CONGRESS OF THE UNITED STATES
CONGRESSIONAL BUDGET OFFICE

CBO

Federal Investment, 1962 to 2018

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Notes

Numbers in this document may not add up to totals because of rounding.

Unless otherwise indicated, the years referred to in this document are federal fiscal years, which run from October 1 to September 30 and are designated by the calendar year in which they end. Dollar values are expressed in 2018 dollars, adjusted to remove the effects of inflation using the gross domestic product price index of the Bureau of Economic Analysis.

Unless otherwise indicated, the term federal spending refers to outlays.

Unless otherwise indicated, values for federal investment do not include investment in higher education through student loan programs.

Starting in 2017, values for investment in research and development reflect a new definition of development. That new definition, now used by the Office of Management and Budget (OMB), better aligns with data collected by the National Science Foundation and with international standards. Development is now defined more narrowly; it does not include demonstrations of systems for a specific use, nor does it include nonexperimental work on a product or system before that product or system goes into full production. Because of the new definition, research and development outlays for defense (and any aggregate outlays in which they were included) were $25 billion lower in 2017 than they were under OMB's previous definition. Data from 2016 and earlier reflect the earlier, broader definition of development.

This report updates an earlier report, which includes detailed descriptions of the sources and methods for the exhibits that have been updated here. See Congressional Budget Office, *Federal Investment* (December 2013), www.cbo.gov/publication/44974.

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Introduction and Summary

The federal government pays for a wide range of goods and services that are expected to contribute to the economy for some years in the future. Those purchases, called investment, fall into three categories: physical capital, research and development (R&D), and education and training.[1] There are several economic rationales for federal investment. The federal government can provide public goods that the private sector and state and local governments would not provide efficiently, such as national defense and basic scientific research. Federal investment can promote long-term economic growth—as education spending does by developing a skilled workforce, as R&D spending does by prompting innovation, or as infrastructure spending does by facilitating commerce. And it can support the work of the federal government by, for instance, providing the structures and equipment necessary to perform federal activities.

In 2018, the federal government spent $492 billion on investment, representing 12 percent of federal spending and 2 percent of gross domestic product (GDP). Those shares have remained roughly stable over the past 25 years, though they reached higher levels in the early 2010s when the American Recovery and Reinvestment Act of 2009 (ARRA, Public Law 111-5) temporarily expanded funding for a number of investment programs. When ARRA spending was at its highest levels, in 2010 and 2011, federal investment approached 4 percent of GDP. Even as ARRA spending wound down in 2012, federal investment was $585 billion (in 2018 dollars), almost 20 percent higher than in 2018, and represented 15 percent of federal spending.[2]

Federal investment as a share of the budget and the economy is lower than in the 1960s. In the 1960s, federal investment represented more than 30 percent of federal spending and averaged nearly 6 percent of GDP. Nearly all federal investment is discretionary spending, which is controlled by annual appropriation acts. Federal investment has gradually declined as a proportion of discretionary spending, from roughly 50 percent in the 1960s to about 40 percent today. In addition, discretionary spending as a whole has fallen as a share of total federal spending since the 1960s. Caps on appropriations that were established by the Budget Control Act of 2011 set limits for most discretionary spending from 2012 through 2021 to amounts that were lower than they would have been if annual appropriations had grown at the rate of inflation. Subsequent legislation increased those caps, most recently for 2018 and 2019. Under current law, the caps would return to the

1. This is an update of an earlier report. See Congressional Budget Office, *Federal Investment* (December 2013), www.cbo.gov/publication/44974.

2. In this report, the Congressional Budget Office used the GDP price index to adjust dollar values to remove the effects of inflation because that approach is useful for examining changes in how budgetary resources are allocated over time. For examining the actual purchasing power of spending over time, it is more appropriate to use price indexes that adjust for changes in the prices of the specific goods and services analyzed. For example, since 2003, inflation-adjusted purchases of physical capital associated with transportation and water infrastructure decreased because the average price of relevant materials (such as asphalt, concrete, and cement) and other inputs rose more quickly than nominal spending on such physical capital. However, because prices in the economy as a whole rose at less than half of the rate of prices of infrastructure-related materials during that period, if the GDP price index is used to adjust dollar values for inflation, spending increased. See Congressional Budget Office, *Public Spending on Transportation and Water Infrastructure, 1956 to 2014* (March 2015), pp. 1–2, www.cbo.gov/publication/49910.

levels specified in the Budget Control Act for 2020 and 2021.[3]

Sixty percent of total federal investment in 2018—or $297 billion, which represented about 1.5 percent of GDP—was for purposes other than national defense. Of that nondefense investment, 41 percent provided funding for education and training, 37 percent was for physical capital, and 22 percent was for R&D. Defense activities accounted for the remaining 40 percent of federal investment and totaled $195 billion, which represented 1 percent of GDP. Three-quarters of federal investment for defense purposes was devoted to physical capital and the rest to R&D.

How Does the Federal Government Support Investment?

The federal government supports public and private investment through several different mechanisms. In many cases, it makes the investment directly, such as when the Army Corps of Engineers constructs a dam or when a federal agency purchases computer equipment from the private sector. In other cases, the federal government makes grants to individuals or to universities and other nongovernmental organizations, which then use the funds to make investments. Examples of such grants include the Federal Pell Grant Program for postsecondary education and the National Science Foundation's research grants. Those direct investments and grants account for 56 percent of nondefense investment, or $165 billion.

The federal government also invests through grants to state and local governments, which in 2018 represented 44 percent of its nondefense investment, or $132 billion. Grants accounted for about two-thirds of federal investment in nondefense physical capital and for nearly half of federal investment in education and training. State and local governments often have some latitude in determining how to spend the grant funds. Many federal grants require state and local governments to spend their own funds as well.

This report focuses on investment that the federal government makes either directly or through grants. However, the federal government also supports investment in other ways. One is through tax expenditures—credits or deductions that reduce the federal income tax liabilities of individuals and firms as a result of certain investments that they make or finance. Those credits or deductions can reduce the cost of investment for state and local governments as well. Defined narrowly, tax expenditures that support investment amounted to $199 billion in 2018.[4] Of that sum, $143 billion supported investment in physical capital, mostly by excluding from taxable income the interest on state and local government bonds and by allowing tax filers to accelerate the depreciation of equipment and therefore to take larger tax deductions earlier in the equipment's life. An additional $43 billion supported investment in education and training, mostly through tax credits and deductions focused on higher education. The remaining $13 billion supported investment in R&D. About three-quarters of that amount was the cost of a tax credit for increasing research activities, which primarily benefits corporations; and about one-seventh was the cost of allowing firms to deduct expenses for research and experimentation immediately. The remainder was the cost of a research tax credit to develop orphan drugs, medications that would treat rare medical conditions.

Other federal policies can also affect private investment. Tax policies, including individual and corporate income tax rates, can restrain or encourage economic activities by changing their relative after-tax prices. Regulatory policies influence investment by prohibiting or constraining certain activities, such as polluting the air, or by necessitating others, such as complying with federal safety standards. And federal deficits (and surpluses)

3. For more details on the caps on appropriations, see Congressional Budget Office, *The Budget and Economic Outlook: 2018 to 2028* (April 2018), p. 55, www.cbo.gov/publication/53651. For CBO's most recent budget projections, see Congressional Budget Office, *Updated Budget Projections: 2019 to 2029* (May 2019), www.cbo.gov/publication/55151.

4. In calculating that figure, CBO generally included credits or deductions for private investment in 2018 (for example, the deduction for higher education expenses) as well as for investments made in previous years (for example, the exclusion from taxable income of interest on public-purpose state and local government bonds). The figure does not include a number of housing-related tax expenditures, including $68 billion for the deduction for mortgage interest on owner-occupied residences and the exclusion of capital gains on sales of principal residences. Also not included is $166 billion in tax expenditures for reduced tax rates on dividends and long-term capital gains and for the exclusion of capital gains at death. Those tax expenditures are estimated in Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2018–2022,* JCX-81-18 (October 2018), www.jct.gov/publications.html?func=select&id=5.

influence the amount of funds available for private investment and the cost of those funds. For example, when the federal government issues bonds to finance its deficits, the funds that investors use to buy those bonds are no longer available to finance private investment. In response to the increased federal borrowing, bond buyers may also demand higher interest rates from the government, which would generally raise interest rates throughout the economy and make it more expensive for people and firms to borrow for investment purposes.

What Does the Federal Government Invest In?

Observers define investment in different ways. In the view of the Congressional Budget Office and consistent with the categories of the Office of Management and Budget (OMB), the federal government invests in three broad areas:[5]

- Physical capital includes structures, such as government buildings, transportation infrastructure, and water and power projects; major equipment, such as computers, machinery, and vehicles; and software. For spending on physical capital to qualify as investment, the physical capital must have an estimated useful life of at least two years. Most federal investment in physical capital for defense purposes is for purchases of major equipment, such as ships and aircraft. Investment in physical capital for nondefense purposes, by contrast, is dominated by transportation spending, which provides infrastructure that contributes to the functioning of the economy.

- Research and development has three components: basic research, which seeks to discover scientific principles; applied research, which attempts to translate those discoveries into practical applications; and the development of new products and technology. Federal R&D spending supports a wide variety of work in government laboratories, universities, and the private sector, including health research studies, basic research in physics and chemistry, and the development of weapon systems. R&D investment builds the stock of knowledge that helps expand the economy over time, and the academic research that it funds is essential to the training of future generations of scientists. Most of the R&D spending by the federal government that supports defense is focused on development, rather than on basic or applied research.

- Education and training includes early childhood, elementary, secondary, and postsecondary education, which help produce a skilled, capable workforce that contributes to the country's productivity. It also includes job training and vocational training for veterans and others, which likewise promote a productive workforce. Federal spending on education and training is thus an investment in the nation's human capital.

In some cases, it is difficult to determine what qualifies as federal investment and what does not. For example, although this report regards spending on instruction and on the construction of school buildings as investment, it does not regard spending on health care and school lunch programs for children as investment, because those goods and services are promptly consumed. Yet keeping children healthy and nourished improves their ability to learn and produces a healthier and more capable workforce in the future.

The Bureau of Economic Analysis (BEA) includes in its calculation of federal investment most of what CBO identifies here, but omits spending on education. The investments in physical assets and R&D presented in this report are roughly comparable to two line items in BEA's tables of the national income and product accounts (NIPAs). The first line item is gross federal government investment, which includes investments made directly by the federal government in structures, equipment, software, and R&D. The second line item is capital transfer payments, which are mostly grants to state and local governments for the purpose of investing in physical capital or R&D.[6] R&D spending was first included

5. For OMB's discussion of federal investment, see Office of Management and Budget, *Budget of the United States Government, Fiscal Year 2020: Analytical Perspectives* (March 2019), Chapter 20, www.whitehouse.gov/omb/analytical-perspectives/. OMB has treated physical capital, research and development, and education and training as investment since the publication of the President's budget for 1996.

6. For fiscal year 2018, BEA's total for those two line items was slightly smaller than the amounts reported here for investment in physical assets and R&D. Some differences remain among the measures of investment used by CBO, BEA, and OMB. For more information, see Bureau of Economic Analysis, *NIPA Handbook: Concepts and Methods of the U.S. National Income and Product Accounts* (updated May 2019), Chapter 9, www.bea.gov/resources/methodologies/nipa-handbook; Congressional Budget Office, *CBO's Projections of Federal Receipts and Expenditures in the National Income and Product Accounts* (July 2018),www.cbo.gov/publication/54194; and Office of Management and Budget, *Preparation, Submission, and Execution of the Budget*, Circular A-11 (June 2018), Section 84, https://go.usa.gov/xyChZ.

in BEA's definition of investment in July 2013, when the NIPAs were revised to count expenditures on intellectual property, including R&D, as investment.

How Does the Federal Government Account for Investment?

For accounting purposes, the federal budget treats most investment the same way it treats other spending: on a cash basis. That is, expenditures on investment are recorded as they are made, just as other expenditures are recorded as they are made and revenues are recorded as they are received. Two important advantages of that approach are that transactions are readily verifiable and that the sum of all transactions provides a close approximation of the government's annual cash deficit or surplus. However, accounting on a cash basis makes investment appear expensive because many of the benefits associated with investment do not arrive until well after the initial investment has been made. For example, building a highway takes a large initial investment, but its benefits are delayed and then last for decades. By contrast, the benefits of other federal spending occur closer to the actual expenditure—for example, when air traffic controllers safely direct flights. Therefore, the current budget system may provide incomplete information to policymakers as they decide how to divide federal resources between investment and competing priorities.

Some policymakers have proposed creating a capital budget for investment that would allocate current capital costs to the future, spreading them over the period when an investment's benefits would occur. That approach, which relies more on accrual-based accounting than on cash-based accounting, would be similar to the one used in the private sector.[7]

Adopting a capital budget for investments would not be likely to have a noticeable effect on the federal budget balance, because even though the cost of current investments would be spread over future years, the federal budget would also have to show the depreciation of investments made in previous years. Nevertheless, the proponents of a capital budget argue that it would better align the timing of costs with the potential benefits of investment.

Aligning the timing of capital costs with an investment's benefits, however, could make such a budget more complex and less transparent in several ways:

- The budget process would become sensitive to small changes in assumptions about the depreciation rates of assets within the capital budget and about how those rates should be adjusted over time to account for inflation and for changes in the assets' replacement cost. A system in which those valuations were not made transparently could encourage manipulation. And it is likely that no depreciation schedule would perfectly track changes in the economic value of an asset.
- Because so much government spending could be viewed as providing benefits over an extended period, it would be difficult to determine what to include in the capital budget. An overly narrow focus would, by leaving some investments out of the capital budget, make them appear relatively expensive and therefore less desirable. An overly broad focus could turn the capital budget into a device for understating the cost of federal spending. The capital budgeting process could lead proponents of particular programs to try to have them classified as capital spending to lower their current cost and to advocate for longer depreciation periods.
- Policymakers would have to decide whether to include within the capital budget assets that the federal government helps fund but does not own. Roads, airports, and mass transit systems, for example, are often paid for in part by the federal government and in part by the state and local governments or independent authorities that own them. Federal investments in those assets could be excluded from the capital budget because the federal government does not own them. However, excluding those investments would make them appear expensive relative to other federal investments that were included in the capital budget.

Although the federal budget does not use capital budgeting, it treats a small amount of investment—investment that occurs through credit programs—on an accrual basis, recording the estimated present value of credit programs' expenses and related receipts when the legal obligation is

7. See Congressional Budget Office, *Cash and Accrual Measures in Federal Budgeting* (January 2018), www.cbo.gov/publication/53461; and *Capital Budgeting* (May 2008), www.cbo.gov/publication/41689.

first made rather than when the subsequent cash transactions occur.[8] Specifically, the Federal Credit Reform Act of 1990 (FCRA) prescribes procedures to estimate the present value of direct loans and loan guarantees to record in the federal budget.

An alternative way to estimate the budgetary cost of credit programs, which is also an example of accrual accounting, is called the fair-value approach. Fair-value estimates account for the market value of the government's obligations and reflect the risks of those obligations for taxpayers. The main difference between FCRA and fair-value measures involves their treatment of market risk (sometimes called systemic risk or nondiversifiable risk), which is the risk that an overall market will decline. Most of the risk associated with financial investments can be avoided by having a diverse portfolio of investments; however, market risk remains even after a portfolio has been diversified as much as possible. It arises from shifts in macroeconomic conditions, such as productivity and employment, and from changes in expectations about future macroeconomic conditions. The government is exposed to market risk through credit programs because, when the economy is weak, borrowers default on their loans more frequently, and recoveries from borrowers are lower. With federal credit programs, the associated market risk of those obligations is effectively passed along to taxpayers, who, as investors, would view that risk as having a cost. In CBO's view, fair-value estimates are a more comprehensive measure than FCRA estimates of the costs of federal credit assistance and can help lawmakers better understand the advantages and drawbacks of specific policies.

8. A present value is a single number that expresses a flow of revenues or outlays over time in terms of an equivalent lump sum received or paid at a specific time.

What Are the Benefits of Federal Investment?

Most federal investment for nondefense purposes contributes to the economy on an ongoing basis by improving the private sector's ability to invent, produce, and distribute goods and services. A similar effect is expected from the small portion of defense investment that goes to basic and applied research. Most defense investment contributes to the development and production of weapon systems and other defense goods and is often thought to be less applicable to innovation in commercial or civilian products (notwithstanding some prominent technological advances, such as the integrated circuit and the Global Positioning System, that resulted from defense R&D and defense agencies' subsequent procurement of those technologies).

Federal nondefense investment can contribute to private-sector productivity in various ways. Without public highways, the cost to the trucking industry of delivering goods would be much higher; if the Internet had not initially been developed through government R&D, whole segments of the economy would not exist; if not for receiving a public education (funded in part by federal spending), many workers would have lower wages than they do. Not all federal investments enhance productivity. For example, some investments may duplicate other efforts or divert federal resources from more productive projects.

In CBO's view, the government has made higher productivity possible by making investments that the private sector would not have made on its own or would have made in smaller amounts than their broad public benefits would justify. The result of that higher productivity is higher private-sector returns. However, the size and nature of those returns are subject to considerable uncertainty, and some of the factors that contribute to that uncertainty are important considerations for policymakers facing decisions about how—and how much—the federal government should invest:

- It can be difficult to know which outcomes to attribute to which investments. Scientific and technological discoveries often build on prior work, making it hard to determine how great a share of a new product to attribute to a particular earlier investment. Similarly, workers' skills are the product of education funded not only by the federal government but also by state and local governments, the private sector, and the workers and their families.

- Realizing the benefits of federal investment may take many years, and the timing varies for different types of investment. A new highway can improve transportation as soon as it is built, but it may take longer to realize the benefits of basic research or elementary education—which may also complicate the already difficult task of identifying those benefits.

- The benefits of federal investment are unlikely to be distributed evenly. Firms located near highways will probably enjoy greater returns

from those highways than will firms located farther away. Recipients of federal grants for R&D may acquire patents based on their work; though products and innovations based on those patents may benefit consumers, they may also earn returns for the patent owners that are not shared with the country as a whole.

- Federal investment may discourage investment by private entities or by state and local governments by raising the price of investment goods such as machinery and other materials. If that happens, and if the discouraged investment would have had positive economic returns, then the net increase in output resulting from federal investment will be lower. Furthermore, state and local governments may use federal spending to fund investments that they would otherwise have made with their own funds. (In some cases, however, federal spending on investment may increase state and local investment, particularly when grant programs require state and local governments to invest as well.)

- Changes in federal investment may have different effects on private-sector productivity depending on the nature of the changes. Increases and decreases in federal investment may have asymmetric effects; changes in productivity may also be sensitive to the size of federal investments.

Acknowledging those sources of uncertainty, CBO uses a range of effects on output when estimating the effect of federal nondefense investment on the private sector. At the high end, CBO estimates that federal investment yields the same net increase in output in the long run as the average effect resulting from completed private-sector projects. At the low end, CBO estimates that federal investment results in no increase in overall economic activity—that is, has no net effect on future private-sector output. The actual effect on output from a particular investment could lie outside that range; the project might decrease private output or, alternatively, yield a greater overall increase than investment completed by the private sector.[9]

Sometimes, policymakers may support investments not to achieve the largest expected economic returns but to accomplish other federal goals, such as defending the country or reducing inequities. At other times, the federal government may rely on policies other than investment to reach particular ends. For example, instead of investing to expand capacity on busy highways, the federal government might encourage state and local authorities to manage the high demand with congestion pricing—that is, charging drivers higher tolls at busy times and places. Even if an investment's benefits would have exceeded its cost, the alternative policy may produce comparable benefits at a lower cost, thus allowing policymakers to find other uses for the funds that would have paid for the investment.

9. Congressional Budget Office, "Estimating the Long-Term Effects of Federal R&D Spending: CBO's Current Approach and Research Needs," *CBO Blog* (June 2018), www.cbo.gov/publication/54089; "How CBO Analyzes the Economic Effects of Changes in Federal Subsidies for Education and Job Training," *CBO Blog* (May 2017), www.cbo.gov/publication/52361; and *The Macroeconomic and Budgetary Effects of Federal Investment* (June 2016), www.cbo.gov/publication/51628.

Federal Investment

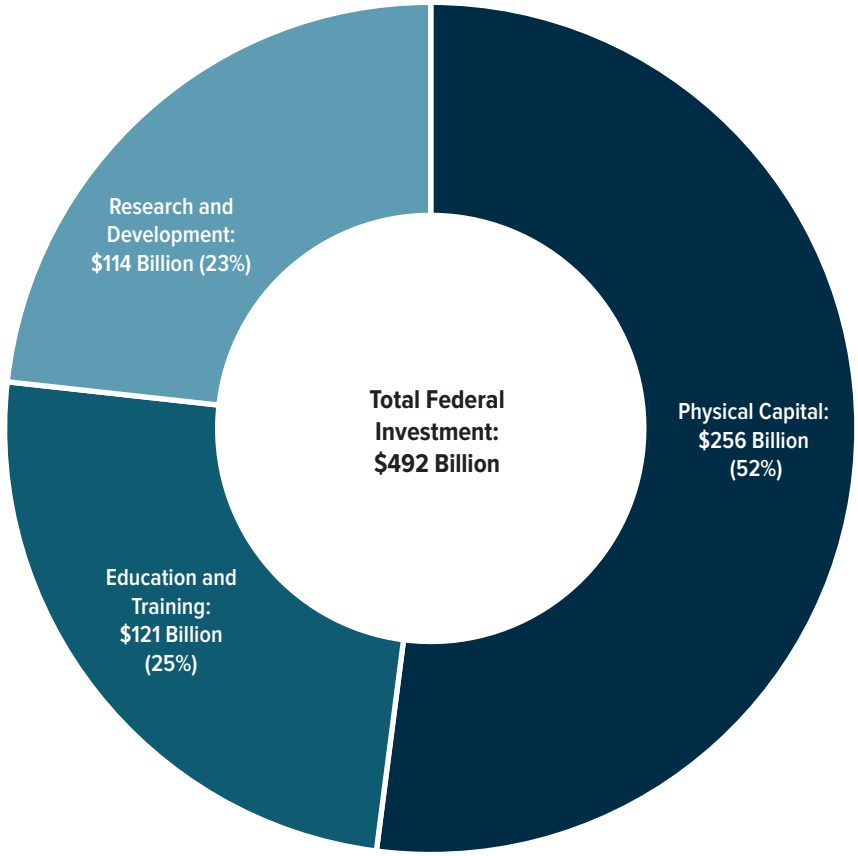
Federal spending to support investment totaled $492 billion in 2018. Just over half of that total was spent on physical capital, one-quarter on education and training, and about one-quarter on research and development.

Sixty percent of federal investment was for nondefense purposes and 40 percent was for defense. Nondefense investment in physical capital was dominated by transportation spending; such investment in R&D went primarily to health-related spending; and education and training investment was dominated by elementary, secondary, and higher education. Defense investment in physical capital largely went to purchases of major equipment, such as ships and aircraft, and defense investment in R&D went mostly to the development of weapon systems.

Almost all investment is from discretionary funding. In inflation-adjusted dollars, federal investment for nondefense purposes has risen over time, but it generally has not risen in relation to the size of the economy. Defense investment, both in inflation-adjusted dollars and as a share of the economy, has increased and fallen in concert with the country's international conflicts.

Exhibit 1.

Federal Investment, 2018



Source: Congressional Budget Office, using data from the Office of Management and Budget and the American Public Transportation Association.

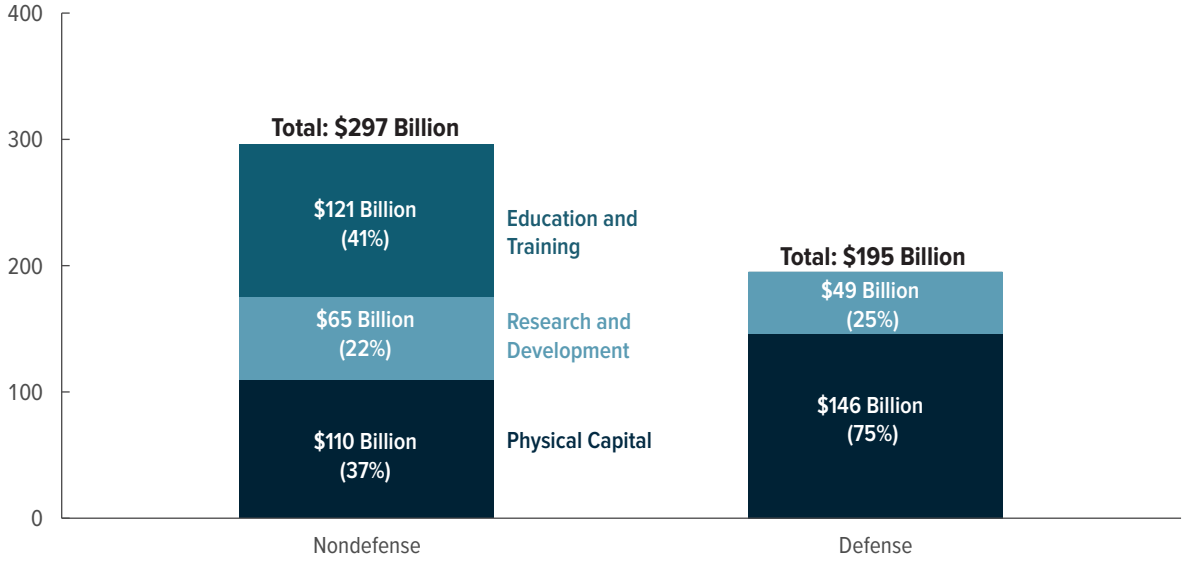
Federal spending to support investment totaled $492 billion in 2018. Slightly more than half of those funds, $256 billion, were spent on physical capital, which includes structures (such as government buildings, transportation infrastructure, and water and power projects), major equipment (such as computers, machinery, and vehicles), and software. Federal investment in physical capital for nondefense purposes is dominated by transportation spending, and such investment for defense purposes is mostly for purchases of major equipment, such as ships and aircraft. (For spending on physical capital to qualify as investment, the physical capital must have an estimated useful life of at least two years.)

Education and training accounted for one-quarter of federal investment, or $121 billion, in 2018. Investment in education and training helps to develop a skilled, capable workforce. That $121 billion was dedicated primarily to support for higher education, mainly through grants to individual students, and to elementary and secondary education, mostly through grants to state and local governments. (This exhibit and others in this report exclude investment in higher education through student loan programs unless otherwise indicated.)

The remaining federal investment of $114 billion, just under one-quarter of the total in 2018, was spent on research and development (R&D). R&D includes basic research, which seeks to expand knowledge without regard to commercial application; applied research, which attempts to link that understanding to some practical purpose; and the development of new products and services. Federal R&D spending for nondefense purposes largely addresses health-related issues; most defense-related R&D spending goes to the development of weapon systems. ◆

Exhibit 2.

Federal Nondefense and Defense Investment, 2018



Source: Congressional Budget Office, using data from the Office of Management and Budget and the American Public Transportation Association.

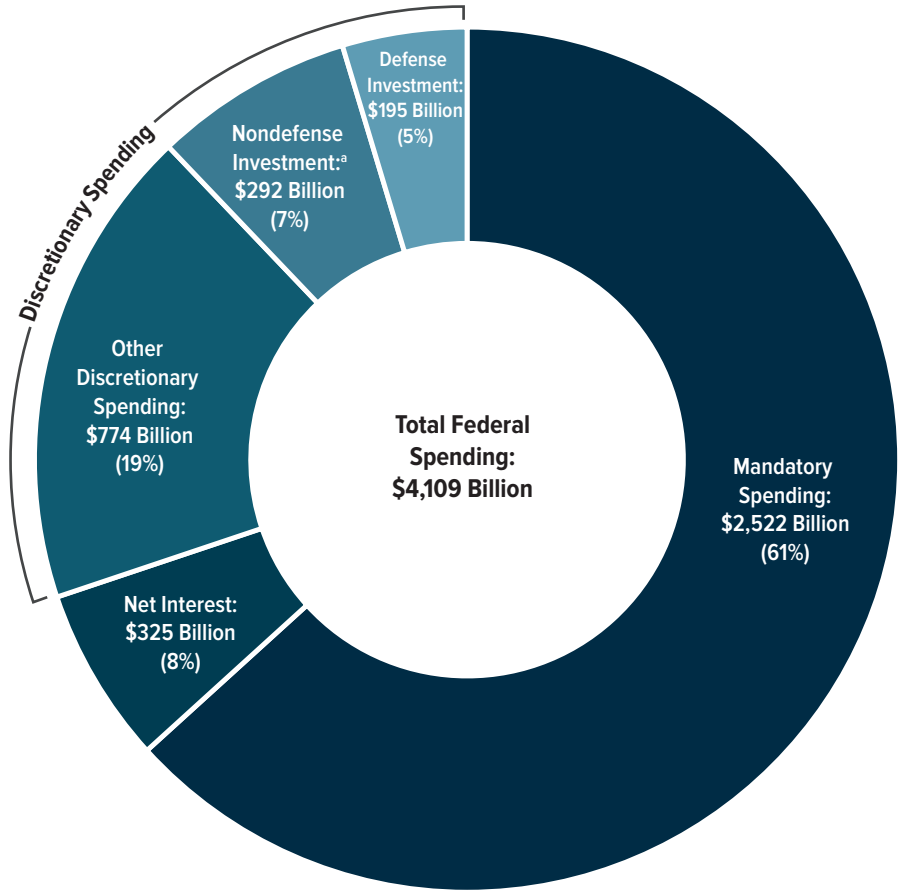
Federal investment for nondefense purposes totaled $297 billion in 2018. About 40 percent of that sum was spent on education and training, such as support for postsecondary institutions and veterans, and about 40 percent was spent on physical capital, such as highways and water infrastructure. The remainder, about 20 percent, was directed toward research and development (R&D), such as research about human health. Nondefense investment typically encourages economic growth.

Spending on defense-related investment in 2018 totaled $195 billion. Three-quarters of that amount was spent on physical capital, such as weapons and equipment. The remainder was spent on R&D, mostly on the development of weapon systems. The primary purpose of defense-related investment is not to promote economic growth but to protect the country, though some federal investments in R&D for defense eventually result in technologies that are used in commercial applications.

The Department of Defense also spent money on education and training. Much of that money went to train service members and employees to do their jobs, and so did not constitute investment spending as defined by the Office of Management and Budget (OMB). However, more than $10 billion went to the military academies, the education of service members' children, and certain specialized training—all of which aligns more closely with the Congressional Budget Office's definition of investment. That spending is not included in this report because the Department of Defense reported it as obligational authority, which is not consistent with the outlay data reported by OMB. ◆

Exhibit 3.

Federal Investment as a Share of Total Federal Spending, 2018



Source: Congressional Budget Office, using data from the Office of Management and Budget and the American Public Transportation Association.

Mandatory spending is generally governed by statutory criteria and is not normally constrained by the appropriation process. It is primarily for benefit programs for which the Congress sets eligibility rules and benefit formulas. Discretionary spending is controlled by lawmakers through annual appropriations. Net interest is the sum of the government's interest payments on debt held by the public, offset by interest income that the government receives.

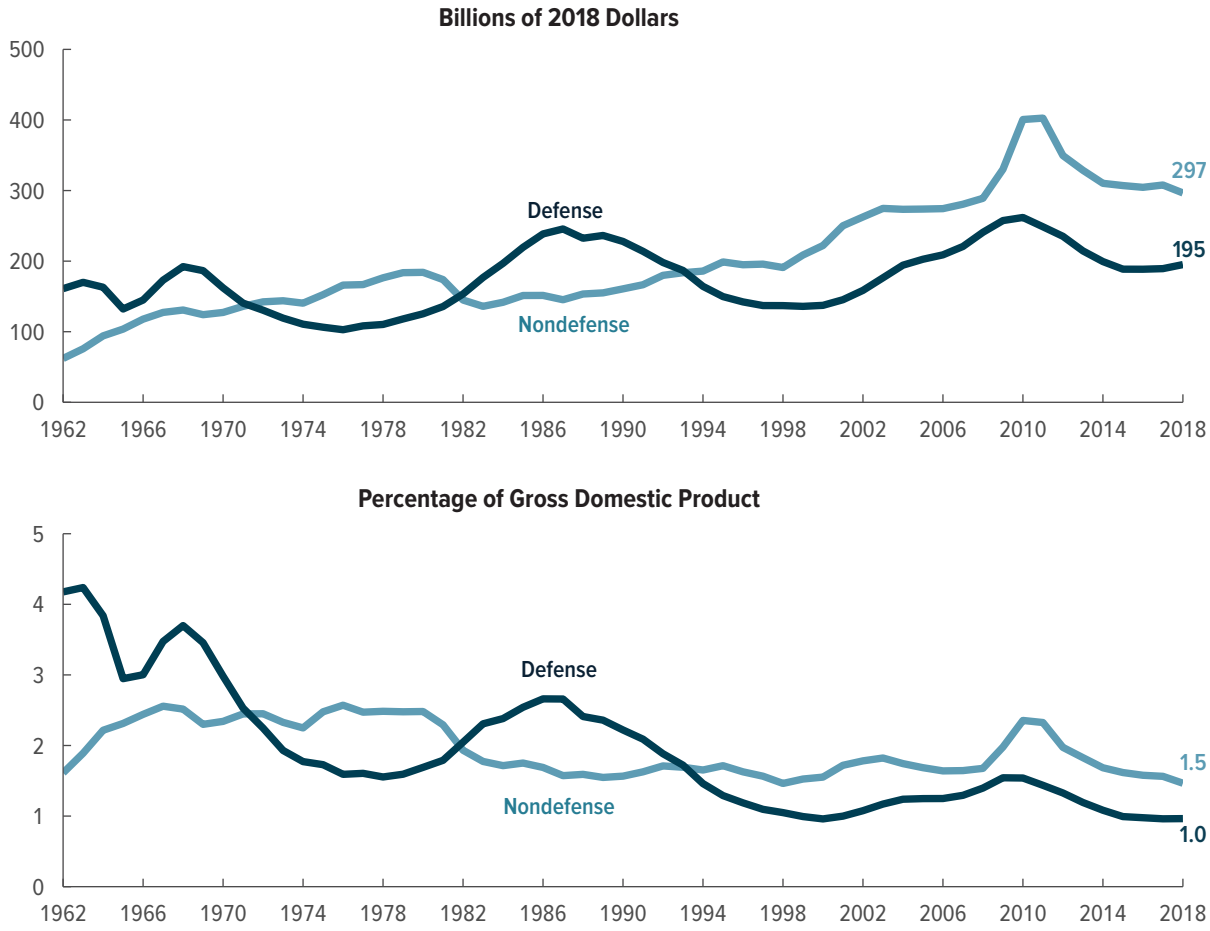
a. As shown in this exhibit, discretionary nondefense spending on federal investment was $292 billion. Exhibit 2 shows that *total* nondefense spending on federal investment was $297 billion. Two factors explain the difference. First, the $292 billion does not include mandatory spending of $6 billion on Pell grants. Second, the $292 billion includes $2 billion in discretionary spending on investment in higher education through student loan programs.

In 2018, investment accounted for 12 percent of the federal government's $4 trillion in total spending. Almost all of the investment was discretionary funding, meaning that it was controlled by lawmakers through annual appropriations. Discretionary investment accounted for 39 percent of discretionary spending, with $292 billion going for nondefense purposes and $195 billion for defense purposes.

A very small portion of federal investment was mandatory spending, primarily for benefit programs. (Mandatory spending is generally governed by statutory criteria and is not normally constrained by the appropriation process. Lawmakers determine eligibility for benefit programs, and spending each year is determined by the number of people who participate and the amount of benefits they receive.) Mandatory spending in 2018 was $2,522 billion. That included a share of investment from two programs that operate with both mandatory and discretionary spending: the Federal Pell Grant Program ($6 billion) and the federal student loan program ($12 billion in savings, under the rules established by the Federal Credit Reform Act of 1990). The loan program's effect on the federal budget depends in part on the difference between the interest rate paid by borrowers from that program and the average rate at which the Treasury borrows money; in 2018, as in some previous years, that difference was large, and mandatory investment for the program yielded savings for the federal government. (Whether the program generates costs or savings under budget accounting rules also depends on the extent of loan defaults and recoveries.) The investment in Pell grants is included in total federal investment in other exhibits, but the investment in student loans is not. ◆

Exhibit 4.

Federal Nondefense and Defense Investment, 1962 to 2018



Source: Congressional Budget Office, using data from the Office of Management and Budget, the American Public Transportation Association, and the Bureau of Economic Analysis.

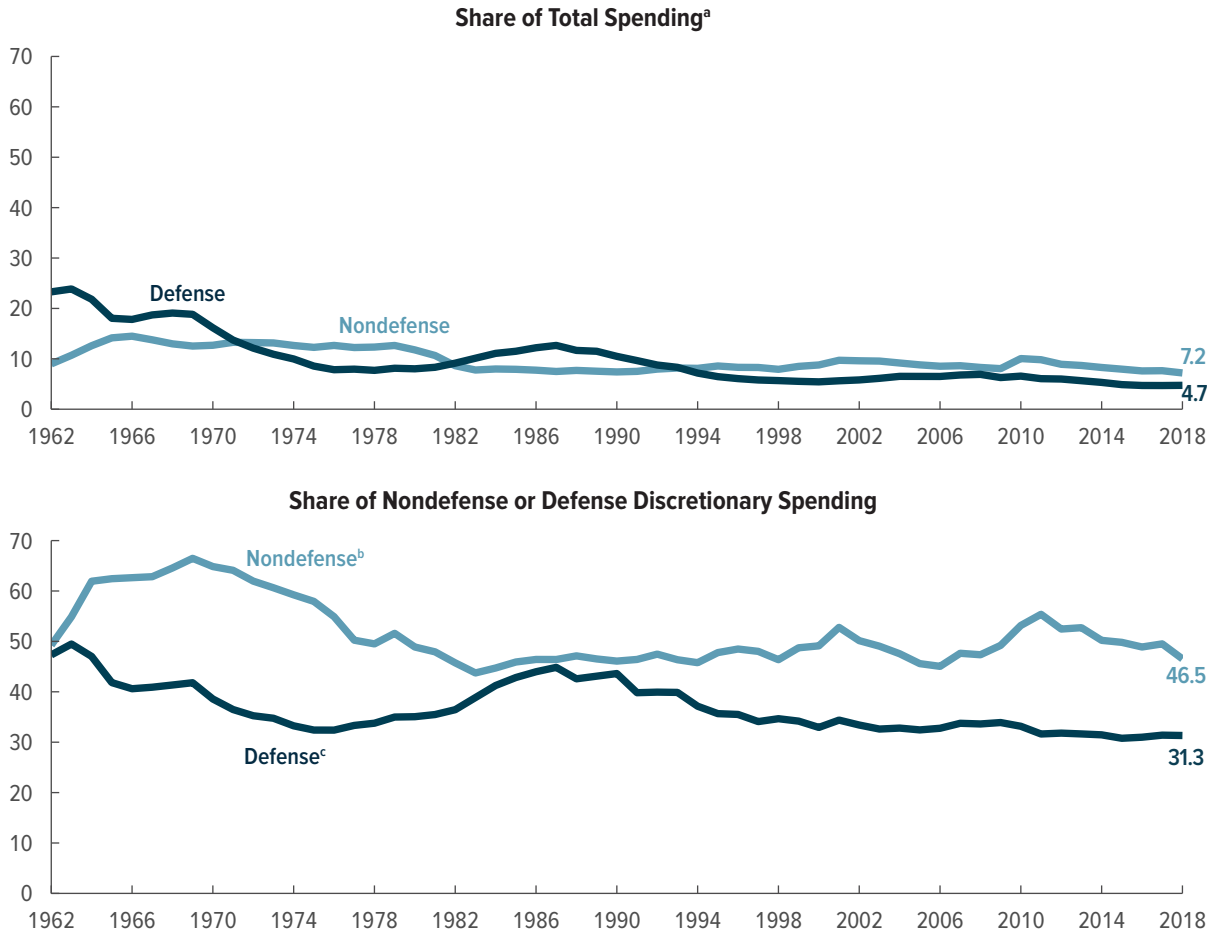
In inflation-adjusted dollars, federal investment for nondefense purposes has risen over time, though there was a notable decline in the early 1980s and another in 2012, as the temporary spending increases of the American Recovery and Reinvestment Act of 2009 (ARRA) receded. Relative to the size of the economy, however, federal investment for nondefense purposes has generally not risen. It averaged 2.4 percent of gross domestic product (GDP) in the 1970s, declined to an average of 1.6 percent during the second half of the 1980s, and remained roughly steady until it rose temporarily in 2009, in large part because of ARRA.

Defense investment has tracked the course of the country's international conflicts, both in inflation-adjusted dollars and as a share of the economy. It averaged 3.6 percent of GDP in the 1960s because of spending for the Vietnam War, declined in the 1970s, and then climbed to 2.7 percent in 1986, as the Cold War intensified during the military buildup of the 1980s. The decline thereafter was reversed following the terrorist attacks of September 11, 2001. Following the end of the Iraq War in 2011, defense investment declined as a percentage of GDP; by 2018 it was again at the same share as in 2000. ◆

Exhibit 5.

Federal Nondefense and Defense Investment Relative to the Budget, 1962 to 2018

Percent



Source: Congressional Budget Office, using data from the Office of Management and Budget and the American Public Transportation Association.

Only a very small portion of federal investment takes place through mandatory spending.

a. Includes discretionary spending, mandatory spending, and net interest.

b. Indicates nondefense investment as a share of total discretionary spending for nondefense purposes.

c. Indicates defense investment as a share of total discretionary spending for defense purposes.

Total federal investment for both nondefense and defense purposes declined as a share of total federal spending, from about 30 percent in the 1960s to about 15 percent in the past decade. Most of that decline had occurred by the early 1980s; during the 35 years since, nondefense and (to a lesser extent) defense investment have both been a fairly consistent percentage of total spending.

Almost all federal investment takes the form of discretionary spending, which is determined by annual appropriations. Nondefense investment peaked at more than 65 percent of all discretionary nondefense spending in the late 1960s, when the federal government spent substantial amounts on the space program and the development of the interstate highway system. During the 1970s, that share declined to about 50 percent, and it mostly ranged between 45 percent and 55 percent thereafter.

Defense investment rose to about 50 percent of all discretionary defense spending during the Vietnam War and to about 45 percent near the end of the Cold War. Since then, that share has declined, standing at just over 30 percent in 2018. ◆

Federal Nondefense Investment

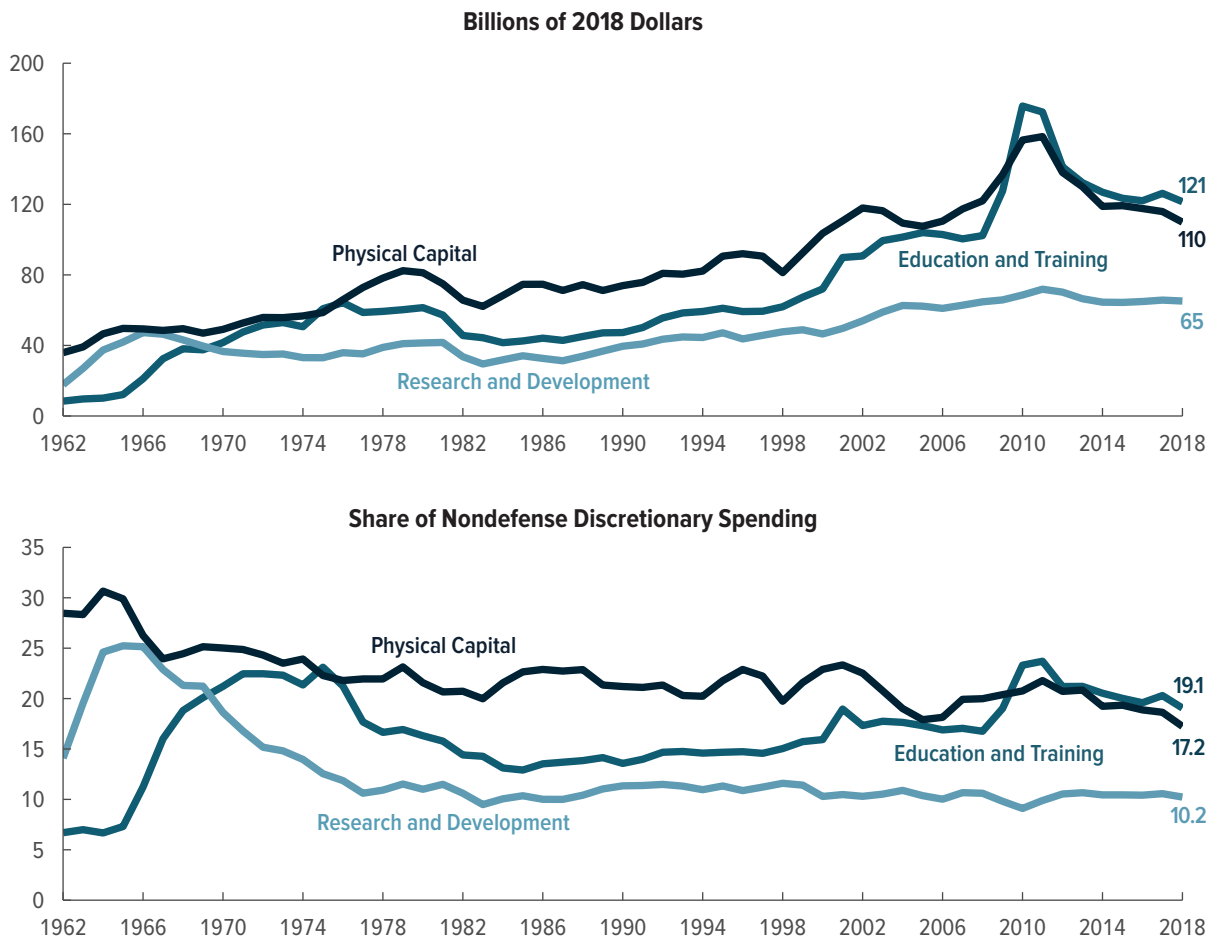
From the early 1960s to the late 2000s, the federal government dedicated the largest share of its nondefense investment to physical capital. Since 2010, however, the federal government's investment in education and training has exceeded that for physical capital. In particular, in 2010 and 2011, federal spending for education and training was boosted by large spending increases for primary, secondary, and vocational education associated with the American Recovery and Reinvestment Act of 2009 and by increased spending for Pell grants, postsecondary education awards made on the basis of financial need.

Within the category of education and training, spending on elementary, secondary, and vocational education has traditionally been higher than spending on other areas. For the past two years, however, investment in higher education has exceeded other types of spending on education and training. In recent years, nondefense investment in physical capital has been primarily for transportation, and about half of nondefense investment in research and development has been directed to the National Institutes of Health and other health research.

Grants to state and local governments are a substantial portion of federal nondefense investment. In 2018, such grants accounted for 46 percent of the $121 billion of federal nondefense investment in education and training and for 68 percent of the $110 billion of federal nondefense investment in physical capital. By contrast, the federal government awarded almost no grants to state and local governments for research and development; instead, it supported research at federal laboratories, universities, nonprofit organizations, and private firms.

Exhibit 6.

Categories of Federal Nondefense Investment, 1962 to 2018



Source: Congressional Budget Office, using data from the Office of Management and Budget and the American Public Transportation Association.

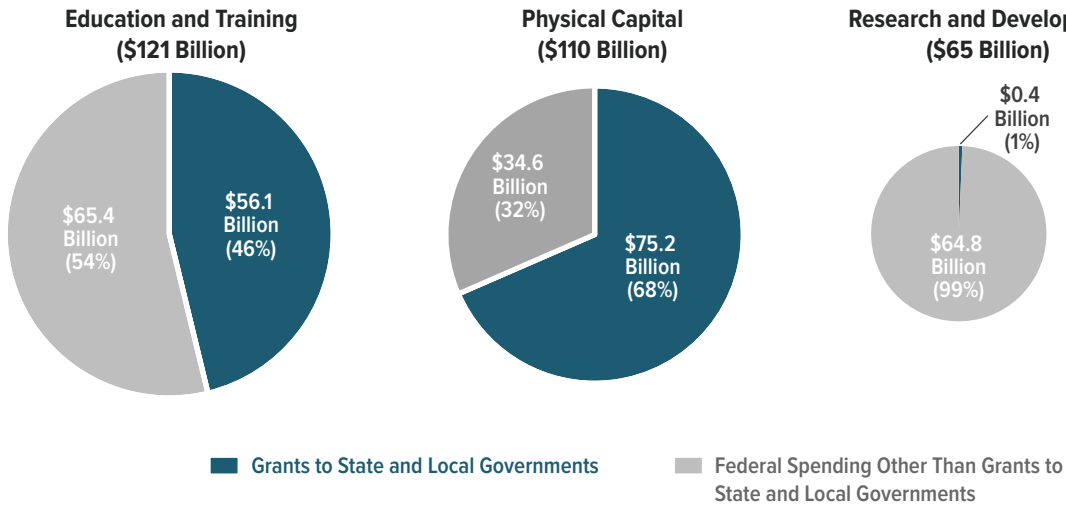
Of the three categories of federal nondefense investment—physical capital, education and training, and research and development—education and training has received the most funding in recent years. Federal investment in education grew substantially beginning in 2009 for two reasons: Spending temporarily increased on Pell grants for higher education, and spending increased for primary, secondary, and vocational education under the American Recovery and Reinvestment Act of 2009 (ARRA). Spending on physical capital also increased temporarily under ARRA.

Over the last decade, the share of investment in education and training has been similar to its share in the 1970s. At that time, there was a large increase in spending on elementary, secondary, and higher education (from $6 billion in 1964 to $24 billion in 1975) as well as an increase in related spending for Vietnam War veterans (from less than $1 billion in 1964 to $17 billion in 1975).

Since the 1980s, the shares of investment in physical capital and research and development (R&D) have remained fairly consistent at levels lower than in the 1960s and early 1970s. During that earlier period, investment in physical capital included the construction of the interstate highway system, and investment in R&D reflected a focus on the space program and on the sciences in general (which followed the Soviet Union's launch of Sputnik in 1957). ◆

Exhibit 7.

Share of Federal Nondefense Investment Provided as Grants to State and Local Governments, 2018



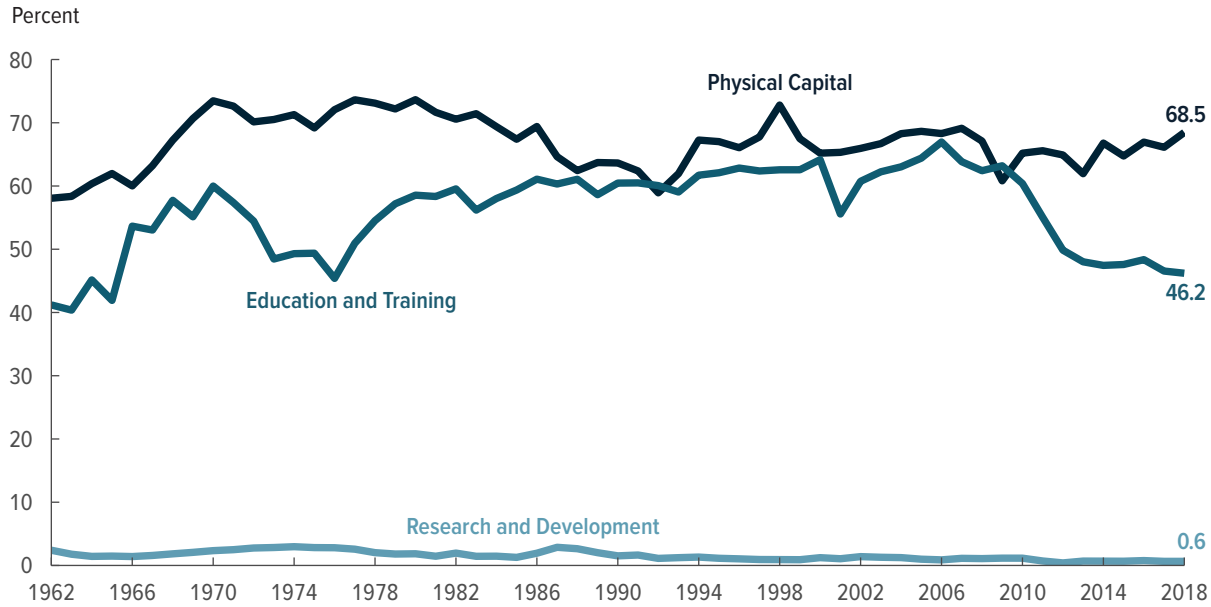
Source: Congressional Budget Office, using data from the Office of Management and Budget and the American Public Transportation Association.

One way that the federal government invests is by providing grants to state and local governments. Those governments are likely to understand local conditions better than the federal government does; they may therefore allocate investment funds more effectively. However, because many grant programs offer state and local governments some discretion in how to use federal funds, the investments may not conform as closely to federal priorities as do investments that the federal government undertakes directly.

In 2018, 46 percent of federal nondefense investment in education and training, amounting to $56 billion, was funneled through grants to state and local governments. So was 68 percent of federal nondefense investment in physical capital ($75 billion). Most of the grants for education and training went to elementary, secondary, and vocational education, while most of the grants for physical capital went to transportation, primarily highways. As a condition of the grants, state and local government were typically required to contribute funding. In contrast, there were almost no grants to state and local governments for nondefense research and development. Instead, the federal government funded research at federal laboratories, universities, nonprofit organizations, and private firms. ◆

Exhibit 8.

Grants to State and Local Governments as a Share of Each Category of Federal Nondefense Investment, 1962 to 2018



Source: Congressional Budget Office, using data from the Office of Management and Budget and the American Public Transportation Association. For details, see the appendix.

Grants to state and local governments have typically constituted a larger share of outlays for physical capital than for other categories of federal investment. That share averaged 67 percent from 1962 to 2018, compared with 56 percent for education and training and 2 percent for research and development.

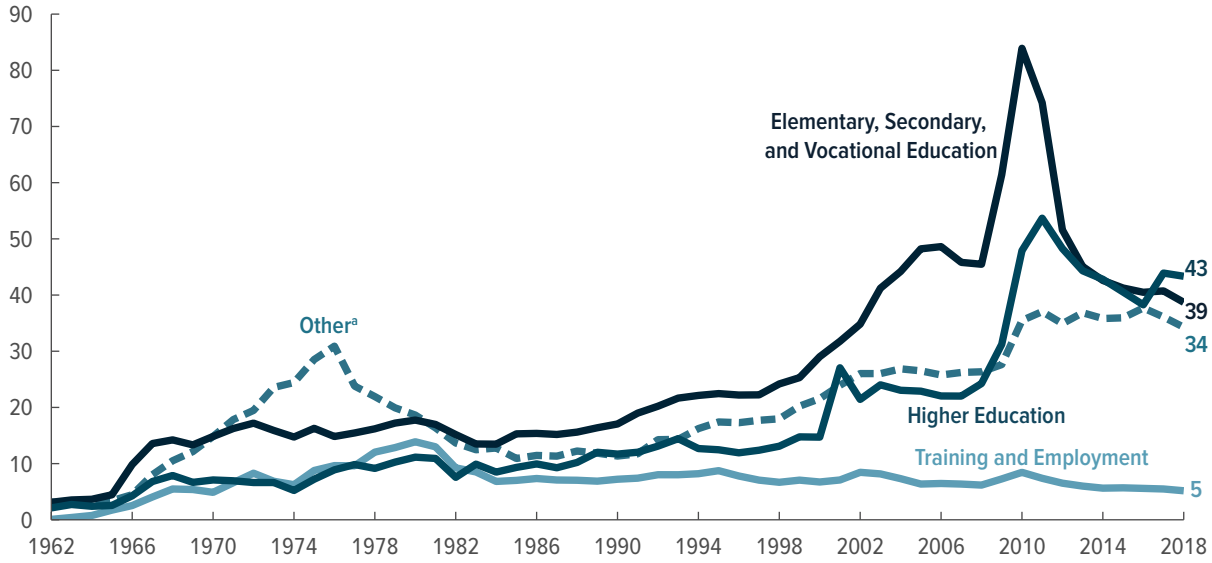
Federal investment in physical capital through grants to state and local governments was particularly high in the 1970s. That is because the 1972 amendments to the Clean Water Act greatly expanded grants for the construction of municipal sewage treatment facilities.

While grants to state and local governments have typically accounted for about half of federal investment in education and training, that share declined in the early 1970s and in the years following 2006. In both periods, the share of such grants declined as the federal government increased its direct investment for education, training, and rehabilitation for veterans of the wars in Vietnam and Iraq. ◆

Exhibit 9.

Education and Training: Federal Nondefense Investment by Activity, 1962 to 2018

Billions of 2018 Dollars



Source: Congressional Budget Office, using data from the Office of Management and Budget.

a. Includes the education, training, and rehabilitation of veterans as well as social services (such as early childhood education).

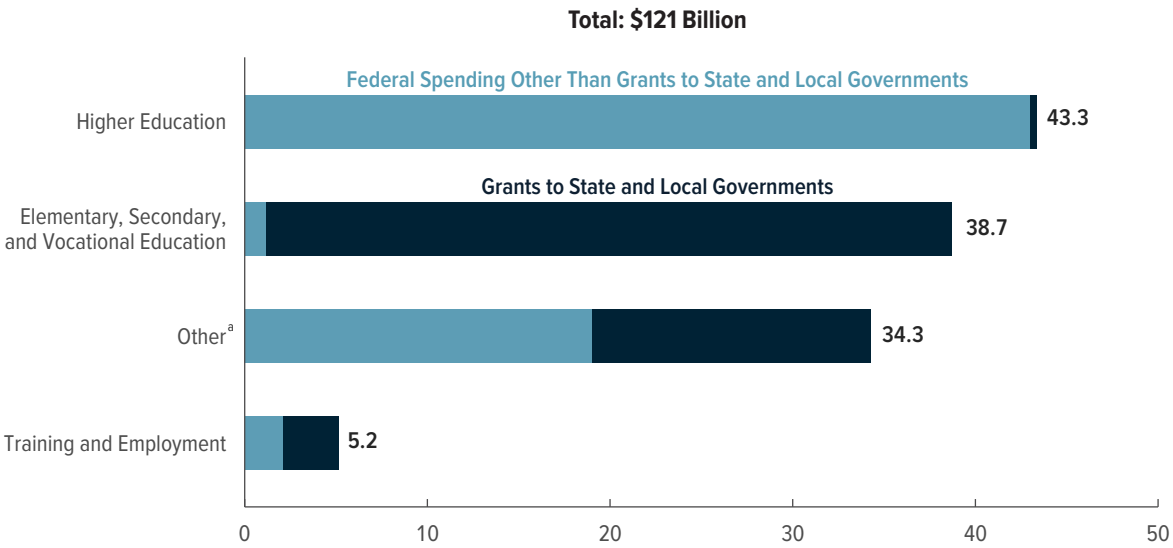
For much of the last 25 years, federal investment in education and training has been led by spending on elementary, secondary, and vocational education, primarily for disadvantaged children and students with disabilities. That spending increased sharply in the 2000s, and in 2010, it peaked at $84 billion (in 2018 dollars)—nearly half of total federal investment in education and training. That temporary spike was largely because of the American Recovery and Reinvestment Act of 2009 (ARRA), which distributed additional funds to states to spend on education and increased spending for existing federal education programs, among other things. Spending declined thereafter by more than half, to $39 billion by 2018.

Support for higher education increased greatly in the 2000s, climbing from $15 billion in 2000 to $54 billion in 2011 (in 2018 dollars). Three-quarters of that increase was attributable to Pell grants, which are awarded to students with limited financial resources according to a formula specified by law. Both the number of students receiving the grants and the average grant amount increased dramatically in the late 2000s. However, in recent years, federal spending on Pell grants fell because there were fewer recipients and average grants were smaller. ◆

Exhibit 10.

Education and Training: Federal Nondefense Investment by Activity, 2018

Billions of Dollars



Source: Congressional Budget Office, using data from the Office of Management and Budget.

a. Includes the education, training, and rehabilitation of veterans as well as social services (such as early childhood education).

In 2018, the federal government invested $121 billion in education and training for nondefense purposes. About 36 percent of that amount, or $43 billion, went to higher education. Only a negligible share was distributed through grants to state and local governments. Instead, nearly all of that investment was made directly by the federal government, and most took place through Pell grants, which provide funds directly to students to pay for education at a variety of postsecondary institutions, including four-year colleges and universities, for-profit schools, two-year community colleges, and institutions that specialize in occupational training. Pell grants are awarded on the basis of financial need and academic course load.

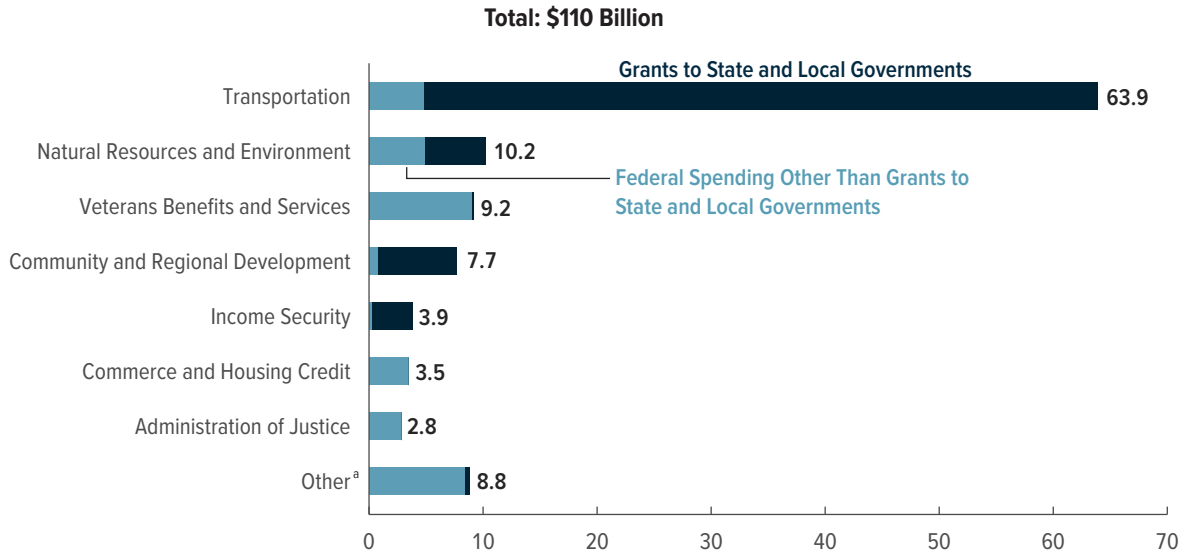
An additional 32 percent, or $39 billion, of the $121 billion went to elementary, secondary, and vocational education. That investment was almost entirely in the form of grants to state and local governments.

Other types of investment, mostly for the education, training, and rehabilitation of veterans, and social services (such as early childhood education), accounted for 28 percent of the total, or $34 billion; about 45 percent of such spending was provided through grants to state and local governments. The remaining 4 percent of the total, or $5 billion, went to training and employment programs, and about 60 percent of those funds was channeled through grants to state and local governments. ◆

Exhibit 11.

Physical Capital: Federal Nondefense Investment by Budget Function, 2018

Billions of Dollars



Source: Congressional Budget Office, using data from the Office of Management and Budget and the American Public Transportation Association.

a. Includes the following budget functions: energy; general government; general science, space, and technology; international affairs; health; education, training, and employment services; agriculture; and Social Security.

In 2018, the federal government invested $110 billion in nondefense physical capital. Nearly three-fifths of that amount, or $64 billion, was for transportation. Most of the transportation funding, 92 percent, was distributed as grants to state and local governments. The grants helped pay for construction and rehabilitation, mostly for highways but also for mass transportation and airports. The remaining 8 percent was invested directly by the federal government, primarily in major equipment for airports and in the Coast Guard.

The federal government also invested $10 billion in natural resources and the environment. Just over half of that $10 billion was grants, mostly state assistance grants through the Environmental Protection Agency and wildlife grants through the Fish and Wildlife Service. The remainder was direct federal spending, primarily for the Army Corps of Engineers' construction program and for equipment for the National Oceanic and Atmospheric Administration.

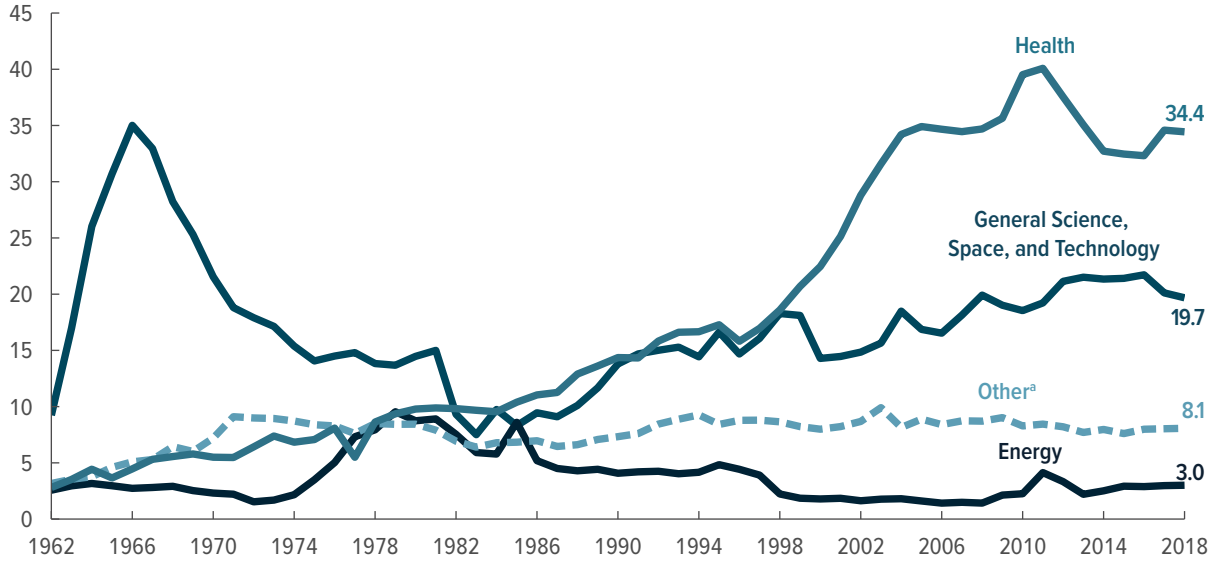
About two-thirds of the $9 billion invested in veterans benefits and services went to acquire medical equipment and information technology for veterans' health care. Almost all of the $8 billion invested in community and regional development took the form of block grants to state and local governments for construction and repair projects.

Notably, the $2 billion invested in energy-related nondefense physical capital (included in the "Other" category in this figure) represents only about 15 percent of the amount spent five years ago. In 2012, the federal government invested $15 billion in energy-related nondefense capital, boosted by sizable investments in clean energy related to the American Recovery and Reinvestment Act of 2009. ◆

Exhibit 12.

Research and Development: Federal Nondefense Investment by Budget Function, 1962 to 2018

Billions of 2018 Dollars



Source: Congressional Budget Office, using data from the Office of Management and Budget.

a. Includes the following budget functions: transportation; agriculture; and natural resources and environment.

In inflation-adjusted dollars, federal spending on health research grew dramatically in the late 1990s and early 2000s, leveled off in the mid- and late 2000s, and then bumped up further, to $40 billion in 2011, to account for more than half of total nondefense investment in research and development (R&D). Subsequently, such spending—most of which is directed to the National Institutes of Health, for research on cancer, infectious diseases, and other health problems—declined. An uptick in 2017 and 2018 brought it back to the level of spending of the mid- and late 2000s.

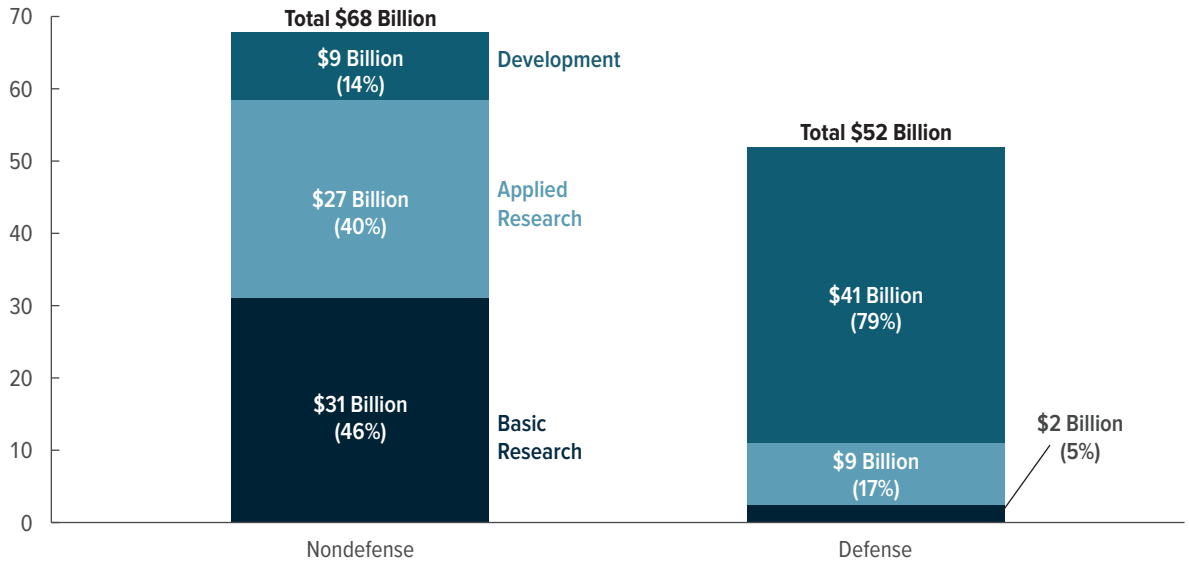
The second-largest component of federal nondefense investment in R&D during the past 20 years has been spending on general science, space, and technology. In 2018, such spending totaled $20 billion, with most of those funds going to the National Aeronautics and Space Administration (for research in areas such as planetary and earth sciences, and space operations) and to the National Science Foundation (for research in such areas as physical sciences and engineering). Investment in nondefense R&D was dominated by this category in the 1960s because of the space race and the government's goal of a manned trip to the moon.

R&D investment related to transportation, agriculture, and natural resources and the environment accounted for 12 percent of nondefense R&D investment in 2018, or $8 billion, while research at the Department of Energy (on energy efficiency and nuclear energy, for example) amounted to $3 billion. Investment in energy-related R&D for nondefense purposes peaked in the 1970s with the energy crisis. ◆

Exhibit 13.

Federal Investment in Various Stages of Research and Development, 2016

Billions of 2018 Dollars



Source: Congressional Budget Office, using data from the National Science Foundation.

The amounts reported here differ from those reported elsewhere in this document because the National Science Foundation reports estimates of federal obligations rather than federal spending. An obligation is a legally binding commitment by the federal government that will result in spending, immediately or in the future.

There are three stages of research and development (R&D). Basic research—for example, physics research on the properties of elementary particles—aims to expand scientific knowledge, regardless of its potential for commercial application. Applied research, such as the discovery of new materials to administer drugs, seeks to connect scientific knowledge to some practical purpose and so is one step closer to commercial application. Development applies scientific discoveries to the creation of particular products.

In 2016, the most recent year for which data are available, federal obligations for investment in nondefense R&D totaled an estimated $68 billion (in 2018 dollars). Most of that investment was for basic and applied research. One reason the federal government plays a large role in nondefense basic and applied research is that private firms invest less in such research than its social benefits justify because it is difficult to capture its benefits and to predict its commercial potential. The federal government plays only a small role in the development stage of nondefense R&D because private firms have strong incentives to create commercially viable products.

In contrast to nondefense spending, 79 percent of federal obligations for investment in defense R&D went to development—mostly the development of weapon systems. The development stage of defense-related R&D has much less potential to lead to products that are commercially viable apart from purchases by the federal government. ◆

Federal, State, Local, and Private Investment

Federal investment in physical capital, education, and research and development takes place alongside investments by state and local governments, households, and the private sector.

The bulk of funding for public elementary and secondary schools and for postsecondary institutions comes from nonfederal sources. Elementary and secondary schools depend principally on funding by state and local governments, while postsecondary institutions rely primarily on households and other private sources of funds.

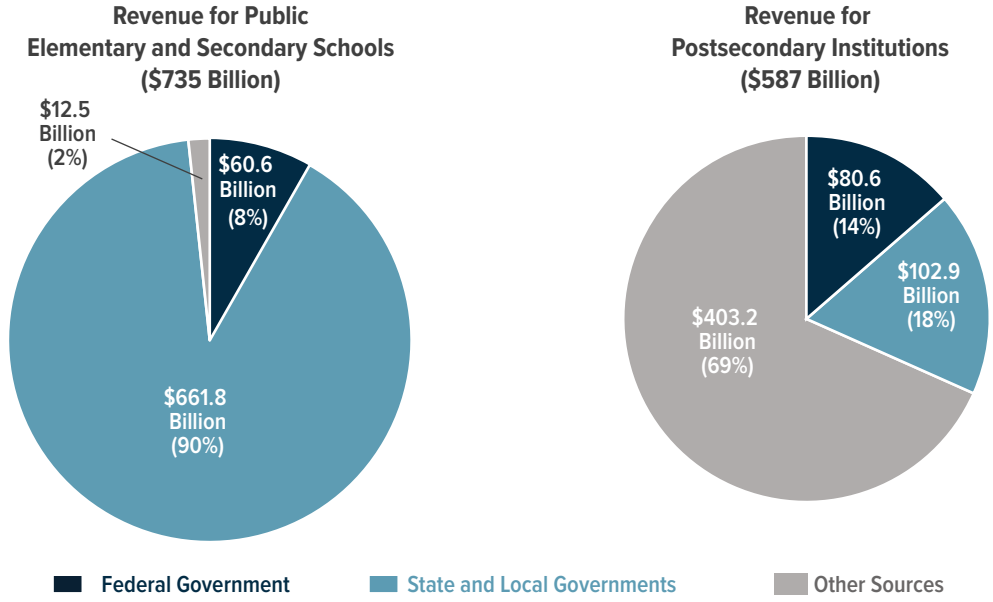
Almost all transportation and water infrastructure projects in the United States to date have been publicly funded. The federal share of investment in transportation and water infrastructure has varied, but in recent years state and local governments have invested more than the federal government has in both types of infrastructure. Investment in water infrastructure is particularly reliant on state and local funding.

Private industry's investment in research and development is more than double the federal amount. Since the 1980s, the industry share of R&D investment has exceeded the federal share by growing amounts. As a result, despite a decline in federal investment in R&D as a share of output, total investment in R&D by all sources has kept pace with economic growth over that time.

Exhibit 14.

Education: Sources of Revenue for Elementary and Secondary Schools and Postsecondary Institutions, 2015–2016 Academic Year

Billions of 2018 Dollars



Source: Congressional Budget Office, using data from the Department of Education.

The academic year covers July 1 through June 30.

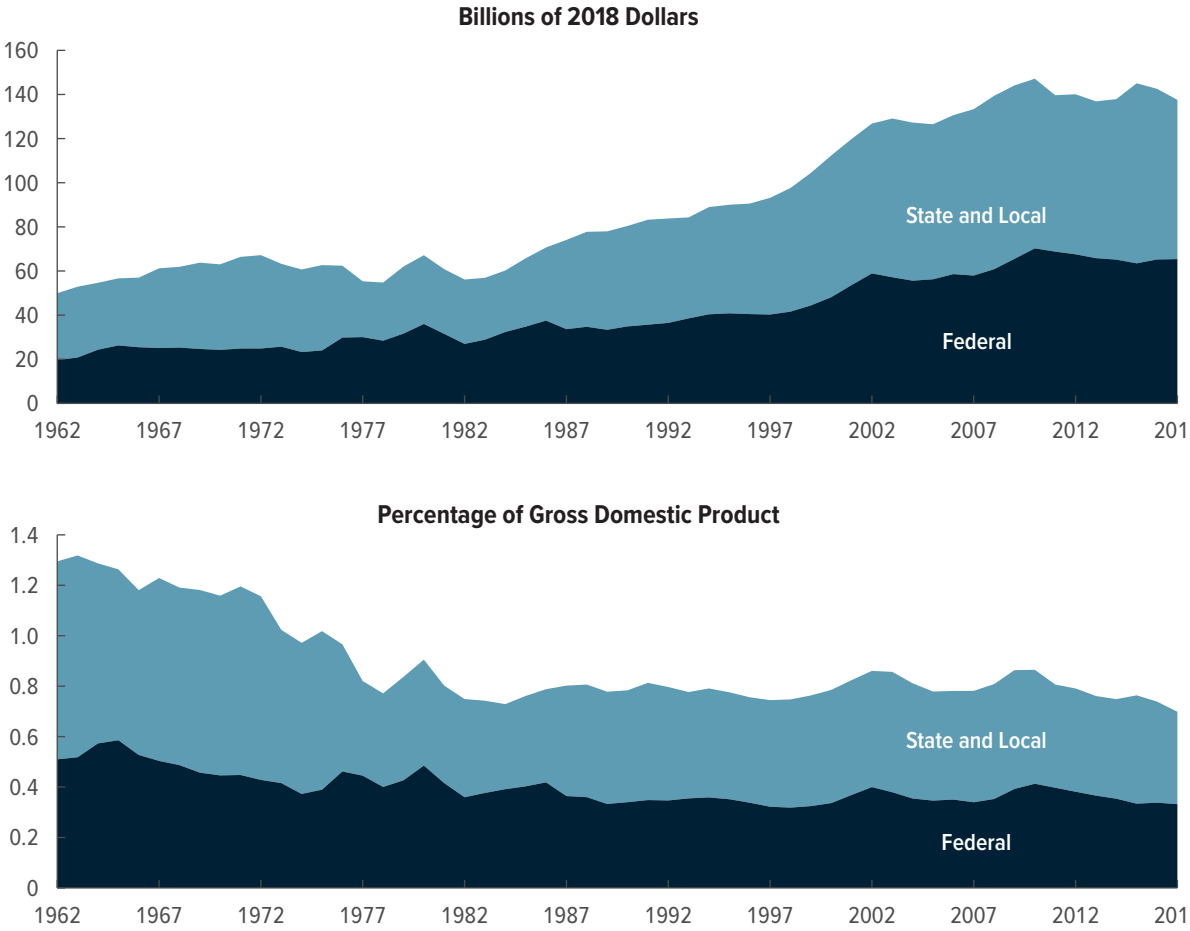
Data for private elementary and secondary schools, which account for 10 percent of total enrollment in elementary and secondary schools, are not available. The numbers shown for postsecondary institutions, however, include private institutions (both nonprofit and for-profit) as well as public ones. The postsecondary institutions' revenues include support for research and development. Other sources of revenue for postsecondary institutions include tuition and fees (financed in part by student loans), income from assets, revenues of hospitals operated by the institutions (including amounts appropriated by governments for the hospitals), payments for services provided by the institutions (such as food services and intercollegiate athletics), and contributions by private donors.

Public elementary and secondary schools had $735 billion (in 2018 dollars) in revenues in the 2015–2016 academic year, the most recent year for which complete data are available. Of that sum, $61 billion, or 8 percent, came from the federal government, largely in the form of grants to state and local education agencies. Most of the schools' revenues—$662 billion, or 90 percent—came from state and local governments, which drew the funds from sales, income, and property taxes.

Postsecondary institutions had $587 billion in revenues (in 2018 dollars) during the 2015–2016 academic year, the most recent year for which complete data are available. Federal spending represented 14 percent of the total, or $81 billion. It was conveyed through different avenues, including research and development funding and grants to students, primarily those from lower-income families. Although the federal government also provides loans to students to pay for tuition, housing, and other costs, those loans are classified here not under federal spending but under tuition and fees (a component of revenue from other sources), because they are ultimately the responsibility of the students or their families. ◆

Exhibit 15.

Transportation Infrastructure: Sources of Nondefense Investment, 1962 to 2017



Source: Congressional Budget Office, using data from the Office of Management and Budget, the Census Bureau, and the Bureau of Economic Analysis.

Most state governments and many localities use a fiscal year that starts on July 1 and ends on June 30. CBO adjusted the data to report spending by those governments during the federal fiscal year, which begins on October 1 and ends on September 30.

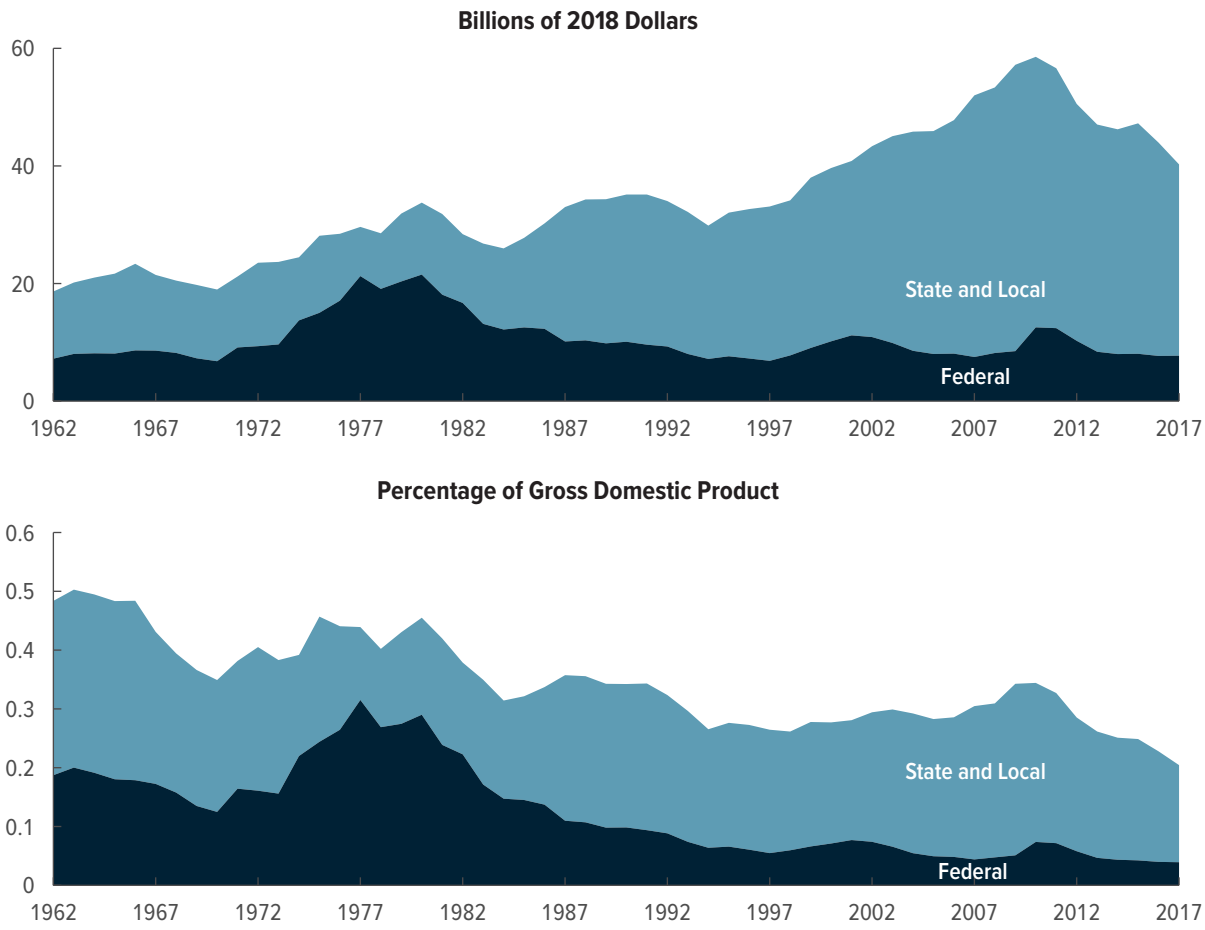
In 2017, the federal government spent $65 billion, or 0.3 percent of gross domestic product (GDP), on physical capital for transportation by highway, mass transit, rail, water, and air. States and localities invested $72 billion that year, or 0.4 percent of GDP, for the same purpose. Some of those state and local funds fulfilled matching requirements that accompanied federal grants.

From 2000 to 2009, annual federal investment in transportation infrastructure averaged $14 billion less than state and local investment, but most of that gap closed in later years. Because of greater federal spending under the American Recovery and Reinvestment Act of 2009 (ARRA), federal investment was more nearly equal to state and local investment in 2010, 2011, and 2012. In those years, annual federal spending averaged $5 billion less than state and local spending. Since ARRA spending subsided, annual federal spending has averaged $10 billion less than state and local spending.

Since the early 1980s, investment in physical capital for transportation by both the federal government and state and local governments has generally climbed but has been relatively stable as a share of GDP. ◆

Exhibit 16.

Water Infrastructure: Sources of Nondefense Investment, 1962 to 2017



Source: Congressional Budget Office, using data from the Office of Management and Budget, the Census Bureau, and the Bureau of Economic Analysis.

Most state governments and many localities use a fiscal year that starts on July 1 and ends June 30. CBO adjusted the data to report spending by those governments during the federal fiscal year, which begins on October 1 and ends on September 30.

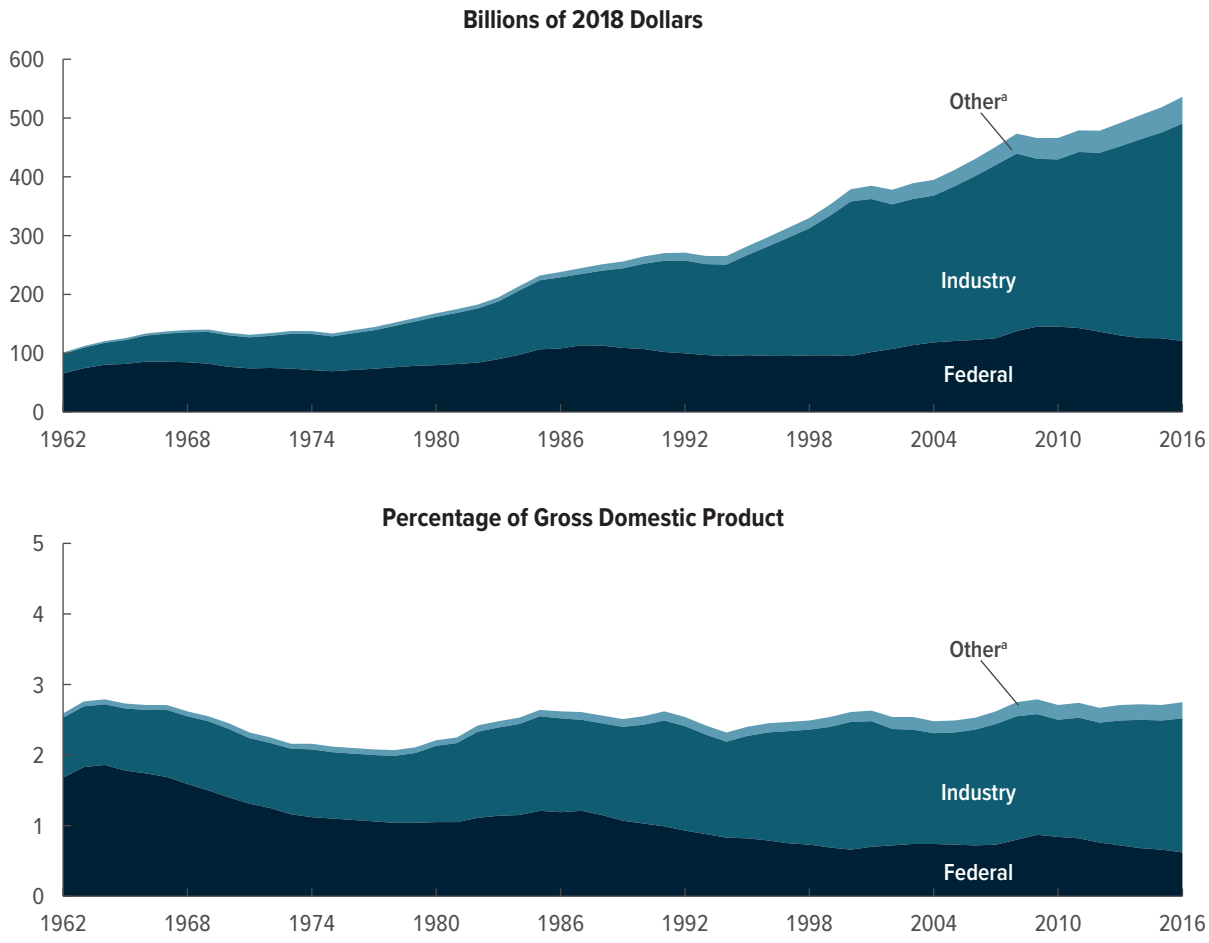
In 2017, the federal government spent about $8 billion and state and local governments spent $33 billion on investment in water infrastructure such as dams, levees, water distribution systems, and wastewater treatment facilities.

From the early 1960s through the early 1970s, federal investment in water infrastructure averaged about two-thirds the amount of state and local investment, but in the late 1970s, it climbed to more than two-and-a-half times the state and local amount. That increase reflected provisions of the Clean Water Act that required and funded greater efforts to clean wastewater before discharging it into waterways. Similarly, a smaller increase in federal investment in the late 1990s reflected amendments to the Safe Drinking Water Act to help local water utilities buy technologies to reduce contaminants. The uptick in federal investment during the 2010–2012 period was associated with the American Recovery and Reinvestment Act of 2009.

Other than those increases, the federal role in water infrastructure has declined over the past few decades. However, increases in state and local funding more than compensated, so that in inflation-adjusted dollars, total investment in physical capital for water infrastructure climbed from the mid-1990s through the early 2010s and—even with recent declines—remained above the level of the mid-1990s. As a share of gross domestic product, however, total investment was at a 55-year low in 2017. ◆

Exhibit 17.

Research and Development: Sources of Investment, 1962 to 2016



Source: Congressional Budget Office, using data from the National Science Foundation and the Bureau of Economic Analysis.

In this figure, spending is measured in calendar years.

a. Consists of support from universities, colleges, nonprofit organizations, and state and local governments.

In calendar year 2016 (the most recent year for which data are available), the federal government spent $121 billion (in 2018 dollars) on defense and nondefense research and development (R&D), or 23 percent of the national total. Most of that federally funded R&D was conducted by universities, private firms, and nonprofit organizations. Industry spent $370 billion on R&D, or 69 percent of the national total, in 2016. Investment by universities, colleges, nonprofit organizations, and state and local governments accounted for the remaining 8 percent of national R&D spending, or $45 billion.

With the exception of a dip in the 1970s, total spending on R&D has generally kept pace with growth in the economy since the early 1960s. However, industry spending outpaced federal spending during that period, and it has been the primary source of funds in every year since 1980. Federal R&D spending grew noticeably in the 1960s, to support the space program; in the 1980s, to expand national defense; and in the 2000s, to promote both defense-related and health-related R&D.

Private industry and the federal government focus on different stages of R&D. In 2016, development accounted for 77 percent of industry-funded R&D; by contrast, basic and applied research accounted for most federal spending on R&D (63 percent). The federal government is the primary source of funds for basic research in the United States, and despite the federal government's diminished role in R&D spending as a whole, growth in basic and applied research spending from all sources taken together has largely kept pace with economic growth since the 1980s. ◆

Appendix: Sources and Methods

Detailed descriptions of the sources and methods associated with every exhibit in this document but one, Exhibit 8, are available in the appendix of Congressional Budget Office, *Federal Investment* (December 2013), www.cbo.gov/publication/44974.

The Congressional Budget Office's primary data sources for Exhibit 8 were Tables 9.2, 9.6, 9.8, and 9.9 in Office of Management and Budget, *Budget of the U.S. Government, Fiscal Year* 2020*: Historical Tables* (March 2019), www.govinfo.gov/app/collection/budget/2020.

CBO's dollar values for federal investment in physical capital through grants to state and local governments do not always match the values reported in Tables 9.2 and 9.6 because the Office of Management and Budget (OMB) records as capital spending some expenditures that were in fact for the operation and maintenance of mass transit. To remove expenditures for operation and maintenance of mass transit from the data recorded by OMB, CBO used Tables 80 and 87 in American Public Transportation Association, *2019 Public Transportation Fact Book,* "Appendix A: Historical Tables" (March 2019), https://tinyurl.com/yytghtq3, and Office of Management and Budget, *Budget of the U.S. Government, Fiscal Years 2000–2020: Analytical Perspectives*, "Aid to State and Local Governments," Table 17-2 (February 1999–2018, March 2019), www.govinfo.gov/app/collection/budget/.

CBO's dollar values for federal investment in physical capital through other federal spending do not always match the values reported in Table 9.2 because OMB records as capital spending some expenditures that were in fact for the operation and maintenance of rail systems. To remove expenditures for operation and maintenance of rail systems from the data recorded by OMB, CBO used data collected from *Department of Transportation: Federal Railroad Administration (2003–2012)*, "Operating Subsidy Grants to the National Railroad Passenger Corp" on OMB form Schedule C.

CBO's dollar values for federal investment in education and training do not always match the values reported in Table 9.9 because CBO's data exclude investment in higher education through student loan programs. CBO made the adjustment for student loans using data for the Department of Education and its Office of Federal Student Aid in Office of Management and Budget, *Budget of the U.S. Government, Fiscal Year 2020: Public Budget Database* (March 2019), www.govinfo.gov/app/collection/budget/; the relevant account codes in the database were 0202, 0230, 0231, 0243, 4256, 4257, 7005, 022100, 271810, 271830, 278110, and 278130.

Related Work by the Congressional Budget Office

Federal Support for Financing State and Local Transportation and Water Infrastructure (October 2018), www.cbo.gov/publication/54549.

Public Spending on Transportation and Water Infrastructure, 1956 to 2017 (October 2018), www.cbo.gov/publication/54539.

Fiscal Substitution of Investment for Highway Infrastructure, Working Paper 2018-08 (August 2018), www.cbo.gov/publication/54371.

How CBO Produces Fair-Value Estimates of the Cost of Federal Credit Programs: A Primer (July 2018), www.cbo.gov/publication/53886.

Fair-Value Estimates of the Cost of Federal Credit Programs in 2019 (June 2018), www.cbo.gov/publication/54095.

Federal Aid for Postsecondary Students (June 2018), www.cbo.gov/publication/53736.

Distribution of Federal Support for Students Pursuing Higher Education in 2016 (June 2018), www.cbo.gov/publication/53732.

Estimating the Long-Term Effects of Federal R&D Spending: CBO's Current Approach and Research Needs (June 2018), www.cbo.gov/publication/54089.

Analysis of the Long-Term Costs of the Administration's Goals for the Military (December 2017), www.cbo.gov/publication/53350.

How CBO Analyzes the Economic Effects of Changes in Federal Subsidies for Education and Job Training (May 2017), www.cbo.gov/publication/52361.

The Macroeconomic and Budgetary Effects of Federal Investment (June 2016), www.cbo.gov/publication/51628.

Approaches to Making Federal Highway Spending More Productive (February 2016), www.cbo.gov/publication/50150.

Federal Support for the Development, Production, and Use of Fuels and Energy Technologies (November 2015), www.cbo.gov/publication/50980.

Federal Policies and Innovation (November 2014), www.cbo.gov/publication/49487.

The Pell Grant Program: Recent Growth and Policy Options (September 2013), www.cbo.gov/publication/44448.

Options to Change Interest Rates and Other Terms on Student Loans (June 2013), www.cbo.gov/publication/44318.

Total Factor Productivity Growth in Historical Perspective, Working Paper 2013-01 (March 2013), www.cbo.gov/publication/44002.

Federal Grants to State and Local Governments (March 2013), www.cbo.gov/publication/43967.

Letter to the Honorable Tim Huelskamp responding to questions about the effects of government

spending on economic growth (August 11, 2011), www.cbo.gov/publication/41146.

"Spending and Funding for Highways," *CBO Blog* (January 20, 2011), www.cbo.gov/publication/25136.

"Subsidizing Infrastructure Investment with Tax-Preferred Bonds," *CBO Blog* (October 26, 2009), www.cbo.gov/publication/41359.

Letter to the Honorable Judd Gregg analyzing the subsidy costs of direct and guaranteed student loans (July 27, 2009), www.cbo.gov/publication/20774.

Using Pricing to Reduce Traffic Congestion (March 2009), www.cbo.gov/publication/20241.

Issues and Options in Infrastructure Investments (May 2008), www.cbo.gov/publication/19633.

Capital Budgeting (May 2008), www.cbo.gov/publication/41689.

Federal Support for Research and Development (June 2007), www.cbo.gov/publication/18750.

About This Document

This Congressional Budget Office report was prepared at the request of the Ranking Member of the Senate Committee on the Budget. In keeping with CBO's mandate to provide objective, impartial analysis, the report makes no recommendations.

Sheila Campbell and Natalie Tawil prepared the report with guidance from Joseph Kile and Chad Shirley. Nabeel Alsalam, Christina Hawley Anthony, Jordan Berne, Devrim Demirel, Sebastien Gay, Justin Humphrey, Mark Lasky, David Mosher, Nathan Musick, Dan Ready, Matthew Woodward, and David Wylie provided helpful comments and data.

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CBO continually seeks feedback to make its work as useful as possible. Please send any comments to communications@cbo.gov.

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Director
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