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Infrastructure and the Economy

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SUMMARY

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Infrastructure investment has received renewed interest of late, with both President Biden and some Members of Congress discussing the benefits and costs of such spending and what investments should be considered part of infrastructure. *Infrastructure investment* or *infrastructure reform* can describe a wide array of activities in policy discussions, depending on the context. In general, infrastructure has historically referred to longer-lived, capital-intensive systems and facilities, such as roads, bridges, and water treatment facilities. Partly owing to the amorphous definition of *infrastructure*, there is no set method for measuring infrastructure investment. For public infrastructure, economists often use a measure called government investment.

Infrastructure is a critical factor in the modern economy, enabling private businesses and individuals to produce goods and services more efficiently. With respect to overall economic output, increased public infrastructure spending generally leads to higher economic output in the short term by stimulating demand and in the long term by increasing overall productivity. The short-term impact on economic output largely depends on the type of financing (whether deficit-financed or deficit-neutral investment) and the state of the economy (whether in a recession or expansion). The long-term impact on economic output is also affected by the method of financing, due to the potential for "crowding out" of private investment when investments are deficit financed. Economists also expect the type of infrastructure—whether in roads, railways, airports, utilities, or public buildings—to affect the impact on economic output.

Nondefense gross government investment (federal, state, and local) in the United States has largely been in decline since the 1960s, falling from above 4% of GDP to about 2.7% in 2019. Direct federal investment, or spending that occurs at the federal level rather than transfers to state and local governments, has gradually declined over the past several decades, falling from about 1.4% of GDP in 1966 to about 0.7% of GDP in 2019. Transfers from the federal government to state and local government for capital investments have exceeded direct federal spending since the mid-1950s. State and local investment has followed a similar pattern over time as investment at the federal level but generally made up a higher share of GDP. State and local investment peaked in 1939 at 3.64% of GDP before shrinking dramatically during and shortly after World War II, then increasing back to about 3% of GDP in the late 1960s. State and local investment has trended downward somewhat since, falling to 2% of GDP by 2019.

Changes in economic output are expected to affect employment; as such, infrastructure investments are likely to increase short-term employment as well. Recent research suggests that increased infrastructure investment modestly reduces the unemployment rate, though the effect can greatly vary depending on the method of financing and the state of the economy. Deficit-neutral investments are less likely to affect employment, whereas deficit-financed investments are expected to reduce unemployment in the short term. Additionally, recent economic research suggests that during an economic expansion, with a relatively strong labor market, infrastructure investments are unlikely to have any sustained impact on the unemployment rate. During a recession, the same investment is likely to reduce the unemployment rate to some degree.

The Biden Administration has put forward a proposal for increased infrastructure spending, the American Jobs Plan, which includes certain provisions that some observers have argued would not necessarily fall under a "core infrastructure" categorization. Others have argued certain provisions would not fall under the umbrella of infrastructure at all, leading to significant debate surrounding the plan's potential effect on the economy and the definition of *infrastructure* more broadly. President Biden has proposed paying for the American Jobs Plan with an increase in the corporate tax rate from 21% to 28%. According to the Administration, this would make the American Jobs Plan deficit neutral within 15 years, although most of the spending would be done in the first 10 years. The American Jobs Plan was originally proposed at $2.25 trillion; the Administration is currently negotiating with Congress, and the size and financing of any final agreement remains to be seen.

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Introduction

Infrastructure generally refers to long-lasting structures or systems that facilitate economic activity. This simple definition, however, belies a lack of consensus over what specific structures or systems should be considered infrastructure. Some things (e.g., roads, bridges, and ports) are broadly considered infrastructure, while others (e.g., intellectual property and government buildings, such as schools and hospitals) are more debatable. Federal, state, and local government plays a significant role in investments to build new and maintain existing infrastructure, although government investment has generally decreased over the past several decades in the United States. Recently, the Biden Administration and Congress have been in talks about potential infrastructure investment spending packages.

Many economists believe that under the right economic conditions, public investment in infrastructure will contribute to long-term growth. However, if the investment is financed through government debt or made during an economic expansion, this could dampen or even negate the impact. This report discusses the potential benefits and drawbacks of public infrastructure investment, the state of public infrastructure investment in the economy, and potential future plans for additional public infrastructure investment. While the report focuses on public infrastructure investment, we note there is a significant amount of private infrastructure investment in this country as well.[1]

Definitions of *Infrastructure*

There is not one set definition of *infrastructure*, and it can be difficult to measure investment in infrastructure. Government agencies and researchers use various types of data to measure infrastructure, and it can be challenging to find two sources of research that are exactly comparable. Most definitions of *infrastructure* include investment in physical structures and equipment that are used in the production process. Infrastructure investment is generally meant to spur productivity growth—one of the main determinants of long-term economic growth—by making the production process more efficient. Not all infrastructure projects will end up increasing productivity growth, and those that do will differ in impact. This section addresses the difficulties in measuring infrastructure investment, the various measures that economists and researchers use, and the different types of infrastructure (and how this can play into questions of measurement).

Types of Infrastructure

Infrastructure tends to be organized into specific buckets. One of the key distinctions many economists and policymakers make is between so-called *core infrastructure* and all other infrastructure. *Core infrastructure* generally refers to physical structures and equipment that have the potential to directly improve productivity, as they are closely associated with the cost of producing goods and services. Examples include roads, railways, airports, and utilities, among

[1] Federal, state, and local governments often share the cost of public infrastructure investments, with the majority of direct spending coming from state and local governments. The federal government contributes to infrastructure investments in the form of both direct spending and grants to state and local governments. For more information, see CRS In Focus IF10592, *Infrastructure Investment and the Federal Government*, by William J. Mallett.

others.[2] Some research suggests that core infrastructure tends to have a larger impact on private-sector economic output than all types of infrastructure taken together.[3]

Another type of categorization of infrastructure has to do with who funds it and who owns it. Infrastructure investment can be made by the government, the private sector, or a combination of the two. Infrastructure is often categorized as public, private, or a public-private partnership. While it may seem at first that infrastructure investment by the government would be on public infrastructure projects, and likewise for private and public-private, this is not necessarily the case. *Public infrastructure* refers to infrastructure that is publicly owned, and *private infrastructure* refers to infrastructure that is privately owned. However, the government can still invest in privately owned infrastructure just as the private sector can invest in public infrastructure.[4]

Measurement

Given that there is no official definition of *infrastructure*, government agencies do not actually publish data on "infrastructure investment." Instead, various agencies publish data on different types of government and private investment. While there is a significant amount of private-sector investment in infrastructure, this type of investment can be more difficult to proxy using publicly available and centralized data; therefore, this report focuses on investment made by the government. The majority of the analysis in this report uses *gross government investment*, as measured by the Bureau of Economic Analysis (BEA), as a proxy for public infrastructure investment. Some analysis also uses *federal investment*, as measured by the Congressional Budget Office (CBO). The following subsections discuss both methodologies in detail.[5] For other research mentioned in this report, a discussion of methodology is included at that time.

Gross Government Investment (BEA)

Due to the ambiguous definition of *infrastructure*, tracking government spending on infrastructure investments can be difficult. One of the more comprehensive sources of data that track government spending in various categories is BEA.[6] BEA divides government spending into consumption expenditures and gross investments.[7] Consumption expenditures consist of spending by the government to produce and provide goods and services to the public, such as paying census workers to survey households, and would generally not include infrastructure. By contrast, government gross investment consists of government spending on fixed assets, or capital, used to benefit the public for more than one year, such as roads, bridges, computers, and government buildings.[8] Investment is then further divided into three categories: (1) structures, which include

[2] For more information about core infrastructure and other definitions, see CRS In Focus IF10592, *Infrastructure Investment and the Federal Government*, by William J. Mallett.

[3] Pedro Bom and Jenny Ligthart, "What Have We Learned from Three Decades of Research on the Productivity of Public Capital?," *Journal of Economic Surveys*, vol. 28, no. 5 (December 2015), pp. 889-916.

[4] U.S. Congressional Budget Office (CBO), *Budgeting for Federal Investment*, April 2021, https://www.cbo.gov/publication/57142#_idTextAnchor006.

[5] For more information on the definitions of *infrastructure investment* by various agencies, see CBO, *Budgeting for Federal Investment*, Chapter 1, https://www.cbo.gov/publication/57142#_idTextAnchor006.

[6] Data on infrastructure investment at the federal level are also available from the Historical Tables produced by the Office of Management and Budget (OMB). These sources do not include data on state and local infrastructure spending.

[7] Because BEA measures the output of goods and services, it does not include government transfers or subsidies in the standard measure of government spending, unlike the federal budget definition of *spending*.

[8] BEA, *Concepts and Methods of the U.S. National Income and Product Accounts*, November 2017, pp. 9-1 to 9-26,

many of the classic examples of core infrastructure (e.g., water systems, highways, bridges); (2) equipment (e.g., computers, military hardware); and (3) intellectual property products (e.g., software, research and development).

Depending on how *infrastructure* is defined, BEA government investment data can act as a proxy for infrastructure investment, although perhaps an imperfect one.[9] Furthermore, it is common to limit analysis of infrastructure investments to nondefense investments, as national defense investments are generally not available to the public to assist in the production of goods and services. (For context, in 2019, about 55% of federal investment was directed to national defense purposes, whereas about 45% was directed to nondefense purposes.)[10]

Federal Investment (CBO)

CBO's federal investment is another common metric for measuring government infrastructure investment. CBO considers federal investment to consist of government spending in three broad areas: physical capital, research and development, and education and training. Physical capital includes structures; major equipment; and software, information systems, and technology. CBO stipulates that to qualify as federal investment, physical capital must have a useful life of at least two years. Research and development includes spending on basic research, applied research, and the development of new products and technologies. Education and training investment includes spending on early childhood through post-secondary education and job and vocational training. CBO does not include any programs or systems that can be immediately consumed, even if those programs might indirectly improve future productivity, such as health care or school lunches.[11]

CBO's measurement is similar to BEA's, although BEA's does not include spending on education and training. However, the methodology for tracking and calculating the data is not the same, and therefore CBO's federal investment less education and training does not necessarily equate to BEA's gross government investment.

The Economy and Public Infrastructure Investment

Economists generally agree that infrastructure is a critical factor of economic well-being, enabling private businesses and individuals to produce goods and services in a more efficient manner. For businesses, infrastructure can help to lower fixed costs of production, especially transportation costs, which are often a central determinant of where businesses are located.[12] For households, a wide variety of final goods and services are provided through infrastructure services, such as water, energy, and telecommunications.[13] Infrastructure tends to benefit the

https://www.bea.gov/sites/default/files/methodologies/nipa-handbook-all-chapters.pdf.

[9] Investment in defense is generally not considered infrastructure. Even when only considering nondefense government gross investment, this measure will not fit everyone's definition of *infrastructure*, and it may therefore be prudent to look at several sources of data to study a full array of investment that both directly and indirectly could affect productivity and long-term growth. Furthermore, this and other data in this report do not account for private investment, which is significant in the United States. Without considering private infrastructure investment, it may be difficult to ascertain a full picture of the state of infrastructure in the United States or compare infrastructure investment in the United States to infrastructure investment in other countries.

[10] CRS calculations based on data from BEA.

[11] CBO, *Budgeting for Federal Investment*.

[12] Ward Romp and Jakob de Haan, "Public Capital and Economic Growth: A Critical Survey," *Perspektiven der Wirtschaftspolitik*, vol. 8, no. 51 (April 2007), pp. 6-52.

[13] Stephane Straub, "Infrastructure and Development: A Critical Appraisal of the Macro-Level Literature," *Journal of*

economy overall, as it allows more goods and services to be produced with the same level of inputs, fostering long-term economic growth.

Many observers debate the optimal amount of government infrastructure investment. All infrastructure investments are not the same; the impact of these investments is likely to depend on a few key considerations, including the way in which the investments are financed and the timing of the investments with respect to the business cycle. This section of the report focuses on the ways in which additional infrastructure investments by the government affect economic output and employment and examines how certain factors are likely to amplify or limit its economic impact.

Effects on Economic Output

An increase in the stock of public capital, such as new or improved transportation and water systems, generally results in higher long-term levels of economic output.[14] It allows individuals and businesses to be more productive in the long term by freeing up time and resources that can be put toward generating additional economic output or used to enjoy more leisure time. For example, a new bridge may greatly shorten travel distances for truck drivers, allowing them to deliver goods to consumers more quickly and at a lower cost. These changes result in productivity growth for the economy as a whole, which is the most important determinant of long-term economic growth.

The extent to which public infrastructure investment results in long-term output growth depends in part on how productive a given infrastructure project is. As mentioned previously, core infrastructure will tend to increase productivity more so than other types of infrastructure; however, an infrastructure project that does not increase productivity would not contribute to long-term growth, even if it is a core infrastructure project. For example, building a road between two cities may increase productivity substantially, whereas building a second road may increase productivity only slightly, and building a third road may not increase productivity at all. Or, if both cities are sparsely populated and separated by difficult terrain, building a six-lane highway connecting the two might not be an efficient investment.

Ample research has attempted to estimate the impact of public infrastructure investment on economic output. For example, a 2014 literature review[15] found that a 1% increase in the public capital stock[16] (about $157 billion in 2019 in the United States) would increase private-sector economic output by 0.083% in the short term (about $14.7 billion).[17] The same 1% increase would increase the long-term level of private-sector economic output by 0.122% (about $21.6 billion in 2019).[18] Meanwhile, CBO estimates that a 1% increase in public capital would increase the long-term level of private-sector output by 0.06% (about $10.6 billion in 2019).[19] It is important to note that the estimated impact is exclusively for private-sector economic output

Developmental Studies, vol. 47, no. 5 (May 2011), pp. 683-708.

[14] Valerie A. Ramey, *The Macroeconomic Consequences of Infrastructure Investment*, National Bureau of Economic Research (NBER), Working Paper no. 27625, July 2020.

[15] Even though not all studies considered share the same definition of *infrastructure*, *public capital stock* is generally defined somewhat more narrowly.

[16] *Public capital stock* refers to government-owned assets that are used in the production process.

[17] Bom and Ligthart, "What Have We Learned from Three Decades of Research on the Productivity of Public Capital?"

[18] Bom and Ligthart, "What Have We Learned from Three Decades of Research on the Productivity of Public Capital?"

[19] CBO, *The Macroeconomic and Budgetary Effects of Federal Investment*, June 2016, pp. 24-25, https://www.cbo.gov/publication/51628.

rather than total economic output, as the impact would likely be larger if total economic output were being evaluated. Additionally, these are only average estimates, and the economic impact depends on how the investment is financed, broader economic conditions when the investment is made, and the type of infrastructure investment.

Timing related to when infrastructure investments are made and when benefits are realized is another consideration. Many economists believe that public infrastructure investment is not an effective *short-term* stimulus tool, although there is some debate surrounding this idea. A recent National Bureau of Economic Research (NBER) working paper—which focuses its analysis on public capital investment—finds that short-run stimulus multipliers[20] from infrastructure investment are smaller than those from other types of government spending, due mainly to the relatively long time frame for building core infrastructure as well as public infrastructure investment crowding out more private spending as compared to other types of government spending, according to the authors' model.[21] Other studies, however, do find that infrastructure investment can have positive short-term impacts on gross domestic product (GDP),[22] provided certain economic conditions and methods of financing. For example, the Penn Wharton Budget Model (PWBM)—which does not define *infrastructure* but rather analyzes specific proposed or enacted legislation—found that an additional $300 billion of federal infrastructure grants in 2020 would have increased GDP by up to $360 billion per year for 2020 and 2021.[23]

Financing[24]

Government investment is financed (or funded) in two distinct ways: deficit financing or deficit-neutral financing. The short-term and long-term impact of infrastructure investment can differ depending on the type of financing used. Investments are considered deficit financed if there is no decrease in government spending or increase in tax revenue to offset the new spending. Investments are considered deficit neutral if there is a decrease in other government spending or an increase in revenues through taxes, user fees, or others to offset the new spending.

Deficit Financing

The total economic impact of deficit financing for infrastructure investment involves opposing forces with respect to economic output. In the short term, additional public investment is likely to boost economic output both directly and indirectly. As the government spends additional funds on infrastructure projects, this directly increases economic output as the government purchases

[20] A multiplier measures the effect of a policy on output. For example, if the government decreased taxes by $1 and output increased by $0.50, the tax decrease would be said to have a multiplier of 0.5.

[21] Ramey, *The Macroeconomic Consequences of Infrastructure Investment*, pp. 41-42.

[22] Gross domestic product is a measure of the value of all final goods and services produced in a country in a given period of time.

[23] Jon Huntley, Zheli He, and Kody Carmody, "Short-Term Economic Effects of a 'Phase 4' Infrastructure Response to Coronavirus," PWBM, April 16, 2020.

[24] The specific financing mechanism—for example, direct government spending, tax incentives, loan guarantees, creating public-private partnerships—may also have important ramifications for the economic impact of government investment. In general, most literature on the subject focuses on instances in which either national or regional governments spend on infrastructure directly, as this is the more common approach historically, though other options for financing infrastructure have been included as possible options in current debates. However, for brevity and clarity given the current uncertainty regarding which, if any, alternative financing mechanisms may be included in future legislation, this report focuses on the economic impact of spending undertaken directly by the government. For a discussion of some of the other infrastructure financing mechanisms, see CRS Report R43308, *Infrastructure Finance and Debt to Support Surface Transportation Investment*, by William J. Mallett and Grant A. Driessen.

goods and services from contractors.[25] Moreover, deficit-financed investments may indirectly increase economic output even further via the multiplier effect.[26] The multiplier effect suggests that $1 of government spending may increase economic output by more than $1, particularly during economic downturns. For example, as the government hires contractors to complete new infrastructure projects, the employees and suppliers utilized by the contractors now have additional money as well and will likely spend at least some of it on goods and services provided by other businesses. The successive flow of funds, first from the government to contractors, then to employees and suppliers, may result in a larger GDP increase than the original spending by the government. However, government spending affects aggregate demand only once the funds are actually distributed. For many infrastructure projects it may take an extended period of time for funds to actually be spent, as projects must first be selected, competing bids reviewed, and so on. Thus, the short-term impact of infrastructure investment may take longer to materialize than the impacts of other types of government spending that can be implemented faster, such as cash transfers to individuals.

Although deficit-financed investment may increase short-term economic output, the medium- to long-term impact may be reduced due to the "crowding out" of private investment. Government borrowing generally results in higher interest rates. As a result, private investment and interest-sensitive consumer spending tends to decrease. CBO estimates that a $1 increase in the federal deficit decreases private investment by about 33 cents.[27] The replacement of private investment with public investment is often of concern to economists because, on average, private investment is thought to be more productive than public investment.[28] So although deficit-financed investment is more likely to produce short-term gains in economic output, it may impose long-term costs to economic output as it replaces some amount of private investment.

Deficit-Neutral Financing

Alternatively, deficit-neutral infrastructure investment is unlikely to significantly affect economic output in the short term. When investment is offset by reducing other spending, it has no immediate impact on aggregate demand because government spending remains level. Moreover, because the government is not borrowing additional money, interest rates are unlikely to change in the short term. However, depending on what types of spending are cut or taxes are raised, offsets could have positive or negative effects on long-term output that would need to be weighed against the long-term benefits of additional infrastructure spending. Although deficit-neutral public investment is not expected to have any significant impacts on short-term economic output, it is less likely to result in crowding out of private investment. As such, additional deficit-neutral investment is expected to have a larger positive impact on long-term economic output than deficit-financed investment does, all else equal.

Comparison

A number of studies have attempted to estimate the magnitude of the effect of the different types of infrastructure investment financing. Due to the complexity of making such estimates and the large effect a study's economic modeling and the availability of data can have on results, different

[25] Economic output, as measured by GDP, necessarily increases as the government spends money, because government expenditures are included as a component of GDP.

[26] Nicoletta Batini et al., *Fiscal Multipliers: Size, Determinants, and Use in Macroeconomic Projections*, International Monetary Fund (IMF), September 2014, https://www.imf.org/external/pubs/ft/tnm/2014/tnm1404.pdf.

[27] CBO, *The Macroeconomic and Budgetary Effects of Federal Investment*, p. 9.

[28] CBO, *The Macroeconomic and Budgetary Effects of Federal Investment*, p. 2.

estimates have been found across studies. Nevertheless, examining some of these studies can be informative.

In an attempt to account for how different financing mechanisms may affect public investment's impact on output, International Monetary Fund (IMF) researchers estimated these impacts separately for deficit-financed and deficit-neutral investment. The authors considered government investment in public capital for advanced economies. The authors found that an increase in deficit-financed public investment of 1 percentage point of GDP tends to increase overall GDP by 0.9% within the first year and by 2.9% after four years, but the authors found no significant change in GDP when investments were deficit neutral.[29] Meanwhile, a 2016 analysis by the CBO of hypothetical federal investments also suggested that deficit-neutral investment would result little short-run growth and deficit-financed investment resulted in a short-term boost. However, this study projected further out in time and found that deficit-neutral investment resulted in higher long-run growth than did deficit-financed investment. CBO found that a deficit-financed increase in public investment of $100 billion would increase GDP by about $22 billion in each of its first two years and resulted in the level of annual GDP being about $1 billion higher after 10 years compared with a baseline. When deficit neutral, the same investment would not increase GDP in the short term but would result in the level of GDP being about $4 billion higher after 10 years compared with a baseline.[30]

Much of the difference between the results produced by the CBO and IMF researchers is due to differing estimates of how public capital impacts productivity and the degree to which public investment crowds out private investment and also the fact that the IMF considers several advanced economies in its assessment while CBO limits its analysis to the United States. CBO assumes that public capital is less effective at increasing productivity and is more likely to crowd out private investment than the IMF researchers assumed.

An additional possible downside of deficit-financed investment is the potential increase in the debt-to-GDP ratio. Elevated debt-to-GDP ratios may impede economic growth if they lead to macroeconomic instability, such as rising interest rates on government debt.[31] The U.S. debt-to-GDP ratio has increased significantly during the COVID-19 pandemic, rising to over 100% in FY2020, and is projected to continue rising rapidly in FY2021 and beyond.[32] Interest rates on this debt have remained relatively low, suggesting that investors are confident in the United States' ability to continue meeting its debt obligations.[33] The already elevated ratio of debt to GDP may give pause to some when considering deficit-financed infrastructure investment. However, deficit-financed investment may not necessarily increase the debt-to-GDP ratio, as the increase in economic output may be greater than the increase in debt.[34] Some research has suggested that

[29] Abdul Abiad, Davide Furceri, and Petia Topalova, *The Macroeconomic Effects of Public Investment: Evidence from Advanced Economies*, IMF Working Paper, vol. WP/15/95, May 2015, https://www.imf.org/external/pubs/ft/wp/2015/wp1595.pdf.

[30] CBO, *The Macroeconomic and Budgetary Effects of Federal Investment*.

[31] Carmen Reinhart, Vincent Reinhart, and Kenneth Rogoff, *Debt Overhangs: Past and Present*, NBER, Working Paper no. 18015, April 2012, https://www.nber.org/papers/w18015.

[32] Federal Reserve Bank of St. Louis and OMB, "Federal Debt Held by the Public as Percent of Gross Domestic Product," https://fred.stlouisfed.org/series/FYGFGDQ188S.

[33] For further information about COVID-19 and current deficit and debt patterns, see CRS Report R46729, *Federal Deficits, Growing Debt, and the Economy in the Wake of COVID-19*, by Lida R. Weinstock.

[34] For more discussion of this topic, refer to CRS Report R44383, *Deficits, Debt, and the Economy: An Introduction*, by Grant A. Driessen.

deficit-financed investment has no impact on the debt-to-GDP ratio and can even decrease it,[35] whereas other research has suggested that such investment will likely increase the ratio.[36] As discussed in the following section, the magnitude of the increase in economic output will additionally depend in part on the business cycle.

Business Cycle Timing

The business cycle timing of additional public investment is likely to alter the impact of public investment on short-term economic output. Current economic theory suggests that in the short term, if public investment is made during a recession, the impact on economic output will be larger than if the same investment were made during an economic expansion.[37] When the economy is in recession, the short-term economic boost from additional public spending is expected to be larger, because various economic inputs are being underutilized and can be called up for production relatively quickly. For example, during a recession large numbers of unemployed workers are generally available, and factories are running below capacity, allowing production to ramp up quickly when the government begins offering new contracts to companies. Alternatively, when the economy is expanding healthily, the boost to short-term economic activity may be smaller because there is less excess capacity in the economy. Additionally, if undertaken at full employment, additional spending may result in higher rates of inflation, or the Federal Reserve might raise interest rates to counter rising inflation, which would decrease the impact on short-term output.

Recent empirical research has largely confirmed this assumption. A recent article estimated that the impact could be about 1.5 times larger during a recession than during an expansion, suggesting that a 1% increase in public investment would boost economic output by 3.4% during a recession and about 2.3% during an expansion.[38] A recent article published by the IMF suggested an even smaller impact during an expansion. The authors consider public investment and the stock of public capital as a proxy measure for infrastructure. The authors found that during a recession, an increase in investment spending of 1 percentage point of GDP would potentially increase economic output by 1.5% in the first year and by 3% after four years, whereas there was no significant change in short-term output when public investment was made during an expansion.[39]

The U.S. economy is still recovering from the COVID-19 pandemic. It is hard to know whether the United States is still technically in a recession or not, and it may be some time before NBER publishes information regarding the exact timing of the recession caused by the pandemic. In any case, there are still portions of the economy that are depressed compared to a pre-pandemic baseline; thus, it is possible that public infrastructure investment undertaken at this point would have a relatively large multiplier effect in the short run. The fiscal and monetary response to the pandemic was unprecedented, and some economists and policymakers have expressed concern that more spending at this point would likely overheat the economy.[40]

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[35] Aseel Almansour et al., *World Economic Outlook: Legacies, Clouds, Uncertainties*, IMF, October 2014, pp. 75-114, http://www.imf.org/en/Publications/WEO/Issues/2016/12/31/Legacies-Clouds-Uncertainties.

[36] CBO, *The Macroeconomic and Budgetary Effects of Federal Investment*.

[37] Alan J. Auerbach and Yuriy Gorodnichenko, "Measuring the Output Responses to Fiscal Policy," *American Economic Journal*, vol. 4, no. 2 (May 2012), pp. 1-27.

[38] Auerbach and Gorodnichenko, "Measuring the Output Responses to Fiscal Policy."

[39] Almansour et al., *World Economic Outlook*, pp. 75-114.

[40] For example, see Lawrence H. Summers, "Opinion: The Biden Stimulus Is Admirably Ambitious. But It Brings

Employment Effects

Changes in economic output tend to occur alongside changes in employment; as the economy produces more goods and services, it generally requires more people to produce those goods and services. A long-standing economic rule of thumb called Okun's Law suggests that increased economic growth generally leads to increased employment and vice versa.[41] This relationship is most obvious during economic downturns, when a decrease in economic growth generally occurs alongside a decrease in employment and a rising unemployment rate. The same is generally true during times of economic growth, with rising employment and a decreasing unemployment rate. Assuming that increased public investment spurs additional economic output, there will likely be some change in employment as well. In addition, faster productivity growth is expected to reduce the long-term unemployment rate, allowing the economy to sustainably operate at lower levels of unemployment without increasing the rate of inflation.[42]

Another way to look at the relationship between economic output and employment involves a basic understanding of how economic output is accounted for. The most prominent measure of economic output is GDP, which sums the cost of all goods and services produced during a specific time period. An alternative way to measure total economic output is as the total income received within all sectors of the economy in a given period. These two measures will theoretically produce the same amount, as any money paid for goods and services is eventually paid to other individuals in the form of, for example, salaries, wages, dividends, and rental payments. Therefore, any increase in GDP is also an increase in aggregate incomes. These increased incomes may be paid out in the form of new jobs or increased pay for existing jobs; it is thus not clear how much an increase in GDP may actually boost overall employment.

While current research surrounding the employment impact of additional public investment generally uses different measures of employment, including overall labor demand, employment levels, and the unemployment rate, some broad characterization of that research is possible. In general, estimates of the impact of public investment on employment range from a positive impact to no impact. IMF research suggests that among OECD countries, an increase in public investment of 1 percentage point of GDP generally decreases the unemployment rate by 0.11% in the short term and 0.35% in the medium term.[43] Alternatively, researchers estimated the impact of increased public capital on labor demand, finding that in the United States a 1% increase in public capital would increase labor demand by 1.13% in the short term, 1.07% in the medium term, and 0.08% in the long term.[44] As defined by the authors, an increase in labor demand constitutes an increase in wages, employment, or both; therefore, it is difficult to draw concrete examples of how public capital may affect employment levels.

Some Big Risks, Too," *Washington Post*, February 4, 2021, https://www.washingtonpost.com/opinions/2021/02/04/larry-summers-biden-covid-stimulus.

[41] Edward S. Knotek, "How Useful Is Okun's Law?," *Federal Reserve Bank of Kansas City Economic Review*, vol. 92, no. 4 (Fourth Quarter 2007), pp. 73-103.

[42] Laurence Ball and Gregory Mankiw, "The NAIRU in Theory and Practice," *Journal of Economic Perspective*, vol. 16, no. 4 (Fall 2002), pp. 115-136.

[43] Abiad, Furceri, and Topalova, *The Macroeconomic Effects of Public Investment*.

[44] Panicos O. Demetriades and Theofanis P. Mamuneas, "Intertemporal Output and Employment Effects of Public Infrastructure Capital: Evidence from 12 OECD Economies," *The Economic Journal*, vol. 110, no. 465 (July 2000), pp. 687-712.

Financing

In the short term, the method of financing additional public investment is likely to alter its impact on employment. If additional public spending is deficit neutral, economists estimate that the impact on overall output is likely to be minimal in the short term. Therefore, they conclude that investment will likely not generate new jobs but rather shift jobs to construction and other areas connected to infrastructure projects. However, economists estimate that a deficit-financed increase in public investment is expected to affect short-term demand and therefore increase employment as demand for labor rises. Researchers with the IMF looked at the impact of increased public investment on the unemployment rate depending on the mode of financing, finding a significantly larger impact on short-term unemployment when the spending was deficit financed rather than deficit neutral. The researchers found that an increase in public investment of 1 percentage point of GDP would potentially decrease the unemployment rate by nearly 2%[45] over four years when it was deficit financed but found no impact on the unemployment rate when deficit neutral.[46]

Business Cycle Timing

Similar to public investment's effect on production discussed above, the ability of public infrastructure investment to generate additional employment is likely to differ based on whether the economy is in recession or expansion, with a larger boost to employment occurring during a recession. In the midst of a recession, the economy is generally operating below its potential with numerous unemployed workers, and increased infrastructure investment is likely to have a larger impact on employment. Conversely, during an economic expansion, there are fewer unemployed individuals, and additional infrastructure investments are less likely to generate new jobs and rather would shift jobs toward occupations related to infrastructure, such as construction and architecture.

Researchers at the IMF estimated the impact of additional public investment on employment depending on the state of the economy. The authors found that during an expansion, there was no significant impact on employment. However, during a recession, an increase in public investment of 1 percentage point of GDP decreased the unemployment rate by 0.5% after one year and 0.75% after four years.[47] As of April 2021, the unemployment rate was 6.1%, above the 3.5% rate in February 2020, before the pandemic began. Much of the increased unemployment is a result of increases in unemployment in specific industries that have been particular affected by the COVID-19 pandemic, such as the hospitality industry.[48] There is anecdotal evidence to suggest that employers are having trouble filling positions, which would normally be a sign of a tightening labor market.[49] Additionally, it is not clear whether the types of workers that are still unemployed would be able to easily transition into the kinds of jobs infrastructure investment might create. In sum, the extent to which public infrastructure investment might affect employment in the short run is largely uncertain at this point.

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[45] In this scenario, a 2% decrease in the unemployment rate will result in less than a 2 percentage point decrease. For example, if unemployment is 10% and decreases by 2%, the resulting rate would be 9.8%.

[46] Abiad, Furceri, and Topalova, *The Macroeconomic Effects of Public Investment*.

[47] Abiad, Furceri, and Topalova, *The Macroeconomic Effects of Public Investment*.

[48] Bureau of Labor Statistics, "The Employment Situation—April 2021," news release, May 7, 2021, https://www.bls.gov/news.release/empsit.nr0.htm.

[49] Greg Ip, "The Job Market Is Tighter Than You Think," *Wall Street Journal*, April 21, 2021, https://www.wsj.com/articles/the-job-market-is-tighter-than-you-think-11619006400.

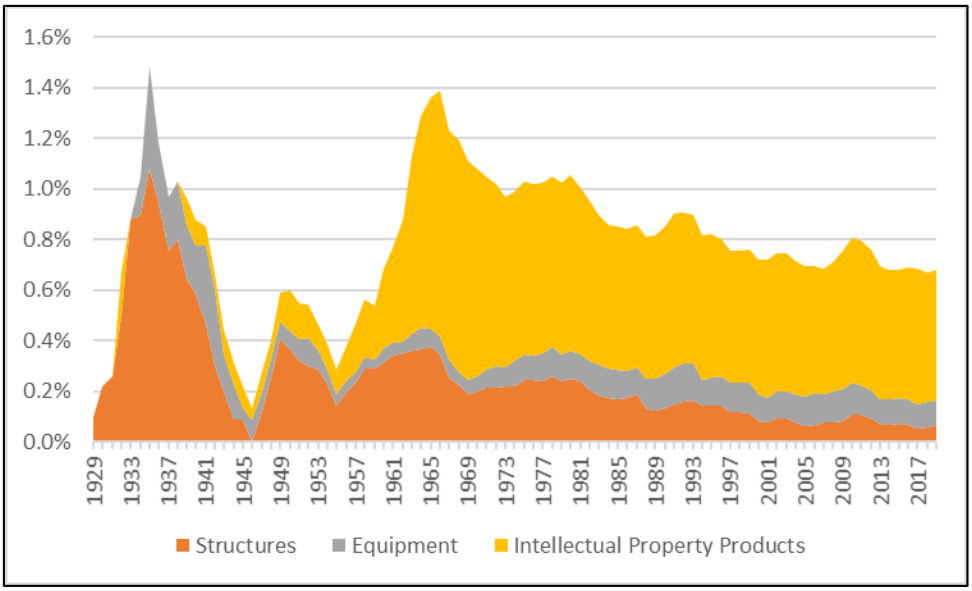
Infrastructure Investment in the United States

Nondefense gross (i.e., federal, state, and local) government investment in the United States has largely been in decline since the 1960s, falling from above 4% of GDP to about 2.7% in 2019. Overall, nondefense gross investment, as a percentage of GDP, was even higher for a number of years in the 1930s before decreasing significantly during and shortly after the end of World War II as gross government investment shifted to defense-related spending and GDP grew quickly. Nondefense gross investment in the 1960s then rose to pre–World War II levels and then began slowly declining over time.

Direct nondefense federal investment, which refers to spending that occurs at the federal level rather than transfers to state and local governments, peaked in the 1930s as a percentage of GDP and again in the 1960s before beginning to gradually decline over the next several decades, falling from about 1.4% of GDP in 1966 to about 0.7% of GDP in 2019, as shown in **Figure 1**.[50] Direct nondefense federal investment in structures also peaked in the 1930s, reaching above 1.0% of GDP briefly, then again to a lesser extent in the late 1940s and 1960s at around 0.4% of GDP. It has hovered around 0.1% of GDP since 2000. Direct nondefense federal investment in equipment has been relatively small as a share of GDP since 1929. It peaked at 0.4% in 1935 and has generally trended at or below 0.1% of GDP since the 1940s. Direct nondefense federal investment in intellectual property products peaked at about 1.0% of GDP in 1966 and has generally trended downward since, to 0.5% in 2019. Of note, the prices of some categories, such as software, have tended to decrease over time, making it difficult to determine the extent to which decreases in investment in dollar terms are a result of decreases in the amount of investment versus price effects.

Figure 1. Annual Federal Nondefense Investment, 1929-2019

(as a share of GDP)



Source: CRS calculations based on data from the Bureau of Economic Analysis.

[50] *Direct federal investment* is limited to funds spent directly by the federal government on investment projects. Funds that are transferred to state and local governments for investment by the federal government are recorded as state and local investment, as they are the entities that directly spend the funds on investment projects.

Transfers from the federal government to state and local government for capital investments have exceeded direct federal spending since the mid-1950s. Transfers to state and local governments for capital investments began in the 1930s and increased through the 1960s to about 0.6% of GDP. These transfers then began to decline through the 1970s, 1980s, and 1990s before rising rapidly in the 2010s, with much of the increase in 2009 attributable to the American Recovery and Reinvestment Act of 2009 (P.L. 111-5). Transfers, as a percentage of GDP, have now declined to levels similar to those in the 1980s and 1990s, around 0.4% of GDP.

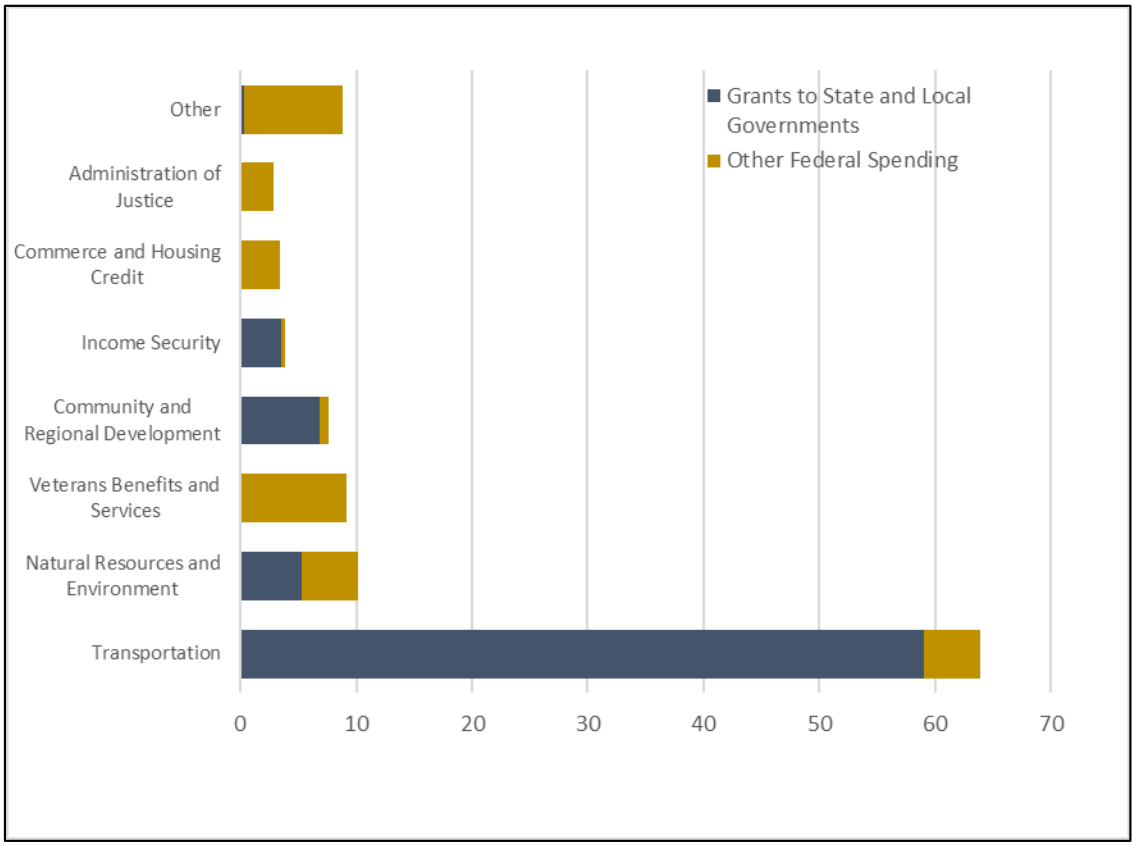
According to data from CBO,[51] in 2018, the flow of federal nondefense investment was about $297 billion (1.5% of GDP) via both direct spending and transfers to state and local governments.[52] Of the $297 billion, roughly $110 was spent on physical capital (largely analogous to core infrastructure). By physical capital budget function, the largest sum was invested in transportation, accounting for about $64 billion, as shown in **Figure 2**. The next largest source of investment was natural resources and the environment, which accounted for about $10 billion in 2018. Depending on the budget function, the mix of investments through direct federal spending and grants to state and local governments varies considerably. Within transportation, about 92% of federal investments are made through grants to state and local governments, whereas within energy, almost 50% of federal investments are made through direct federal spending.

[51] CBO, *Federal Investment, 1962 to 2018*, June 2019, p. 9, https://www.cbo.gov/system/files/2019-06/55375-Federal_Investment.pdf.

[52] As discussed earlier in this report, CBO measures federal investment differently than BEA does. Therefore, this data may not be comparable to the other data presented in this section.

Figure 2. Physical Capital: Federal Nondefense Investment by Budget Function, 2018

(in billions of dollars)



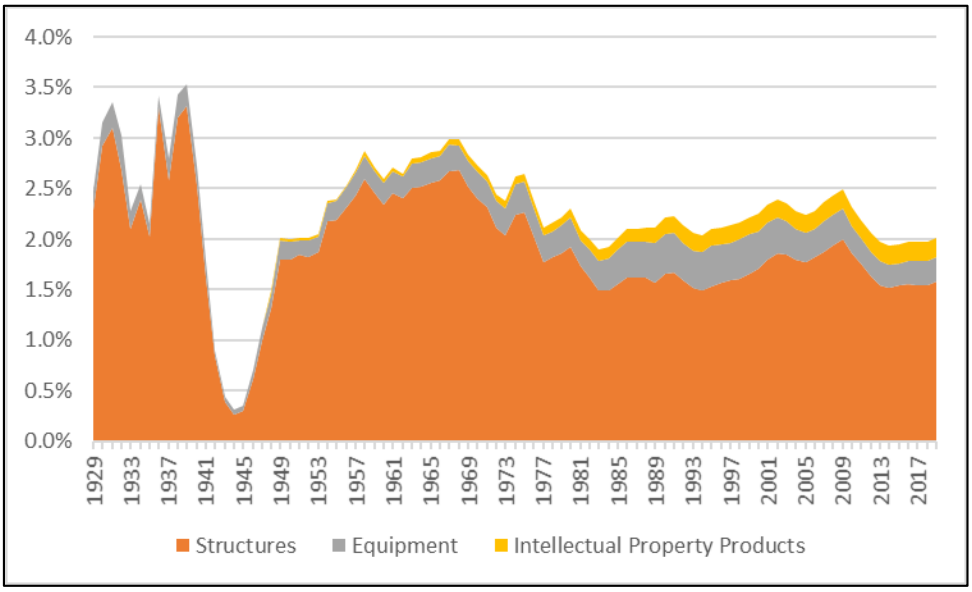
Source: Congressional Budget Office, *Federal Investment*, Exhibit 11, June 27, 2019.

Notes: "Other" 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.

State and local investment[53] has followed a similar pattern over time as investment at the federal level but has generally made up a higher share of GDP. State and local investment peaked in 1939 at 3.64% of GDP before shrinking dramatically during and shortly after World War II then increasing back to about 3% of GDP in the late 1960s, as shown in **Figure 3**. State and local investment has trended downward somewhat since, falling to 2% of GDP by 2019. Unlike direct federal investment, state and local investment has consistently been largest in the category of structures. In 2019, state and local spending on structures accounted for 1.6% of GDP as compared to 0.2% for both equipment and intellectual property products.

[53] State and local governments directly invest significantly more in general than the federal government does; however, some of the direct investments made by state and local governments are the result of transfers from the federal government. In 2018, state and local governments directly invested funds equivalent to about 2% of GDP, but the federal government also transferred funds equivalent to about 0.4% of GDP to state and local governments for capital investments in that year. Some or all of those transferred funds could be a part of that 2%.

Figure 3. Annual State and Local Investment, 1929-2019
(as a share of GDP)



Source: CRS calculations based on BEA data.

The American Jobs Plan

The Biden Administration has put forward a proposal for increased infrastructure spending, called the American Jobs Plan.[54] The plan calls for investment to

- "Fix highways, rebuild bridges, upgrade ports, airports and transit systems;
- "Deliver clean drinking water, a renewed electric grid, and high-speed broadband;
- "Build, preserve, and retrofit more than two million homes and commercial buildings, modernize the nation's schools and child care facilities, and upgrade veterans' hospitals and federal buildings;
- "Solidify the infrastructure of our care economy by creating jobs and raising wages and benefits for essential home care workers;
- "Revitalize manufacturing, secure U.S. supply chains, invest in R&D, and train Americans for the jobs of the future; and
- "Create good-quality jobs that pay prevailing wages in safe and healthy workplaces while ensuring workers have a free and fair choice to organize, join a union, and bargain collectively with their employers."

This proposal has garnered much debate about its proposed size and means of financing and what does and does not count as infrastructure. The White House continues to negotiate with Congress, and several alternate frameworks have been put forward for discussion.[55] This section discusses

[54] The White House, "Fact Sheet: The American Jobs Plan," March 31, 2021, https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/31/fact-sheet-the-american-jobs-plan/.

[55] See, for example, *Politico*, "Bipartisan Infrastructure Plan," https://static.politico.com/0a/08/

the American Jobs Plan, the debates surrounding the infrastructure discussions, and the potential impacts such a proposal might have on the economy in the short and long run.

Proposed Size and Financing

As originally outlined by the Biden Administration, the American Jobs Plan would cost $2.25 trillion over 10 years.[56] The Administration is currently negotiating with Congress on infrastructure legislation. The size and method of financing of any resulting legislation is, as of this writing, unclear. As such, the remainder of this section will focus on the original American Jobs Plan proposal.

President Biden has proposed paying for the American Jobs Plan with an increase in the corporate tax rate from 21% to 28%.[57] According to the Administration, this would make the American Jobs Plan deficit neutral over 15 years,[58] although most of the spending would be done within 10 years. According to the Committee for a Responsible Federal Budget (a Washington, DC, think tank), this would result in a 10-year deficit of $900 billion.[59] Financial services company Moody's Analytics came up with a slightly lower estimate of a 10-year deficit of $850 billion, although when accounting for the projected economic benefits of the plan, Moody's predicts an even lower $625 billion deficit over 10 years.[60]

Some Members of Congress have reportedly suggested alternative measures for funding government investment in the form of funding offsets, such as repurposing existing approved funds, including user fees on select items, and requiring contributions from state and local governments.[61]

Potential Impacts

The American Jobs Plan includes spending that does not fit into traditional definitions of *infrastructure*. It therefore may be particularly challenging to judge the potential impacts of the plan, as it may cause different impacts than past infrastructure bills did. This section will discuss some research and projections on the impact the American Jobs Plan might have on employment and output.

398515524e38ab4807521dcfbd92/bipartisan-infrastructure-framework-two-pager-final-7.pdf; or Sam Mintz, "Senators Say a Deal with the White House Is in Hand on Infrastructure," June 23, 2021, https://www.politico.com/news/2021/06/23/infrastructure-deal-biden-congress-495796.

[56] The White House, "Fact Sheet: The American Jobs Plan."

[57] Jim Tankersley and Emily Cochrane, "Biden Wants to Pay for Infrastructure Plan with 15 Years of Corporate Taxes," *New York Times*, April 22, 2021, https://www.nytimes.com/2021/03/30/business/economy/biden-infrastructure-taxes.html.

[58] The White House, "Fact Sheet: The American Jobs Plan."

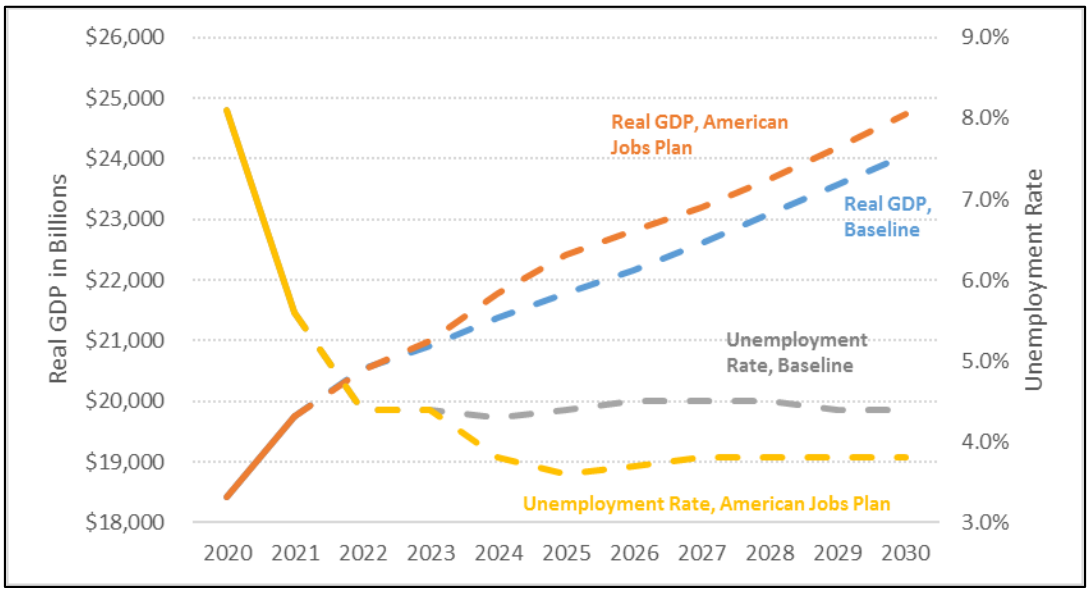
[59] Committee for a Responsible Federal Budget, "What's in President Biden's American Jobs Plan?," April 2, 2021, https://www.crfb.org/blogs/whats-president-bidens-american-jobs-plan.

[60] Mark Zandi and Bernard Yaros, *The Macroeconomic Consequences of the American Jobs Plan*, Moody's Analytics, April 2021, https://www.economy.com/getlocal?q=C228A0FF-2701-47B2-ADE0-D158B5866251&app=download.

[61] For example, see *Politico*, "Bipartisan Infrastructure Plan," p. 2; David Morgan, "Republicans Unveil $568 Bln Infrastructure Package to Counter Biden," Reuters, April 22, 2021, https://www.reuters.com/world/us/republicans-unveil-568-bln-infrastructure-package-counter-bidens-23-trillion-2021-04-22/; and Kelsey Snell, "Countering Biden, Senate Republicans Unveil Smaller $568 Billion Infrastructure Plan," NPR, April 22, 2021, https://www.npr.org/2021/04/22/989841527/countering-biden-senate-republicans-unveil-smaller-568-billion-infrastructure-pl.

The Moody's Analytics report about the potential economic impact[62] of the American Jobs Plan uses a one-year multiplier of around 1.5 for the traditional infrastructure investment included in the plan. Over the next 10 years, Moody's finds that the American Jobs Plan would increase GDP and employment (see **Figure 4**).[63]

Figure 4. Projected Impact of American Jobs Plan, 2020-2030



Source: Mark Zandi and Bernard Yaros, *The Macroeconomic Consequences of the American Jobs Plan*, Moody's Analytics, April 2021, https://www.economy.com/getlocal?q=C228A0FF-2701-47B2-ADE0-D158B5866251&app=download.

Debates

The American Jobs Plan sparked significant debate surrounding the definition of *infrastructure*. The debate is centered upon whether, and the extent to which, various aspects of the plan directly or indirectly improve the productive capacity of the U.S. economy, since the research surveyed above indicates that infrastructure generally has a more positive effect on the economy than other types of government spending. The American Jobs Plan includes provisions that would not necessarily fall under the "core infrastructure" category and, some have argued, would not fall under the umbrella of infrastructure at all, such as improving the stock of affordable housing or expanding elderly and disabled access to care.[64] The Biden Administration has argued, for

[62] The potential impacts of this plan are less clear in the long run. PWBM predicts that the spending provisions of the American Jobs Plan, absent the increase in corporate taxes, would decrease the level of GDP by 0.33% by 2050. In the scenario in which the American Jobs Plan is accompanied by the proposed increase in taxes, PWBM predicts GDP would decrease by 0.8% by 2050. Other analyses are more optimistic, such as Oxford Economics, which predicts that long-run potential output will increase by 0.1% owing to the American Jobs Plan and that it will create 2 million additional jobs by the end of 2024. See PWBM, "President Biden's $2.7 Trillion American Jobs Plan: Budgetary and Macroeconomic Effects," April 7, 2021, https://budgetmodel.wharton.upenn.edu/issues/2021/4/7/president-biden-american-jobs-plan-effects; and Oxford Economics, "Biden's American Jobs Plan Will Provide a Structural Lift," April 10, 2021, http://blog.oxfordeconomics.com/content/bidens-american-jobs-plan-will-provide-a-structural-lift.

[63] Zandi and Yaros, *The Macroeconomic Consequences of the American Jobs Plan*.

[64] Jim Tankersley and Jeanna Smialek, "Biden Plan Spurs Fight over What 'Infrastructure' Really Means," *New York Times*, April 5, 2021, nytimes.com/2021/04/05/business/economy/biden-infrastructure.html.

example, that increasing elderly care would allow adults who were previously caregivers to join the labor force and increase production, thereby making elderly care a component of infrastructure.[65] Detractors argue that such a proposal is social spending and would not actually increase productivity.

There has also been debate surrounding the timing, size, and financing of the American Jobs Plan. Certain economists and policymakers are concerned about the size of the plan, specifically in light of the spending in the recently passed American Rescue Plan Act (P.L. 117-2), and are concerned that the plan would cause or contribute to an overheating economy and inflation.[66] Some Members of Congress are specifically opposed to the proposed tax increase, fearing that increasing taxes would cause the economy to slow in its recovery from the pandemic.[67] The Biden Administration counters that the plan would create jobs in the short term and, if passed alongside the proposed tax increase, be fully paid for within 15 years and actually reduce deficits in the years thereafter.[68]

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This report has been adapted from a report authored by Jeffrey Stupak, former CRS Analyst in Macroeconomic Policy.

[65] Andrea Shalal, "Top White House Economist Defends 'Care Economy' as Infrastructure," Reuters, April 6, 2021, https://www.reuters.com/article/us-usa-biden-infrastructure-care/top-white-house-economist-defends-care-economy-as-infrastructure-idUSKBN2BU02A.

[66] Senator Pat Toomey, "Toomey Statement on Biden's Massive Spend and Tax Binge," press release, March 31, 2021, https://www.toomey.senate.gov/newsroom/press-releases/toomey-statement-on-bidens-massive-spend-and-tax-binge.

[67] Senate Committee on Finance, "Crapo: Raising Taxes Incredibly Misguided," press release, March 31, 2021, https://www.finance.senate.gov/ranking-members-news/crapo-raising-taxes-incredibly-misguided.

[68] The White House, "Fact Sheet: The American Jobs Plan."

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