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POLICY BRIEF
COVID-19 RESPONSE

Will a Burst in Federal Infrastructure Spending Accelerate the Recovery from the COVID-19 Recession?

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As a result of the global COVID-19 pandemic and the accompanying economic shutdown to slow its spread, US real gross domestic product (GDP) declined at a 4.8 percent annual rate in the first quarter of 2020.[1] For the second quarter, the Congressional Budget Office (CBO) projects a grim 11.8 percent drop in real GDP in the second quarter compared with the first quarter of the year. This works out to an unheard-of 39.6 percent decline on an annual basis.[2] The CBO projects a robust recovery in the second half of the year, though. Because this is an unprecedented economic (and health) crisis, the CBO says that these preliminary forecasts are "subject to enormous uncertainty."[3] Although a recovery in the second half of the year seems likely, the recovery's strength remains highly uncertain.

Facing a highly uncertain and potentially sluggish recovery in a presidential election year, the president and Congress will face pressure to act. The president has pressed for increased infrastructure spending to boost the economy. If he continues to promote this idea, members of Congress may go along with this policy as a potential way to speed up the recovery. Because the current transportation funding bill is due to expire in September, there will be a window of opportunity to act.

A limited number of research papers have carefully examined the impact of government investment spending on highways and other infrastructure since the Great Recession. Published papers have examined the effectiveness of the spending programs embodied in the American Recovery and Reinvestment Act of 2009 (ARRA). I show in this policy brief that the preponderance of evidence suggests that this type of spending does not significantly boost the economy in the short term.[4] In particular, the most likely impact is a spending multiplier that is less than one.[5] This implies that government investment spending reduces, or crowds out, some private spending.

When it comes to allocating billions of dollars to various potential infrastructure projects, the evidence says not to rush if the goal is short-term stimulus. A more deliberate, long-term perspective and funding reforms are needed if the goal is to focus infrastructure investment on projects that promote economic activity and prosperity.[6]

HOW DOES BUILDING INFRASTRUCTURE IMPACT THE ECONOMY?

From a long-term economic growth perspective, a country's infrastructure can improve economic performance in several ways.[7]

- First, highways increase the mobility of workers and help businesses deliver their products and services to consumers. Highways allow workers to find jobs farther from home that are better matches to their skills. This increases labor productivity and wages. Businesses can move products faster to their customers, lowering shipping and inventory costs, which improves efficiency. These factors raise profits, encouraging business expansion.[8]

- Second, the introduction of productive public capital increases the productivity of private capital.[9] This creates an incentive to expand private capital investment, increasing the productivity of labor. Employment and wages rise.

- Third, when people think about the employment effects of infrastructure expansion, they often have images from the Great Depression in mind; e.g., a line of workers using picks and shovels to build a road. While that may reflect road construction in the 1930s, it's not how roads are built today. In the 21st century, road building uses advanced machinery and skilled workers. It is a less labor-intensive process than in the 1930s. Job creation comes more from the impact on mobility and rising labor productivity than from jobs associated with the actual construction of an infrastructure project.[10]

  In America's current situation, many unemployed workers come from the service sector. It is unlikely that a laid-off waiter can make a fast transition to driving highway construction equipment. Laid-off construction workers may be able to make such a transition, but as the economy recovers, this type of transition will hamper the expansion of private-sector projects.[11]

- Fourth, the expansion of airports and seaports promotes long-distance travel and international trade. The deregulation of air travel and the increased efficiency at seaports have lowered the cost of international trade. This significantly raises the US standard of living.[12]

- Finally, clean drinking water and effective sewage systems have a positive impact on population health, reducing disease, lowering infant mortality rates, and increasing life expectancy. Healthier children perform better in school, which raises human capital. Higher life expectancy enables productive workers to stay in the workforce longer. These factors raise human capital, productivity, and economic growth.[13]

From a short-term stimulus perspective, it would be difficult to capture these effects. Several potential problems complicate assessing the short-term impact of incremental infrastructure spending on output.[14] It takes time to start an infrastructure project. Infrastructure projects require extensive planning before implementation. It often takes up to a year to start a highway maintenance project; even more time is often involved in starting new construction. There can be legal challenges associated with the environmental impact or neighborhood displacement effects that delay significant projects. These delays shift the impact timing to periods when the economy has already recovered.

In addition, spending financed with taxes distorts economic decision-making, adversely affecting the economy. If financed with debt, the pressure on the fiscal deficit could lead to a premium on the government's borrowing rate as well as businesses updating their expectations and reducing investment in anticipation of higher taxes after the current crisis.

An important caveat: the type of project being funded matters. Some investments in public infrastructure enhance private capital; those investments are likely to have a higher economic impact, both in the short-term and primarily over time as their positive economic effects compound.[15] The evidence examined later in this brief considers the aggregate effect of public investment. If high-return investments do not outweigh the effect of low-return ones, then stimulus packages are usually a mixed bag with limited impact.

WHAT DOES THE EVIDENCE SAY?

This section of the brief summarizes the recent findings of empirical studies that attempt to quantify the impact of government investment expenditures on economic activity.[16]

There are several issues associated with understanding reported government spending multipliers. The most common approach, used in the recent literature, is to calculate a cumulative multiplier for a time horizon: for example, for one year or for three years. To start, researchers estimate the present value of the output change following an increment in government spending. In their empirical estimations, they take care to control for other variables besides the increment in government spending that might impact economic activity. This allows researchers to isolate the impact of the federal spending. Dividing the estimated present value of the change in output by the present value of the change in government spending yields the multiplier.[17]

Recent Aggregate Estimates

Recent discussions of the impact of government infrastructure investment on economic performance began with work by David Aschauer.[18] He estimates that the elasticity of US GDP with respect to the public capital stock is 0.39. Because elasticity is a measure of relative percentage

changes, his results say that a 1.00 percent increase in the public capital stock leads to an increase in GDP of 0.39 percent. He argues that the slower growth in the 1970s and 1980s was the result of declining government infrastructure investment over that period. Alicia Munnell uses an approach like Aschauer's and gets similar results.[19] However, recent reviews and meta-analyses of the literature since Aschauer's work was published find the estimated elasticity in the short term to be around 0.08 and 0.12 in the long term.[20] The smaller elasticity estimate is the result of dealing with the estimation problems that plagued the earlier work. The size of the elasticity ultimately impacts the size of the estimated spending multiplier.

One can be more confident of the findings of the more recent papers, as the researchers were able to deal with an important econometric issue: simultaneous equation bias.[21] Simultaneous equation bias occurs when the variables of interest are mutually determined, instead of only one variable having an impact on the other. For example, in this case, additional public capital can increase GDP, but the reverse is also true: countries with higher levels of GDP are likely to spend more on public capital (infrastructure). As tricky as it sounds, the recent research takes these feedback effects into account when estimating the economic impact of infrastructure investment.[22]

Alredo Pereira and Rafael Flores de Frutos were the first to address the various feedback effects of the economy on government infrastructure investment. Looking at the period from 1956 to 1989, they find that a $1.00 increase in public capital results in a $0.65 long-term accumulated increase in GDP.[23] This represents a long-term multiplier of 0.65. They also find small employment effects. Based on their results, they do not recommend using infrastructure investment as a business cycle stabilization tool.

Two more recent papers have focused on estimating the size of the aggregate short- and long-term government investment multipliers taking into account the feedback effects.[24] Ethan Iltzetzki, Enrique G. Mendoza, and Carlos A. Végh estimate a model for 44 countries (including the United States) for 1960 through 2007 using quarterly data and a vector autoregression model that allows for dynamic feedback effects from the economy to public investment.[25] They estimate a government investment multiplier for high-income economies of 0.39, which is statistically significant, in the short term and 1.50, which is not statistically significant, in the long term. The government consumption multiplier was estimated to be significant in the short term and long term, at 0.39 and 0.66, respectively.

Christoph Boehm deals with another issue raised by Valerie Ramey.[26] If government spending is anticipated by the private sector, much of the impact on economic activity might occur before the investment. Controlling for this, Boehm looks at a group of Organisation for Economic Co-operation and Development countries (including the United States) between 2003 and 2016 and finds no evidence of short-term impacts from government investment and finds a short-run consumption multiplier around 0.80. In both cases, he finds long-term multipliers greater than one. The smaller government investment multiplier occurs because higher expected wealth from

the productive public capital offsets the negative wealth effect associated with the related tax increases. Since investment is very sensitive to interest rate movements, the investment drop is large, resulting in little expansion of output in the short run. Boehm concludes government investment does not provide much short-term stimulus to the economy.

Most estimates of short-term government investment multipliers are less than one. This shows that private consumption and investment decline because of higher taxes or interest rates when government investment spending increases in the short term. There is a net positive output effect, but it tends to be small. While not accounted for in these papers, delays in the start of a project and distortionary taxes to finance the projects tend to weaken the overall impact of infrastructure spending, especially in the short-to-medium term, the time frame that is relevant if these expenditures are designed to stimulate the economy in a recession.

Estimates from the American Recovery and Reinvestment Act of 2009

Considerable attention has been given to the regional impact of infrastructure spending associated with the ARRA. Research has focused on the impact of government investment spending at the state or county level. These estimates measure the impact on a state or county from additional spending of federal funds relative to the average state. The estimates do not control for financing issues and spillovers between regions. As Valerie Ramey shows, since state (and county) economies vary considerably by size, the impact can vary across states, and the results may not be representative of the typical state.[27] Without weighting each state by some measure of size, the results can be misleading.[28] The impact of an additional dollar spent in California, a large state economically and geographically, is likely to differ from the impact of federal spending in a smaller state, such as Rhode Island. In Rhode Island, much of the impact can be expected to spill over and impact neighboring state economies rather than be felt entirely in Rhode Island.

Sylvain Leduc and Daniel Wilson examine the impact of highway spending from the ARRA on state GDP and employment between 1993 and 2010.[29] They estimate an average 10-year state GDP multiplier that was a little below two. But the other results in the paper are puzzling. For five years following the increase in infrastructure spending, employment, wages, and state GDP are negative. There must be significant delays in starting highway projects, highway construction must be disruptive to the local economy, or both.[30] Leduc and Wilson also provide evidence that highway construction is a capital-intensive industry. These results suggest that highway spending did not provide much short-term stimulus, especially in terms of employment, to the average state economy during the Great Recession.

In a later paper, Leduc and Wilson find that federal highway construction assistance has a modest impact on state highway construction jobs. A $1 million grant increases construction employment by two jobs. They also find that these grants significantly encourage more state and local highway

spending.[31] The state spending increase is higher in states where campaign contributions from the public works sector were greater than previous levels. This result differs from those of Brian Knight, who finds nearly complete crowding out of state spending on highways during 1983–1997.[32]

However, Leduc and Wilson do not weight the observational unit by a measure of state size. When Bill Dupor weights the observation unit by population (a control for state size), he finds no increase in state and local highway expenditures, suggesting that states take advantage of federal funding to shift state funds—funds that would have gone to the highway system—to other state programs.[33]

Andrew Garin examines the impact of ARRA construction projects on county employment.[34] His results suggest that an additional $1 million spent at the county level leads to an increase in construction employment of six job years at a cost of $150,000 per job year. Looking at it from another perspective, each addition dollar spent raises construction payrolls by $0.30 during the five years after the passage of the ARRA Act. He finds no evidence of a spending multiplier because county payrolls and employment increase less than payrolls and employment for construction firms in the county.[35] His results are heavily influenced by county size. Smaller, more isolated counties experience the biggest impact because more of the spending stays in the county.

The results from the state and county research provide little support that highway spending can provide much short-term stimulus. Methodological issues have clouded the question, so the size of the local multiplier is highly uncertain. Another explanation is that some infrastructure projects can help to promote long-term growth, while others may not be very productive. Also, implementation lags, construction disruptions, and poor targeting reduce the short-term impact; that impact is the point of the policy.

POLICY IMPLICATIONS

Government infrastructure investment can play an important role in promoting economic activity. It can improve mobility, raise the return on private capital investment, and help improve population health over the long term.

Often, infrastructure investment is thought to be a good source of short-term stimulus during a recession. The evidence from the recent economics literature does not support this claim, though. Spending multipliers are consistently estimated to be less than one in the short term, which is the relevant business cycle time frame. Estimates of the local impact do not fare any better. There remains considerable uncertainty over the short-term impact, making the notion of accelerating billions of taxpayer dollars a questionable policy for stimulating the economy in a recession.

Infrastructure investment spending should be part of a long-term government investment program. Projects need to be carefully evaluated. Reform is needed so that management of the

different infrastructure systems is the responsibility of the appropriate level of government. This would result in better infrastructure investment decisions, allowing the economy to better capture the benefits of a well-run infrastructure.[36]

ABOUT THE AUTHOR

Robert Krol is an emeritus professor of economics at California State University, Northridge; a senior affiliated scholar at the Mercatus Center at George Mason University; and a member of the Heartland Institute's board of policy advisers. He also worked as an economist at Security Pacific National Bank in Los Angeles and the Milken Institute in Santa Monica, California. He received his PhD in economics from Southern Illinois University, Carbondale in 1982. His current research focuses on regulation, transportation infrastructure issues, international trade and investment, and the impact of economic policy uncertainty on the economy.

NOTES

1. Bureau of Economic Analysis, "Gross Domestic Product, First Quarter 2020 (Second Estimate) Corporate Profits, First Quarter 2020 (Preliminary Estimate)," news release no. BEA 20-23, May 28, 2020, https://www.bea.gov/data/gdp/gross-domestic-product.
2. Phil Swagel, "CBO's Current Projections of Output, Employment, and Interest Rates and a Preliminary Look at Federal Deficits for 2020 and 2021," *CBO Blog*, April 24, 2020.
3. Swagel, "CBO's Current Projections of Output."
4. Valerie A. Ramey, "Ten Years after the Financial Crisis: What Have We Learned from the Renaissance in Fiscal Research?," *Journal of Economic Perspectives* 33, no. 2 (2019): 89–114.
5. Spending multipliers measure the impact an increase in government spending has on real GDP. A multiplier greater than one indicates that a $1 increase in spending causes output to increase by more than a $1. In traditional Keynesian models, this occurs because the recipient of the government spending uses the additional income to increase consumption. This induced additional spending results in a multiplier greater than one. In modern macroeconomic models, the greater government spending reduces individuals' wealth, causing them to increase labor supply. This results in an increase in GDP. The decline in wealth can reduce consumption and investment. In this case, the multiplier would be less than one.
6. Robert Krol, "Federal Highway Funding Needs to Change" (Mercatus on Policy, Mercatus Center at George Mason University, Arlington, VA, August 2017); Veronique de Rugy and Matthew D. Mitchell, "Would More Infrastructure Spending Stimulate the Economy in 2017?" (Mercatus Policy Primer, Mercatus Center at George Mason University, Arlington, VA, 2017).
7. In this paper, I focus on public, rather than privately owned, infrastructure.
8. Stephen J. Redding and Matthew A. Turner, "Transportation Costs and the Spatial Organization of Economic Activity," in *Handbook of Urban and Regional Economics*, ed. Gilles Duranton, Vernon Henderson, and William Strange, vol. 5 (Amsterdam: Elsevier, 2015).
9. Not all these infrastructure projects will be productive; pork-barrel projects are common. Robert Krol, "Political Incentives and Transportation Funding" (Mercatus Research, Mercatus Center at George Mason University, Arlington, VA, July 2015); Robert Krol, "Public Infrastructure and Economic Development," in *Handbook of Economic Development*, ed. Kuotsai Tom Liou (New York: Marcel Dekker, 1998).

10. Edward L. Glaeser, "If You Build It . . .," *City Journal*, Summer 2016; Robert Krol, "Transportation, Mobility, and Economic Growth," *InsideSources*, January 19, 2017.

11. Garett Jones and Daniel M. Rothschild, "Did Stimulus Dollars Hire the Unemployed? Answers to Questions about the American Recovery and Reinvestment Act" (Mercatus Working Paper, Mercatus Center at George Mason University, Arlington, VA, September 2011); Garett Jones and Daniel M. Rothschild, "No Such Thing as Shovel Ready: The Supply Side of the Recovery Act" (Mercatus Working Paper, Mercatus Center at George Mason University, Arlington, VA, September 2011).

12. Gary Hufbauer and Zhiyao Lu, "The Payoff to America from Globalization: A Fresh Look with a Focus on Costs to Workers" (Policy Brief No. 17-16, Peterson Institute for International Economics, Washington, DC, May 2017); Redding and Turner, "Transportation Costs."

13. Robert J. Gordon, *The Rise and Fall of American Growth* (Princeton, NJ: Princeton University Press, 2016); Rajesh Sharma, "Health and Economic Growth: Evidence from Dynamic Panel Data of 143 Years," *Plos One* 13, no. 10 (2018): 1–20.

14. Eric M. Leeper, Todd B. Walker, and Shu-Chun S. Yang, "Government Investment and Fiscal Stimulus," *Journal of Monetary Economics* 57, no. 8 (2010): 1000–1012; Valerie A. Ramey, "The Macroeconomic Consequences of Infrastructure Investment," in *Economics of Infrastructure Development*, ed. Edward L. Glaeser and James M. Poterba (Chicago: University of Chicago Press, forthcoming).

15. See Krol, "Public Infrastructure and Economic Development" on this issue.

16. Government investment spending includes infrastructure spending on highways and buildings. Government consumption represents expenditures on goods and services such as education and the judicial system. Transfer payments such as welfare and Social Security are not included in government consumption.

17. Andrew Mountford and Harald Uhlig, "What Are the Effects of Fiscal Policy Shocks?," *Journal of Applied Econometrics* 24, no. 6 (2009): 960–92; Ramey, "Ten Years after the Financial Crisis."

18. David Aschauer, "Does Public Capital Crowd Out Private Capital?," *Journal of Monetary Economics* 24, no. 2 (1989): 171–88.

19. Alicia H. Munnell, "Why Has Productivity Growth Declined? Productivity and Public Investment," *New England Economic Review*, 1990 issue (1990): 3–22.

20. These values come from a meta-analysis of the literature. Pedro R. D. Bom and Jenny E. Ligthart, "What Have We Learned from Three Decades of Research on the Productivity of Public Capital?," *Journal of Economic Surveys* 28, no. 5 (2014): 889–916; Patricia C. Melo, Daniel J. Graham, and Rubin Brage-Ardao, "The Productivity of Transport Infrastructure Investment: A Meta-Analysis of the Empirical Evidence," *Regional Science and Urban Economics* 43, no. 5 (2013): 695–706.

21. I focus on the simultaneous equation bias and the need to capture the dynamic impact over time. There are also potential issues with data stationarity and controlling for other factors that could impact results.

22. They model the relationship using vector autoregressions or estimate the model using the instrumental variables technique.

23. Alfredo M. Pereira and Rafael Flores de Frutos, "Public Capital Accumulation and Private Sector Performance," *Journal of Urban Economics* 46, no. 2 (1999): 300–322. They did not determine whether the results were statistically significant.

24. This paper discusses the key recent papers on infrastructure investment. For a more detailed discussion see Ramey, "Ten Years after the Financial Crisis" and Ramey, "The Macroeconomic Consequences of Infrastructure Investment." For a review of the earlier research, see Edward Gramlich, "Infrastructure Investment: A Review Essay," *Journal of Economic Literature* 32, no. 3 (1994): 1176–96 or Krol "Public Infrastructure and Economic Development." These papers show there was considerable uncertainty about the impact of public investment on the economy based on published research in the 1990s.

25. Ethan Ilzetzki, Enrique G. Mendoza, and Carlos A. Végh, *Journal of Monetary Economics* 60, no. 2 (2013): 239–54.

26. Christoph E. Boehm, "Government Consumption and Investment: Does the Composition of Purchases Affect the Multiplier?," *Journal of Monetary Economics*, published ahead of print, May 21, 2019; Valerie A. Ramey, "Identifying Government Spending Shocks: It's All about the Timing," *Quarterly Journal of Economics* 126, no. 1 (2011): 1–50.

27. Ramey, "The Macroeconomic Consequences of Infrastructure Investment."

28. However, the weighting system can result in large states having too much influence on the results.

29. Sylvain Leduc and Daniel Wilson, "Roads to Prosperity or Bridges to Nowhere? Theory and Evidence on the Impact of Public Infrastructure Investment," in *NBER Macroeconomics Annual, Volume 27*, ed. Daron Acemoglu, Jonathan Parker, and Michael Woodford (Chicago: University of Chicago Press, 2013): 89–142.

30. Trevor Gallen and Clifford Winston, "Transportation Capital and Its Effects on the U.S. Economy: A General Equilibrium Approach" (Purdue University working paper, August 2018); Leeper, Walker, and Yang, "Government Investment and Fiscal Stimulus."

31. Sylvain Leduc and Daniel Wilson, "Are States Roadblocks to Federal Stimulus? Evidence on the Flypaper Effect of Highway Grants in the 2009 Recovery Act," *American Economic Journal: Economic Policy* 9, no. 2 (2017): 253–92.

32. Brian Knight, "Endogenous Federal Grants and Crowd-Out of State Government Spending: Theory and Evidence from the Federal Highway Program," *American Economic Review* 92, no. 1 (2002): 71–92.

33. Jack Garton and Bill Dupor, "Why the 2009 Recovery Act Didn't Improve the Nation's Highways" (Economic Synopses No. 14, Federal Reserve Bank of St. Louis, St. Louis, MO, 2017). Since the ARRA did not have a standard highway matching component, they were effectively lump-sum grants. Without a matching component, the tax price of the grant does not decline, so the increase in desired consumption of highways does not increase as much as with a matching grant. As a result, the increase in state and local expenditure on highways does not increase as much. There should be less crowding in of state and local highway expenditures. Ronald C. Fisher, *State and Local Public Finance* (London and New York: Routledge, 2016).

34. Andrew Garin, "Putting America to Work, Where? Evidence on the Effectiveness of Infrastructure Construction as a Locally Targeted Employment Policy," *Journal of Urban Economics* 111, issue C (2019): 108–31.

35. Several papers estimate multipliers associated with total ARRA outlays rather than focusing on government investment spending. Multiplier estimates range from 0.30 to 1.70. Gabriel Chodorow-Reich, "Geographic Cross-Sectional Fiscal Spending Multipliers: What Have we Learned?," *American Economic Journal: Economic Policy* 11, no. 2 (2019): 1–34 and Ramey, "Ten Years after the Financial Crisis." Once one weights the model by state populations, the multiplier declines and becomes insignificant. Ramey, "Ten Years after the Financial Crisis."

36. Robert Krol, "Political Incentives and Transportation Funding" (Mercatus Research, Mercatus Center at George Mason University, Arlington, VA, 2015); Krol, "Federal Highway Funding Needs to Change."