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Budget Model

Explainer: Economic Effects of Infrastructure Investment

Summary: Public infrastructure investment boosts the productivity of private capital and labor, leading to higher output, but this positive effect can be offset if the investment is financed with additional government borrowing. PWBM estimates that an illustrative 10-year, \$2 trillion public investment plan will raise public capital by 4.6 percent but lower private capital by 0.8 percent in 2040, with a net zero effect on GDP in 2040.

Introduction

In 2018, both the [Trump administration](#) and the [Senate Democrats](#) advanced proposals to invest in America's infrastructure. In 2020, an infrastructure platform was a central component of the [Biden campaign](#). More recently, in 2021, the Biden Administration's [American Jobs Plan](#) and [American Families Plan](#) contained proposals for substantial public infrastructure investments.

An increase in public infrastructure by itself raises the productivity of private capital, as public capital is a [complement to private capital](#). Higher private capital increases the productivity of labor and leads to higher wages and lower interest rates (borrowing costs), encouraging additional work and incentivizing higher investment in private capital. More work and private capital lead to higher GDP. If the additional public infrastructure investment, however, is paid for with additional federal borrowing, then a competing effect is introduced: the additional federal debt crowds out private capital, which leads to lower output. The net effect on output from an infrastructure program is then determined by the speed with which public infrastructure is built and by how much of each additional dollar in federal infrastructure spending results in new public capital (since federal spending may be offset by changes in state and local spending).

To demonstrate these effects, we evaluate an illustrative \$2 trillion plan, consisting of \$200 billion appropriated per year for 10 years. This public infrastructure plan by itself, free of any of the effects from financing, increases GDP by 0.3 percent in 2040. In the case that the plan is financed by with additional federal borrowing, crowd out leads to a decrease in private capital of 0.8 percent, which offsets the productivity gains and leads to a net zero change in GDP in 2040.

Infrastructure Spending and Investment

When the federal government appropriates money to infrastructure spending, two effects limit how quickly and how effectively federal aid becomes productive public infrastructure: (1) state-and-local government infrastructure spending offsets and (2) the time needed to complete the infrastructure investment.

State and Local Offsets

When the federal government awards aid for infrastructure investment, historical evidence indicates that state and local governments often shift or offset their own spending and revenues. PWBM [reviewed empirical studies](#) about how states and localities changed their spending and revenues in response to federal aid. Those studies indicate that an additional dollar in federal spending typically increases actual total (federal, state and local) spending by well less than one dollar, including the federal dollar. State and local governments collect federal aid but do not use all the money for new infrastructure. In our analysis of the American Jobs Plan and the American Families Plan, PWBM assumes that every dollar in federal infrastructure spending leads to about 60 cents of additional public infrastructure investment. This increase in total infrastructure spending is based on the same state-and-local government infrastructure spending offset used in the 2018 analysis of the [Senate Democrat](#) infrastructure plan, which proposed aid to a wide range of different types of infrastructure spending programs.

Different types of federal aid have different effects on state and local government decisions. Types of aid such as *Grants and Matching Grants with Caps* tend to generate infrastructure investment of considerably less than one dollar for each dollar in federal aid. *Matching Grants with Caps for Distressed Areas*; *Direct Federal Spending*; and *Credit Programs, Loans and Tax Credits* typically lead to higher levels of public infrastructure investment for each dollar of federal aid. For proposals that clearly articulate the composition of types of aid, PWBM evaluates the programs in greater detail.

Time to Spend and Build

Once the new infrastructure projects are funded and approved, it takes time to spend the money, and then additional time to complete the investment. A 2016 paper by the Congressional Budget Office (CBO) presents a schedule for spending money that is appropriated for investment, and then a schedule for the time required to complete a set of illustrative infrastructure investments once the money has been spent.¹ For programs that emphasize “shovel-ready” projects such as those emphasized by the 2018 Trump administration and Senate Democrat plans, PWBM projections assume double the spending rates and building rates applied by CBO (2016). For longer-term programs that emphasize the development of new infrastructure initiatives, we apply the building and spending rates directly reported in CBO (2016). In this case, some of the investment takes more than two decades to become productive capital—this reflects spending on very long-term investments in programs such as basic research.

Productivity Effects of Infrastructure Investment

To illustrate the productivity effects of infrastructure, we show the macroeconomic effects of an illustrative \$200 billion, 10-year infrastructure investment plan. To highlight the productivity effects from this capital, in this scenario we assume that the federal infrastructure aid is externally financed and therefore comes at no cost to the federal government.

Table 1. Economic Effects of a \$2 Trillion, Externally Financed Infrastructure Investment

Percent Change from Baseline

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Year	Debt	GDP	Hours Worked	Average Hourly Wages	Private Capital Services	Public Capital Services
2031	0.0	0.2	0.0	0.2	0.1	2.6
2040	-0.4	0.3	0.0	0.3	0.3	4.6
2050	-0.7	0.3	0.0	0.3	0.5	3.5

Note: The \$2.0 trillion in federal infrastructure investment is proportional to the investment allocation in the 2018 Senate Democrats' Jobs and Infrastructure Plan for America's Workers and is unfunded. Consistent with our previous dynamic analysis and the empirical evidence, the projections above assume that the U.S. economy is 40 percent open and 60 percent closed. Specifically, 40 percent of new government debt is purchased by foreigners. The above projections assume the spending rates and building rates applied by CBO (2016). Consistent with empirical evidence, the projections above assume that the elasticity of output to a change in public capital is 0.05. Revenue estimates change with the distribution of taxable income that reflect a dynamic economy.

Table 1 shows the macroeconomic effects in 2031, 2040, and 2050. Although \$200 billion is appropriated every year, only a fraction of that money is spent each year, and many years pass before the entire public infrastructure investment becomes productive. By 2031, public capital has increased only 2.6 percent. However, by 2040, more of the money has been fully invested, which is reflected in a 4.6 percent increase in public capital. As the new public capital gets older, it begins to lose its value as it depreciates. By 2050, after almost all of the money has been invested and has begun to depreciate, public capital is only 3.5 percent above baseline.

Higher public capital raises the productivity of private capital and labor. Because private capital is more valuable with the addition of public infrastructure, households save more and private capital increases by 0.1 percent, 0.3 percent, and 0.5 percent in 2031, 2040, and 2050, respectively. More productive labor is also reflected in higher wages. By 2040, wages go up by 0.3 percent. Greater productivity of labor and capital, combined with additional private capital, leads to an increase in GDP of 0.3 percent in 2040 and 2050. Because GDP goes up, government revenue from business and personal income taxes goes up, reducing the deficit and lowering debt. Federal debt declines by 0.4 percent in 2040 and 0.7 percent in 2050.

Infrastructure Investment and Crowd-Out

Table 2 shows the economic effects from the same infrastructure program, but this time the effects from financing the investment with additional borrowing are included in the analysis.

Table 2. Economic Effects of a \$2 Trillion, Deficit-Financed Infrastructure Investment

Percent Change from Baseline

[DOWNLOAD DATA](#)

Year	Debt	GDP	Hours Worked	Average Hourly Wages	Private Capital Services	Public Capital Services
2031	5.2	-0.1	0.0	-0.1	-0.7	2.6
2040	5.1	0.0	0.0	0.0	-0.8	4.6
2050	4.0	-0.1	0.0	-0.1	-0.7	3.5

Note: The \$2.0 trillion in federal infrastructure investment is proportional to the investment allocation in the 2018 Senate Democrats' Jobs and Infrastructure Plan for America's Workers and is financed with \$2 trillion in additional deficits. Consistent with our previous dynamic analysis and the empirical evidence, the projections above assume that the U.S. economy is 40 percent open and 60 percent closed. Specifically, 40 percent of new government debt is purchased by foreigners. The above projections assume the spending rates and building rates applied by CBO (2016). Consistent with empirical evidence, the projections above assume that the elasticity of output to a change in public capital is 0.05. Revenue estimates change with the distribution of taxable income that reflect a dynamic economy.

Public capital goes up by the same amount as before, increasing by 4.6 percent in 2040 and 3.5 percent in 2050 relative to the current law baseline. However, the additional debt, which is 5.1 percent higher in 2040 and 4.0 percent higher in 2050, crowds out private capital. Private capital declines by 0.8 percent in 2040 and 0.7 percent in 2050. Wages would go down because there is less private capital, but this is offset by higher productivity owing to the public capital investment. In the end, wages are unchanged.

In this case, the decline in private capital offsets the productivity effects of public capital. Even though GDP goes down by 0.1 percent in 2031, more public capital is built over time, leading to a subsequent increase in GDP. The productivity from newly built public infrastructure by 2040 is enough to offset the decline in output from the decline in private capital, and GDP is unchanged by 2040. As the public capital depreciates, however, GDP decreases by 0.1 percent in 2050 relative to baseline.

This report was written by [Jon Huntley](#). Prepared for the website by [Mariko Paulson](#).

1. "The Macroeconomic and Budgetary Effects of Federal Investment." Congressional Budget Office, June 2016. <https://www.cbo.gov/publication/51628>. ↩