continued at the same share of GDP sustained from 1967–1980, or 0.88 percent, cumulative federal investments in education since 1980 would have totaled \$878 billion more than actual investments over this period.²⁵

Figure 7: Federal expenditures on employment and training as a share of GDP.²⁶



While cutting funding for R&D, education and training, and infrastructure reduces the budget deficit and debt, it also increases the country's investment deficit and debt.

CAUSES OF FALLING INVESTMENT

So why has investment been sputtering? On one level, the answers are different for public and private investment. But on another level, as discussed below, the answers are remarkably similar.

The conventional explanation for decreased public investment is that the budget deficit and large national debt require belt-tightening. Because Congress and the president lowered taxes in the early 2000s, and because entitlement costs have increased as a growing share of the population ages above 65 and retirement benefits are indexed to wages rather than inflation, the federal deficit and debt both have ballooned. The obvious solution to most economists is to raise taxes on individuals, especially high earners, while cutting spending, especially on entitlements for elderly people. But both paths are politically difficult. Many Democrats, seniors, and powerful lobbies such as the AARP resist cutting entitlements, while many Republicans, small businesses, and voters resist raising taxes. So the path of least resistance is to cut federal discretionary spending, including on investments.

The logical problem with this path is that it does nothing to address the country's total debt, which is a combination of the budget debt and investment debt. Granted, cutting funding for R&D, education and training, and infrastructure reduces the budget deficit and debt; but it also increases the country's investment deficit and debt. As a strategy, it is a bit like that of homeowners trying to limit their debt by not spending money to repair leaky rooves. Not spending the money to fix a roof keeps a homeowner's debt from increasing; but it also lowers the future net worth of the house by reducing its net present value. As discussed below, a better alternative is to treat investment differently in federal budgeting.

The after-tax cost of investment is relatively high in the United States, partly because the U.S. corporate tax rate is the highest in the developing world while incentives for capital investment are relatively weak.

The reasons for the decline in private investment are more complicated. Some argue that capital equipment has gotten cheaper, and therefore companies naturally should be spending less on it. But inflation-adjusted or quantity-based measures of investment have fallen as well, indicating a real decline. Moreover, one would expect capital investment quantities to go up as capital equipment prices fall. Similarly, some argue that as the economy becomes less focused on manufacturing, which historically has been more capital-intensive than other sectors, we should see less capital investment. But, as noted above, capital investment rates have declined in many non-manufacturing sectors as well. Still others hold the Keynesian view that the explanation is merely cyclical—capital investment is lagging because demand is lagging. But capital investment declines predated the Great Recession, and, as noted above, they have grown more slowly than in past recoveries even as low interest rates and government deficit spending have increased demand. Finally, some argue we shouldn't worry about decline in investment from established companies, because money is flowing to shareholders who, in turn, are investing in high-tech startups. But venture capital rates as a share of GDP, while up slightly in 2014 and 2015, have largely been at the same levels since the late 1990s (not counting the big bumps in 1999, 2000, and 2001).²⁷ Moreover, the Roosevelt Institute finds that investment spending by newer corporations is lower than it was in the late 1990s.²⁸

To get a better sense of the true cause of private-investment declines, it's important to realize that private investment depends on three factors: the pre-tax benefit of the investment; the after-tax cost of the investment; and the orientation and willingness of management to invest.

The after-tax cost of investment is relatively high in the United States, partly because the U.S. corporate tax rate is the highest in the developing world, while incentives for capital investment are relatively weak. Many other nations have more generous tax incentives designed to spur investment. For example, Taiwan's Statute for Upgrading Industries provides a package of corporate tax incentives including accelerated depreciation and tax credits for investments in R&D, automation, and worker training. In Austria, firms can receive a tax credit of 6 percent for the costs of educating and training their workforce. In Malaysia, companies can depreciate general plant and equipment over six years, heavy machinery over four years, and computer and IT equipment even faster. In Canada, computer purchases are eligible for a 55 percent declining-balance capital-cost allocation rate in the first year, while in Singapore firms can in the first year expense all computers and prescribed automation equipment, including robots.²⁹ In contrast, the main comparable incentives in the United States—the modified accelerated credit recovery systems (MACRS) and bonus depreciation—provide a less generous tax incentive for companies to invest in capital equipment.

In addition, when the price of labor is high, the returns on investments in labor-saving technologies are higher. In the United States, however, an unwillingness to raise the federal minimum wage, coupled with the vast expansion in low-wage, low-skill immigration has kept labor costs low, making it less profitable for companies to substitute capital for labor.

As a report by the Migration Policy Institute says, “production techniques shift in response to less-educated immigrant labor, with employers less likely to substitute capital and/or technology for less-educated labor when more immigrants are available.”³⁰

Second, corporate governance and equity market pressures appear to lead firms to invest less in capital expenditures in an effort to boost short-term equity values. A 2004 survey found that more than 50 percent of U.S. executives would delay new investment projects to meet short-term earnings targets, even if it meant sacrificing long-term value creation.³¹ A 2013 McKinsey Quarterly survey of more than 1,000 C-suite executives and board members found that 63 percent felt the pressure to demonstrate short-term financial performance had increased over the previous five years, and 86 percent believed that using a longer time horizon to make business decisions would positively affect corporate performance.³² A 2011 paper from the Federal Reserve Bank of New York found that changes in management compensation, particularly the use of stock options linked to short-term market performance, have led to reduced investment.³³ A 2013 study by Asker, Farre-Mensa, and Ljungqvist found that public firms lagged far behind private firms in capital expenditures.³⁴ And a 2016 study by Ladika and Sautner shows that “executives with more short-term incentives spend less on long-term investment.”³⁵ As finance expert Andrew Smithers writes:

Modern incentive structures encourage managements to push up profits in the short-term at the expense of exposing their companies to greater long-term risks. This has led them to push up profit margins and reduce investment. But the fall in the cost of capital has not, as would previously have been expected, stimulated investment. This is because the perceived cost of capital to management has risen not fallen, because it is in the interests of management to spend on buy-backs rather than on new investment. As analysts’ attention to RoE [return on equity] has increased, the speed with which equipment has been scrapped is thus likely to have risen.³⁶

Or as MIT’s Clay Christenson has suggested, one way to increase return on net assets (a common financial reporting measure) is to reduce net assets.³⁷

A third factor affecting investment is the expected pre-tax rate of return from the investment, which depends in large part on technological innovation in capital-goods investment. If capital equipment and software get cheaper and better because of innovation, this should spur more investment. Innovation in capital equipment and software could drive a new wave of investment if machines yield much bigger payoffs relative to costs. This is why innovation in areas such as artificial intelligence, robotics, advanced computing, and autonomous technology (e.g., self-driving vehicles, drones, etc.) is so central to spurring the next investment boom. But while there is progress in all these areas, the technology is, for the most part, not yet at the point where IT was in the mid-1990s, when advances in desktop computing, software, and networking powered an investment rebound as companies felt they could not afford to *not* invest.

STEPS TO RESTORE PUBLIC AND PRIVATE INVESTMENT

Given the importance of investment to U.S. economic growth, what do we need to do to restore prior investment levels?

First, we need to develop a broadly shared political consensus that society has a stake in the investment decisions of industry. Some free market conservatives argue that if companies don't want to invest, then why should the rest of us second-guess them? Clearly, the narrative goes, industry is seeing something in the market that argues against investment. Indeed, investing has come to be viewed with suspicion in financial circles when harvesting can be more profitable. As *Wall Street Journal* columnist James Mackintosh writes, "We can be reasonably sure that when shareholders push companies to invest, it will eventually lead to lower profitability for everyone."³⁸ But there are two problems with this kind of argument. First, conservatives argue, often correctly, that regulatory barriers limit investment. Does it not follow that public policy should be redesigned to spur investment? And if so, then why not redesign tax and R&D policy too? Moreover, some free market conservatives overlook the fact that there are externalities to investment, meaning that, absent incentives, decisions by businesses will lead to lower social rates of return than are optimal. Indeed, a wide array of economic research has found that companies do not capture all the benefits of capital investment; many of them "spill over" to competitors, suppliers, and others. Absent pro-investment policies, companies will invest less than is optimal.

It's one thing to have a vigorous debate about the proper size of government, but we should be able to move beyond that and develop a separate consensus when it comes to public investment.

At the same time, many liberals are decidedly ambivalent or even hostile toward increased private investment, wrongly believing it comes at the expense of jobs; they thus favor policies that tilt the balance away from investing in machines and more toward hiring workers. Yet the evidence is clear that investing boosts productivity, and that enhanced productivity does not mean fewer jobs; moreover, new evidence shows that higher productivity has boosted wages.³⁹

Economists across the political spectrum should cheer when businesses invest in new capital equipment, not complain.

Second, just as we need a new consensus in support of private-sector investment, we need a new consensus supporting increased public-sector investment. It's one thing to have a vigorous debate about the proper size of government, but we should be able to move beyond that and develop a separate consensus when it comes to public investment. The problem, of course, is that many on the left do not distinguish between spending and investment—even when public expenditures are clearly just spending, such as for home-energy assistance, housing assistance, or other social programs—either because they are unconcerned about the budget deficit or because they believe spending and investment have the same Keynesian economic impact. Just as Keynes once said that the government should put Treasury notes in old bottles and bury them in abandoned mines because it would stimulate private enterprise to dig them, many liberals today argue that anything that gets public spending flowing is investment that will create jobs. In contrast, many on the right either dismiss the need for public investment or argue it is ineffective. For them, increasing

public investment requires increasing taxes, which they see as confiscation of private property. Both of these positions are wrong.

Part of developing a consensus around the need for increasing public-sector investment is developing a broadly shared understanding that while America faces a budget deficit, it also faces an investment deficit. The investment deficit is the shortfall of public investments in scientific research, education and training, infrastructure, and new technologies that are essential for maintaining our current standard of living and that provide a critical foundation for long-term economic prosperity. These investments drive economic growth by accelerating innovation and boosting productivity, yielding positive returns for the entire economy. As such, organizations focused on cutting the budget deficit, such as the Committee for a Responsible Federal Budget, need to understand that a federal budget that puts everything on the table for cuts, including true federal investment, is anything but responsible. Productive public investments will help reduce the total debt (budget and investment) and should be strengthened, while consumptive spending will add to the total debt and could be cut more justifiably.

If robots were twice as effective and half as expensive, there would likely be a significant increase in capital expenditures as more companies bought more robots to automate work.

Third, we need targeted tax policies to spur investment. The problem with relying on low interest rates as the sole driver of investment is not only that doesn't seem to work, but also that it has negative effects across the economy in terms of encouraging other kinds of borrowing (credit card, autos, housing), which, as we have seen in recent years, can create unsustainable bubbles. A better policy would be more carefully targeted just to spur investment through the tax code, either by introducing an investment tax credit or by allowing all investment in machinery and software to be expensed in the first year. To get there, we need new clarity on tax policy, with the left recognizing that the right kind of tax incentives for investment are pro-worker and right recognizing that investment incentives, such as first-year expensing are anything but "picking winners." To be sure, some tax expenditures, such as the ethanol tax credit, are wasteful and do not increase productivity or growth, while others, such as the R&D tax credit and modified accelerated credit recovery system (MACRS), encourage activities that foster productivity and innovation. Any reform to the corporate tax code should strengthen these kinds of investment incentives instead of weakening them in the pursuit of a lower statutory rate. Policymakers also can increase incentives for investment by supporting a higher federal minimum wage while limiting low-skill immigration (in contrast, high-skill immigration, especially scientists and engineers, is pro-growth).

Fourth, any national investment policy needs to include measures to counter corporate short-termism. One easy next step would be for Congress to establish a national commission to identify legislative and regulatory steps that would encourage companies to invest more for the long term. For example, such a commission might consider a proposal from the Institute of Corporate Directors to replace quarterly financial reports with less frequent updates, such as half-year results.⁴⁰

To grow steadily better, we will have to spend less and invest more, as individuals, companies, and governments.

Fifth, spurring technological innovation in capital goods will play an important role in increasing private-sector investment. For example, if robots were twice as effective and half as expensive, there likely would be a significant increase in capital expenditures as more companies bought more robots to automate work. While some of this technological improvement will come from private-sector efforts, some of it will have to come from federal support for early stage research and tax incentives. For example, Congress should increase the research and experimentation tax credit from its relatively low rate of 14 percent to at least 20 percent. (The United States now ranks 27th in R&D tax incentive generosity among 35 nations with any incentives at all.)⁴¹ The next administration should develop national research roadmaps for key automation technologies and for the technologies underlying those technologies, such as semiconductors, and significantly increase investment to accelerate their advancement.

One key technology will be robotics. Improving productivity in many functions and industries that involve moving physical things will depend on much better robotic technology. To be sure, robots are already driving productivity.⁴² But we have barely scratched the surface of their potential because of limitations in functionality and high costs. For example, robots could be developed to pick up litter and clean streets and parks. Robots could deliver food in restaurants and provide room service in hotels. Robots could operate fork lifts in warehouses—and much more. The myriad possibilities justify a significant increase in funding for robotics research. Related to robotics is artificial intelligence, which also will be critical to future productivity improvements, especially in knowledge-based work. AI tools such as IBM’s Watson are already helping doctors diagnose diseases. In the future, AI could replace at least some of the work that personal assistants now do (e.g., scheduling) and automate a range of tasks, such as insurance underwriting.

Finally, to spur robust investment in the underpinnings of U.S. economy, we need to put national interest ahead of self-interest. One key factor that explains the decline of both public and private investment in the United States appears to be a rise of a politics myopically focused on consumption and self-interest, not on investment or the national interest. While the WWII generation ran up huge deficits to pay for the war effort, it also largely paid off that debt, leaving its children a legacy of fiscal freedom along with modern infrastructure, great research facilities, and other capital stock we benefit from today. Yet the Baby Boomers and Gen Xers are doing the opposite. Today, the left rejects cutting entitlements—including for people aged 65 to 70, most of whom could work—as a way to reduce future debt, while the right rejects increasing taxes as a way to pay for needed investments. What do they have in common? A short-term, individualistic orientation: “Me, now!” As James Lincoln Collier writes in *The Rise of Selfishness in America*, “A nation in which most people cannot even occasionally put the good of the whole society above their own immediate gratification is bound to grow steadily worse.”⁴³ To grow steadily better, we will have to spend less and invest more, as individuals, companies, and governments.

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