
Soaring Construction Costs Threaten Infrastructure Push

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INTRODUCTION

Throughout the 2016 presidential campaign, Donald Trump promised a massive infrastructure program financed primarily by the private sector. Trump's 2018 budget proposed leveraging \$200 billion in direct federal spending into \$1 trillion in infrastructure investment through private sector incentives.

However, President Trump recently retreated from this campaign pledge that private sector funding would be a cornerstone of his infrastructure plan, raising questions as to whether the plan would be financed through increased federal spending or if state and local governments would be forced to foot most of the bill.¹ Unfortunately, this approach is likely to limit the scope of the initiative to a fraction of what Trump has described, as federal, state, and local governments continue to deal with the reality of limited budget resources. In any case, there's a large obstacle to any ambitious infrastructure plan – soaring construction costs.

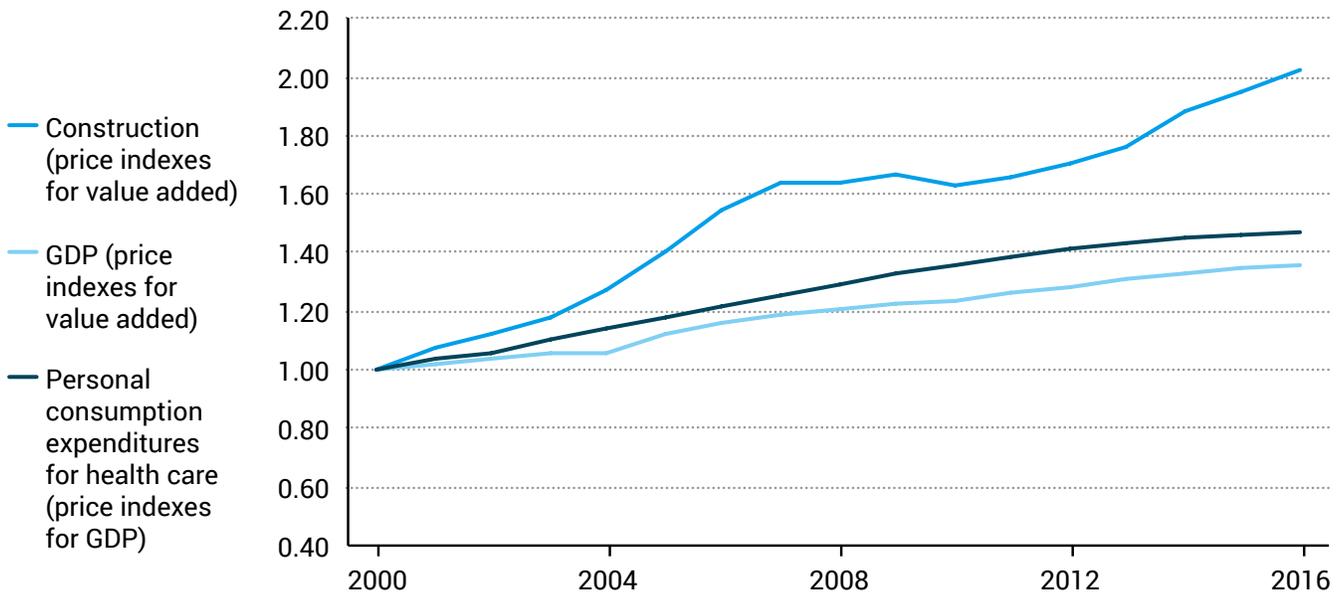
Bringing down the astronomical cost of construction in the United States, which turns even the simplest infrastructure projects into enormous fiscal burdens, would help make the infrastructure upgrade that America so badly needs more affordable.

The numbers are astounding. Since 2000, the cost of construction has doubled, as measured by the Bureau of Economic Analysis – far

exceeding the price increase for healthcare.² It has become 88 percent more expensive for the private sector to invest in new buildings and 68 percent more expensive for the federal government.^{3,4} Since 2003, the cost of

highway construction has gone up 66 percent.⁵ Meanwhile, the overall price level in the economy has gone up only 33 percent during this period and, even during today's period of low inflation, the cost of construction continues to rise.⁶

FIGURE 1: The Price of Construction Has Doubled since 2000



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Oddly, this costly trend seems to be unique to the United States. As Vox's Matthew Yglesias notes, "The Second Avenue Subway in New York City, for example, is being built at a cost of nearly \$1.7 billion per kilometer while new subway lines are being built in Paris, Copenhagen, and Berlin for about \$250 million per kilometer."⁷ Bloomberg writer and economist Noah Smith points out, "That suggests that U.S. costs are high due to general inefficiency – inefficient project management, an inefficient government contracting process, and inefficient regulation."⁸

In order to afford the infrastructure upgrade our country badly needs, we'll have to bend down the construction cost curve. In this report, I provide background on the importance of the construction sector to the overall economy, identify the factors driving costs up, give examples of innovative technologies that lower costs and raise productivity, and identify government policies that can facilitate more innovation and investment.

BACKGROUND AND COST DRIVERS

Construction is a major component of U.S. economic activity. In 2016, the sector contributed about 4.2 percent of GDP, somewhat below its long-term average.⁹ Construction employs nearly 7 million Americans and is one of the largest customers for the manufacturing and mining industries.^{10,11}

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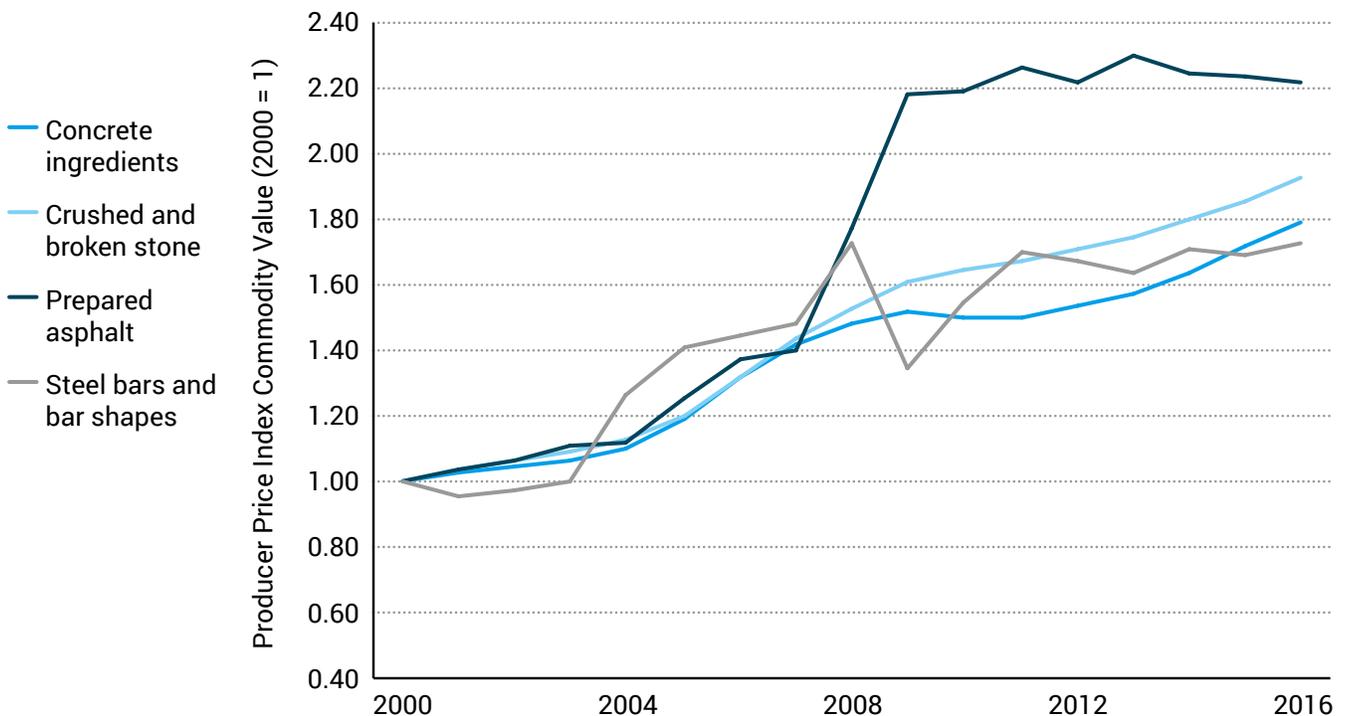
So what’s behind the cost increase in the construction sector? “Getting work done is more expensive. Because of low productivity in the sector, what used to take nine people now takes ten,” Anirban Basu, an economist with expertise in the construction industry, told Progressive Policy Institute (PPI). Indeed, the number of hours worked and the number of employees in commercial construction both remain about 9 percent lower than they were in 2007 and 6 percent lower than their 2000 levels.¹² Meanwhile, the cost of construction labor has actually fallen behind with the rest of the economy. Since 2000, real hourly pay for

production and nonsupervisory workers in the construction industry has risen only 7 percent, compared to a 10 percent gain for the economy as a whole.¹³ Thus, the sector is producing less while construction workers have lost ground in terms of wages.

Paradoxically, contractors point to a skilled labor shortage in commercial construction as one reason construction costs have risen.¹⁴ When skilled workers like carpenters and electricians are scarce, work slows down, causing delays and budget overruns. The average backlog for commercial construction was almost 9 months – and 11 months for infrastructure.¹⁵

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FIGURE 2: Cost of Building Materials since 2000



The cost of building materials has also risen.¹⁶ Certain asphalt products, paving mixtures and steel products are more than twice as expensive today as they were in 2000. Crushed and broken stone is 93 percent more expensive. Concrete ingredients and related products are 79 percent more expensive. The cost of asphalt and paving mixtures, a petroleum-based product, reflects the cost of oil rising through 2008.¹⁷ Crushed and broken stone is a key ingredient in concrete, thus tracing it closely on the cost curve. Steel and concrete rose during the housing boom before declining, then recovering.

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President Trump's protectionist promise to limit imports has also induced domestic material producers to raise prices.¹⁸ And, in March 2017, the Commerce Department slapped duties ranging from 3.62 percent to 148 percent on seven foreign producers it found were selling steel in the U.S. market below its fair price.¹⁹ This too tends to raise the price of steel, a common material in construction.

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Regulation and bureaucracy have contributed to the cost increase as well. Common Good, a government reform coalition, finds that building permits for infrastructure projects can take a decade or longer, significantly increasing their cost:

“Our analysis shows that a six-year delay in starting construction on public projects costs the nation over \$3.7 trillion, including the costs of prolonged inefficiencies and unnecessary pollution. This is more than double the \$1.7 trillion needed through the end of this decade to modernize America's infrastructure.”²⁰

New York's Second Avenue Subway, which opened in early 2017 – five years after its estimated completion date and almost a century after being proposed – ran \$500 million over its original budget of \$4 billion – all just to add three stops. By comparison, the Empire State Building was built in just 410 days. One cost driver stemmed from when the state and federal government fought for more than a year about whether a fire-suppression system met longstanding federal “buy America” mandates. Another was the Metropolitan Transit Authority's inability to keep private-sector contractors on schedule.²¹

Many cities, counties and municipalities have statutes on the books that limit the types of materials that can be used for infrastructure projects. For example, the city of Rock Hill, South Carolina requires that “all pipe laid outside the road right-of-way shall be ductile iron.”²² So too does the city of Portage, Michigan.²³ A recent study found that municipalities limiting what kind of materials can be used in infrastructure projects are spending 27 to 34 percent more than municipalities that do not.

Similarly, a recent report on capital construction projects at New York City libraries and cultural institutions found projects to run significantly over budget when managed by the city's chief

capital construction agency, the Department of Design and Construction rather than by the libraries and cultural institutions themselves. Capital upgrades to the Kingsbridge Library in New York cost \$1,117 per square foot – and Weeksville Heritage Center cost \$1,398 per square foot.²⁴ The median capital project took more than four years to complete, with 17 projects lasting more than seven years, and the median cost for new buildings was \$930 per square foot. By comparison, the average cost of six new, self-managed public libraries was \$523 per square foot. Among the problems driving costs up were a lack of coordination among oversight agencies, little accountability for projects to run on time and on budget and ineffective budgeting and planning processes.

MODERNIZING THE U.S. CONSTRUCTION INDUSTRY

To date, 70 percent of IT investment has been made by digital industries.²⁵ Physical industries – where 75 percent of the private sector workforce is employed – including construction have accounted for only 30 percent of IT investment.

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In order to realize productivity gains and cut costs, the construction sector will need to invest more in innovative technologies like robotics, information modeling, digitization and new building materials and processes. For example, industrialist Elon Musk of Tesla and SpaceX fame has also founded a tunnel boring company that will dig underground tunnels to alleviate traffic congestion. The project aims to

reduce tunnel costs by a factor of more than 10 by reducing the diameter of tunnels and increasing the speed of the boring machine.²⁶ Robot-assembled construction, which uses robots for repetitive and predictable construction projects such as tiling, bricklaying, welding and demolition, is also being utilized.²⁷

The construction industry could integrate next-generation 5-D building information modeling (5-D BIM).²⁸ 5-D BIM software uses the standard 3-D spatial design parameters and links them to scheduling and cost-related information. When major aerospace companies adopted similar 3-D modeling technology in the 1970s, it “helped to improve sector productivity by up to ten times.”²⁹

Most of the construction industry still relies on paper tracking that is costly, time-consuming and delayed. Digitizing work flows and utilizing mobile devices and apps that can share information in real time – such as time and material tracking, project updates, equipment maintenance and incident reporting – could save time and money.

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New materials and processes would help cut costs. Some materials still in the development phase include cement that can be programmed to form desired shapes,³⁰ concrete that heals itself,³¹ and strong, lightweight nanomaterials that may eventually substitute for steel reinforcement.³² Additionally, structural 3-D printing is being designed and implemented.

The McKinsey Global Institute recently estimated that, if construction sector productivity were able to catch up with

the rest of the economy, the sector’s value would be increased by \$1.6 trillion, adding about 2 percent to the global economy.³³ They estimate that about one-third of this opportunity would be in the United States.

If construction sector productivity were able to catch up with the rest of the economy, the sector’s value would be increased by \$1.6 trillion, adding about 2 percent to the global economy.

New Technologies to Boost Construction Productivity and Cut Costs

ROBOTICS	Tunnel boring and robot-assembled construction
INFORMATION MODELING	5-D building information modeling that combines a project’s cost and schedule with the standard 3-D spatial design parameters
DIGITIZATION	Digitizing workflows and utilizing mobile to reduce paperwork, save time and share information in real time
NEW BUILDING MATERIALS AND PROCESSES	Programmable cement, self-healing concrete, strong nanomaterials that may substitute for steel, and structural 3-D printing

EXPEDITE PERMITS AND INVEST IN TECH AND SKILLS

Federal, state and local governments can play a role in bringing down the cost of construction by speeding up regulatory review. Common Good proposes a two-year review for the permitting process, with one agency having overriding permitting authority.³⁴

contracting by assessing value rather than defaulting to the lowest bid, and simplifying the design review process.

Federal, state and local governments can play a role in bringing down the cost of construction by speeding up regulatory review.

The Center for an Urban Future offered 12 recommendations to improve costs for capital projects on New York City libraries and cultural institutions. Some of these include starting to systematically track capital project costs and timelines, establishing dependable funding for capital construction projects (including routine state-of-good-repair investments), improving

The federal government can help close the skilled labor shortage in construction by investing more in upskilling. Previously, in a report for PPI, Harry Holzer proposed creating one million new apprenticeships and a “High-Road Jobs Fund” for states to support creation of good jobs, including skilled trades that pay

middle-class wages.³⁵ Under the fund, states would provide matching funds and indicate how they would support and reward high-road job creation, and the federal government would fund states with the most credible plans for the largest numbers of workers. PPI has also proposed a new \$10 billion “Race to the Top” for states, which would promote skill formation with high labor market value, such as electricians, carpenters and welders. Governments should also create stronger incentives for employers to

create pathways into skilled trades. These could include tax credits for employee training, tax credits or grants for employers who pay middle-skill workers more, and giving preference to these firms in public procurement contracts.³⁶

The federal government can help close the skilled labor shortage in construction by investing more in upskilling.

Streamlining Government and Investing in Tech and Skills

<p>SPEED REGULATORY REVIEW</p>	<p>Implement a two-year review for building permits, with one agency having overriding permitting authority. Systematically track capital project costs and timelines. Establish dependable funding for capital construction. Improve contracting by considering value rather than lowest bid. Simplify the design review process.</p>
<p>INVEST IN SKILLED LABOR</p>	<p>Create one million new apprenticeships, a “High-Road Jobs Fund,” and a \$10 billion “Race to the Top” that would promote skill formation, and incentives for employers to create pathways into skilled trades</p>
<p>INCENTIVIZE INVESTMENT IN TECHNOLOGY</p>	<p>Create tax credits for construction firms that invest in R&D and IT</p>
<p>PROMOTE STRONG COMPETITION</p>	<p>Allow flexibility when considering materials in infrastructure projects.</p>
<p>TAP PRIVATE CAPITOL</p>	<p>Governments should tap private capital via public-private partnerships (P3s) where appropriate when building public works.</p>

Federal and state governments should encourage construction firms to invest more in cost-cutting and productivity-enhancing R&D and information technology. Construction is currently one of the least digitized sectors in the world.³⁷ Tax credits that make it cheaper for firms to experiment with new ideas would encourage wider adoption of innovative

processes and technologies. For example, states have expanded the federal R&D tax credit.³⁸ Sonecon’s Robert Shapiro has called for allowing businesses to fully expense the cost of equipment in its purchase year.³⁹ And last year the government of Alberta invested in a \$75-million tax credit to encourage businesses to make capital investments that it anticipated

leveraging into \$700 million worth of private sector investment.⁴⁰ Incentives such as these would encourage more investment in the construction sector and bring down skyrocketing costs for the public.

Local governments should allow more materials to be considered in infrastructure projects. For example, Michigan Senate Bill 157 and South Carolina House Bill 3652 would make certain that, when state money is used, all municipalities give their local engineers flexibility to consider different materials that meet approved performance standards used in water infrastructure projects.^{41, 42}

Lastly, governments should tap private capital via public-private partnerships (P3s) where appropriate when building public works. The Federal Highway Administration defines P3s as “contractual agreements formed between a public agency and a private sector entity that allow for greater private sector participation in the delivery and financing of transportation projects.”⁴³ P3 benefits include private financing and project acceleration, cost and time savings, lifecycle efficiencies, improved project quality and risk transfer.⁴⁴ For example, the Chicago Region Environmental and Transportation Efficiency (CREATE) Program is a 70-project, \$4.4 billion plan to improve the efficiency of freight, commuter, and intercity rail and to reduce highway delay in the Chicago region. Freight rail currently averages a 30-hour wait time when traversing the city.⁴⁵ As of February 2017, railroad companies had made 25 percent

of funding commitments to the project, which has reduced travel time to move freight across the city by roughly 45 percent.⁴⁶

CONCLUSION

America’s infrastructure crisis is about more than a lack of political will. The rising price of construction means the bill to fix roads, bridges, and dams just keeps getting bigger and bigger – making it harder to pass against competing priorities.

Fixing this problem will require strong effort from both the private and public sectors. On the private side, the construction industry will need to invest more in innovative technologies that increase productivity and cut costs. Construction is ripe for tech-driven innovation.

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Government has a key role to play in both driving demand and lowering costs. Governments can play a role by lowering regulatory barriers and adopting policies that catalyze increased investment in the sector. It’s essential for governments to enact tax incentives that catalyze increased investment in the sector. Equally important, governments must tackle the regulatory overhang that drives up cost. Smart regulatory improvement might be just the ticket for getting infrastructure moving again.

ABOUT THE AUTHOR

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