

Testimony of Samuel D. Zurier in support of S-2124

Bill S-2124 would require the Department of Administration to commission an independent efficiency and performance audit of the Department of Transportation to be completed by January 1, 2027. The audit would cover a range of areas including project delivery efficiency, asset management, engineering capacity, maintenance efficiency and governance and oversight. While RIDOT provides periodic reports concerning a limited number of performance areas, to my knowledge its reporting is of limited scope without independent review.

I believe that a comprehensive, independent efficiency audit would be beneficial to RIDOT and Rhode Islanders for these reasons:

1. The RIPTA Audit and the RIPTA budget

In recent years, the Rhode Island Public Transit Authority (RIPTA) faced a multimillion dollar funding gap. The General Assembly budget included funding for a portion of that gap, but required RIPTA to commission an independent efficiency audit before addressing the rest of that funding gap. The RIPTA efficiency audit concluded that the agency's operations were reasonably efficient when compared to its peers. Because the report arrived late in last year's budget cycle, the General Assembly did not consider whether to close the remaining funding gap. As a result, RIPTA curtailed operations, causing harm to many Rhode Islanders. At a recent hearing, RIPTA stated that the Governor's budget did not contain funding to restore the canceled routes, and that an additional \$5 million to \$10 million would be necessary to accomplish that goal. RIDOT's current budget exceeds \$1 billion; therefore a 5% savings in efficiency (after accounting for the multiplying effect of federal funds) would be more than sufficient to close the RIPTA funding gap.

2. The Washington Bridge draft forensic audit report

Last September, the Attorney General released the draft forensic audit report RIDOT commissioned concerning the failure of the Washington Bridge. Exhibit 1 contains an excerpt, stating its conclusions and recommendations. The report concludes that the failure was foreseeable, and that poor maintenance over a period of decades was one of the contributing factors to the bridge's failure.

3. The Washington Bridge oversight hearing

Last November, the Senate and House Oversight Committees conducted a joint hearing reviewing the failure of the Washington Bridge, including a discussion of the forensic audit report. As reported in the Boston Globe (Exhibit 2), the RIDOT director acknowledged that forensic audit report stated that while the in-house "statewide program manager" could delegate functions to other personnel, that statewide program manager "retains all responsibility for bridge inspection operations for which he or she was assigned." Despite this, the RIDOT Director denied this responsibility and sought to place exclusive responsibility on contractors. The RIDOT Director also was unable to name the in-house statewide program manager responsible for the Washington Bridge.

4. The WPRI Report

In March, WPRI-TV published its Road Woes report (Exhibit 3), which reviewed Federal Highway Administration (FHWA) data from 2014 (just before the start of the Rhode Works program), 2019 and 2024. In each year, Rhode Island had the highest percentage of roads in poor condition in the country. WPRI analyzed the categories of State roads, concluding that Rhode Island's inventory of "urban principal arterials," such as North Main Street in Providence and Route 2 in Warwick, are in especially bad condition, with almost 48% rated as "poor."

5. The Research Paper

WPRI also referred to a research paper by professors at Cal-Berkeley, Columbia and Yale Law School (excerpt at Exhibit 4) that studies the role in-house engineers in state road resurfacing projects. Using their sample of data, the authors compared resurfacing cost per mile across the 50 states. As depicted in Figure D.7 on page 60, Rhode Island's cost of \$2 million per mile was at least twice as much as any other state. Using FHWA data, the authors compared road quality in Figure D.9 on page 62. Rhode Island had the poorest quality by a significant margin. I believe there is a need to study the efficiency of our \$1 billion RIDOT annual budget when there are data indicating that our current program produces the nation's poorest quality roads at what may be the nation's highest cost.

The authors compared these results against each state's level of in-house engineering capacity. The data supported the conclusion that states with greater in-house capacity produced better quality roads at lower cost. RIDOT's status as a low-quality high-cost program is consistent with this conclusion, given the excessive reliance on consultants noted in Director Alviti's testimony.

6. Conclusion

RIPTA remains underfunded after completing successfully an independent efficiency audit. There are multiple indications that RIDOT is not operating at peak efficiency. Rhode Island taxpayers deserve efficient government, and an independent comprehensive efficiency audit of RIDOT would serve that need, while also likely producing efficiency findings that could generate savings to close the RIPTA funding gap.

EXHIBIT 1



I-195 Washington Bridge (700)

Forensic Evaluation and Procedural Audit Related to PT Tie-Down Failures

I-195 SB Washington Bridge over Seekonk River
Providence, RI



DRAFT REPORT

April 5, 2024

WJE No. 2023.7858.0

PREPARED FOR:

Mr. John Preiss
State Bridge Engineer
Rhode Island Department of Transportation
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Rehabilitation

During the 1996-1998 rehabilitation contract, the project team encountered significantly greater deterioration in cantilevers, corbels and drop-in beam ends than previously thought, including voids in tendons and delaminations in the webs of cantilevers. Special provisions were issued to perform nondestructive evaluation using impact echo and indications were explored by creating 1 square foot openings. Voids detected by impact echo and confirmed by drilling were retrofit grouted. Over 125 locations were opened following these procedures. Exact locations and quantities of retrofit grout were not shown in available documents, but it is assumed they occurred through Spans 1 through 14. Note that the top "H" tendon of the cantilevers was not surveyed by impact echo and thus presumably did not receive retrofit grout.

Though details available to WJE are sparse, the 2016 rehabilitation seemed to have been plagued by poor coordination and very little emphasis on progressing the work. Although repairs were heavily concentrated at the east end of the bridge, the distribution and progress of patch repairs seemed very haphazard. Inspection reports document accumulation of construction debris and eventually bird feces on the scaffolding and falsework that remained in place for years. There were instances where back-to-back annual inspections showed very little change in element condition states that would reflect the benefit of ongoing repairs. These conditions are corroborated by some inspection photos that show the same incomplete repair conditions over a period of years. Inspection photos showed persistent incomplete patch repairs with poor preparation and opened areas remaining exposed for extended periods. "Prepared" patches contained corroded reinforcement and severed prestressing strands that were not cleaned or primed, nor supplemented with prestressing splices. Many areas were not appropriately squared off or chipped to required depths below reinforcement.

In addition, the 2016 repair plans called for FRP strengthening of cantilever beam corbels and drop-in beam ends; inspection photos do not reflect that any significant FRP wraps were ever installed under either rehabilitation project.

The crack growth along the faces of the PT tendons in cantilever beams did not appear to have been specifically investigated in preparation for the 2016 and 2021 rehabilitation projects. While FRP was to be applied to strengthen the corbels, no further probing of the tendons appears to have been conducted to evaluate potential causes for the continued propagation of cracks.

Overall, the bridge superstructure general condition rating remained 4 – Poor for more than a decade while known defects continued to grow and multiply. Many maintenance recommendations were repeated over multiple inspection cycles without being addressed. The failure of the 2016-2019 rehabilitation project resulted in extended exposure and greater deterioration. However, had the original link slab design been implemented, the failure of the tie-down rod connections may have been accelerated.

CONCLUSIONS

What events and conditions led to the failure of the tie-down rods?

The fracture of the PT tie-down rods appears to have resulted from a combination of the following:

- Severe reduction of local cross-sectional area due to advanced corrosion.

- Lack of recognition by inspectors of the importance of the tie-down rods to the structural stability of the bridge.
- Poor maintenance of the structure (e.g., leaking joints, corroding reinforcement, and cracked and spalled concrete) over an extended period of decades.
- A lack of toughness of the original high-strength rod materials, which were based on the standards applicable at the time of construction. Though technically not out of specification, they do present greater risk than those that comply with modern standards.
- Possibly to a lesser extent, failure during rehabilitation design to properly characterize boundary conditions associated with the presence of the tie-down rods, and their effect on expansion and contraction of the bridge between expansion joints. Calculations were found for influence at Abutment 1, but not for Piers 6 and 7.

Was the agency's decision to close the bridge to traffic reasonable?

It is our opinion that Rhode Island Department of Transportation was entirely justified in closing the bridge as a precaution to protect both the traveling public and workers at the bridge.

Should conditions leading to the failure have been foreseen?

Many of the issues highlighted in this report show that program managers, bridge inspectors, and designers should have and could have been aware of problems that were developing. Greater attention needed to be paid to the importance of the post-tensioning systems in overall structural performance and stability of the bridge.

Should conditions discovered after the failure that revealed more serious condition of cantilever beams have been foreseen?

The deteriorating condition of the cantilever beams and corbels was clear. Given experience within the industry with poorly grouted post-tensioning systems on other bridges, more attention should have been given to signs of continuing cracking in the beams along the tendons, exposure of post-tensioning anchorages, and advanced deterioration of cantilever beam ends. Though the 1996-98 rehabilitation undertook retrofit grouting of the tendons, it is not clear that all voids had been treated or that the treatment was 100 percent effective.

What actions or policy recommendations are recommended to prevent similar types of events from occurring in the future?

The entity responsible for safety inspections within RIDOT should conduct a review of structures that could be considered complex to identify critical elements or details, to include but not limited to NSTMs. For critical portions of a structure that do not have a specific element defined in the bridge management system, consider establishing specific agency defined elements (ADEs) to ensure that the elements are properly inspected/addressed with each applicable inspection.

In addition, RIDOT should review its processes for prioritizing and following up on work recommendations provided in inspection reports.

EXHIBIT 2

Grilled under oath, R.I. DOT director blames outside inspectors for failure of Washington Bridge

Consultants hired to inspect the bridge were supposed to “do their damn job, and didn’t,” Peter Alviti said at a tense hearing

By [Steph Machado](#) and [Edward Fitzpatrick](#) Globe Staff, Updated November 13, 2025, 9:37 p.m.



DOT Director Peter Alviti responds to a question from former US Attorney Zachary Cunha (not pictured) during an oversight hearing on the Washington Bridge at the State House in Providence, R.I., on Thursday. JESSICA RINALDI/GLOBE STAFF

PROVIDENCE — Rhode Island Department of Transportation Director Peter Alviti testified Thursday it was not the job of state officials to “second-guess” companies that inspected the [Washington Bridge](#) over the past decade, some of whom apparently [failed to catch critical problems](#) with the structure.

“We rely on their expertise and their reporting so that we can serve the public,” a defiant Alviti told a joint hearing of the House and Senate Oversight Committees. “And they betrayed that.”

Questioned under oath by former US Attorney Zachary Cunha, who was hired by the lawmakers at \$600 per hour, the transportation director squarely blamed third-party companies who inspected the [bridge](#), which carries I-195 West over the Seekonk River to Providence and had to be abruptly [shut down in 2023](#) after the discovery of severed tie-down rods.

“Is RIDOT helpless to do anything other than sign contracts and pay out money? You have no ability to assess the adequacy of this work?” asked Cunha, sounding incredulous.

“We make sure that it’s done on time, on budget and on scope,” Alviti said.

Over the course of five hours, Alviti repeatedly insisted only the outside contractors were liable for the actual inspections of state bridges.

“They are responsible to be accurate and provide us with the truth,” Alviti said. “We’ve paid \$200 million for expert companies to inspect our bridges.”

In fact, he said, the DOT had commissioned 11 outside inspections of the Washington Bridge in the 10 years before it failed.

“And it certainly didn’t work here,” Cunha said.

“It did not, at the fault of those ... companies that were supposed to do their damn job and didn’t,” Alviti said.

“It sounds to me like you’re hiring these consultants at great cost and then are helpless to assess whether their work is adequate,” Cunha said.

“We’re not absolutely helpless,” Alviti responded. “We have a contract that requires them to be absolutely accurate. In the case of literally \$7 billion worth of other projects, they have been.”



Former US attorney Zachary Cunha (left) questions Rhode Island Department of Transportation Director Peter Alviti during an oversight hearing on the Washington Bridge at the State House in Providence, R.I., on Thursday. JESSICA RINALDI/GLOBE STAFF

Alviti was frequently on the defensive, as both Cunha and state lawmakers questioned him on the DOT's level of responsibility over the bridge, one of roughly 1,100 bridges the sprawling agency oversees.

It marked a change in tone from state legislators. While Alviti has testified before the oversight committees before, he declined to answer questions about who was responsible for the bridge failure, citing the ongoing lawsuit against [13 companies](#) who have worked on the bridge.

This time, following the release of a [forensic audit](#) in September that was kept under wraps for a year and a half, legislative leaders said they were “deeply troubled” by the findings and would put Alviti under oath to be questioned, which is not routinely done at the state Legislature.

Even Attorney General Peter Neronha, who is leading the lawsuit, said Alviti should not get a “free pass” from answering questions because of the litigation.

The audit, conducted by Wiss, Janney, Elstner Associates, found decades of missteps, shoddy work, botched projects, and ignored warnings that ultimately led to the closure of the bridge in December 2023.

The authors of the report said RIDOT should shoulder some of the blame for missing the problems with the bridge over the years.

“Although the statewide program manager may choose to delegate some or all functions to other bridge inspection personnel, the statewide program manager retains all responsibility for bridge inspection operations for which he or she was assigned,” the authors wrote.

Under questioning by Cunha, Alviti said he could not recall who that statewide program manager is. The employee oversees the entire bridge inspection program. He said he does not meet with the person regularly.

“I feel bad that I don’t,” he said. “I should.”

Later Thursday night, RIDOT spokesperson Charles St. Martin said the employee’s name is Christopher Hart. State records indicate he is a managing engineer making about \$138,000 a year.

Alviti said the DOT, which has about 700 employees, does “not have the expertise in-house” to determine the safety rating of bridges.

“Where does the buck stop?” asked State Representative Jennifer Boylan, a Barrington Democrat. “It can’t always stop with consultants.”

In response, Alviti said there was a “heavy reliance on government employees” before his tenure began in 2015. Using outside contractors helped reconstruct hundreds of

structurally deficient bridges, he said.

“We turned that all around,” he said. About one in five bridges were structurally deficient when Alviti was appointed director of RIDOT by former Governor Gina Raimondo.

Nearly two years since the bridge shut down, no one in state government has been disciplined or fired over the abrupt failure. The bridge, which once carried 90,000 cars a day, is a key connection between the East Bay of Rhode Island and parts of Southeastern Massachusetts to Providence.

In December 2023, an engineer working on rehabilitating the bridge discovered a “critical failure” of tie-down rods. Alviti said something “catastrophic” — such as a collapse — could have happened if the bridge was not shut down.

“It was, frankly, the most difficult decision I’ve had to make in my career,” Alviti said Thursday.

Governor Dan McKee has stood by Alviti even as critics, including his opponent in the 2026 governor’s race, Helena Foulkes, have said Alviti should be fired.

It’s not clear how long the tie-down rods, a critical component of the bridge, were severed before the December 2023 discovery. Based on corrosion and the timeline of other rehab projects, the audit suggests it could have happened in 2022.

Cunha pulled up side-by-side photos of a July 2023 inspection compared to December 2023, which Alviti had shown at a Dec. 13, 2023, press conference. At the time, Alviti said the photos proved that “something catastrophic” had occurred between July and December.



A side-by-side of inspection photos of the Washington Bridge in July and December 2023. The photo on the right shows severed steel rods, which were not visible in the photos from July. RIDOT

“Is it not the case that this bridge ... was in a critically unsafe condition for at least six months and possibly more than a year prior to its closure?” Cunha asked Thursday.

“I’m not going to speculate on an assumption,” Alviti said. He pointed to the July 2023 inspection by engineering consultant AECOM.

“It was the job of that report ... to show and tell us of any defects in the bridge,” Alviti said. “I think a severed rod is a defect. That report did not mention it. That’s pretty definitive to me.”

Responding to a question from Senate Minority Leader Jessica de la Cruz, a North Smithfield Republican, Alviti acknowledged he “can’t say with certainty” if people were at risk while driving over the bridge before the failure was discovered.

Initially, state officials said the bridge would reopen in about three months after making repairs. But further investigation determined the bridge was a lost cause, and needed to be fully demolished and rebuilt. The [new bridge](#) is expected to reopen in [late 2028](#), five years after it closed.

The bridge closure “continues to have devastating and inconvenient impacts” on commuters, residents and businesses, House Oversight Chair Patricia Serpa said at the start of the hearing.

“A once-routine trip across the river is now an ordeal to be planned for and avoided if at all possible,” Serpa said. “This committee has an obligation to understand the circumstances that led to this event and what we can do to avoid this happening again.”

Lawmakers said they would consider calling more witnesses at future hearings, including the contractors and the authors of the forensic audit, though no specific dates were set.

Cunha said Alviti’s testimony blaming the contractors was “not a terribly surprising development” given the pending lawsuit.

He said the question for lawmakers is: “Are you satisfied that measures and procedures are in place to ensure that something like this doesn’t occur?”

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EXHIBIT 3

46°

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TARGET 12

Worst roads, high costs: Why RIDOT struggles with paving despite \$1 billion transportation budget

by: [Ted Nesi](#)

Posted: Mar 5, 2026 / 07:23 PM EST

Updated: Mar 5, 2026 / 10:15 PM EST

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PROVIDENCE, R.I. (WPRI) — Rhode Island has had the worst state roads in the country for at least a decade, even as the R.I. Department of Transportation's budget has doubled to over \$1 billion, a Target 12 investigation has found.

Target 12 reviewed 10 y
shows 32% of Rhode Is
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Rhode Island ranked dead last among condition. Massachusetts ranked third national average.



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% of state roads were in poor t just 11% poor — close to the 8%

The situation is nothing new for Rhode 35% of state roads were in poor condit

t place 10 years before, in 2014, when s rose to 37%.

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The problem is not evenly distributed across RIDOT's road network, however.

Interstates and freeways are generally in good shape, the FHWA data shows. But the roads known as "urban principal arterials" — the busy, multi-lane roads with traffic lights that move people through cities and suburbs, like North Main Street in Providence or Route 2 in Warwick — are in far worse condition. Nearly half of those road miles, 48%, were rated poor in 2024.

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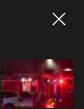
'Working our way up'

The findings come as RIDOT is going through a major transition.

Peter Alviti, who led the agency for the last decade, stepped down at the end of last month, and a search is underway for his permanent replacement. RIDOT's budget soared from \$490 million to over \$1 billion during Alviti's tenure as he implemented RhodeWorks, the

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Pettengill said federal officials required RIDOT to prioritize bridge rehabilitation over road repairs in recent years. Since 2016, the agency has increased the share of National Highway System bridges that are structurally sufficient [from 74% to nearly 91%](#).

She said RIDOT has now shifted its focus to roads, with \$500 million budgeted for road work over the current five-year period, using funding from the bipartisan infrastructure law. The agency has also committed about \$35 million a year in federal formula funds to pavement projects, she said.

RIDOT's own targets for road conditions remain modest.

Under federal rules, RIDOT is required to set performance targets for pavement condition. A state [website](#) shows its most recent target for non-interstate state roads was 10% good and 20% poor — targets the agency was already exceeding when they were set in 2021. (RIDOT uses a composite measure for those targets, rather than the IRI roughness data used in Target 12's analysis.)

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WHAT DO YOU THINK?

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'Decades of neglect'

The condition of Rhode Island's state roads is so bad it was — literally — off the chart in a recent academic paper by experts at Yale University, the University of California Berkeley and Columbia University.

The study used public-records requests to collect project-level data on road resurfacing projects across all 50 states, which the authors said was more reliable than inconsistent federal spending data. They then compared costs against road conditions, staffing levels, and procurement

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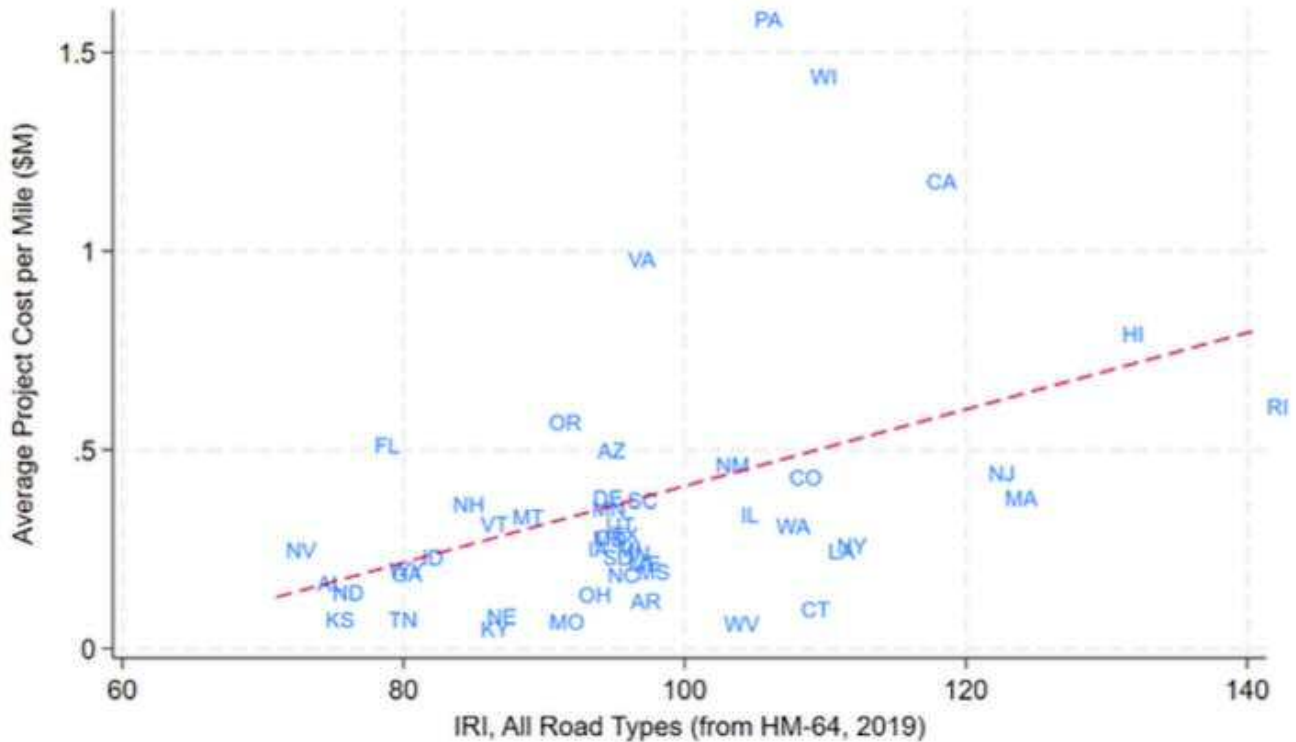
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(Story continues below chart.)



(a) Cost per Mile and Roughness

Figure D.9 in the Liscow paper.

While the paper doesn't include specific figures for each state, Rhode Island was found to be spending over \$500,000 per lane mile of road repair in the projects examined, which was more than twice the national median of \$226,000 per lane mile.

"Large variation in costs across states persists even after controlling for observables like weather and labor costs," the authors found.

Asked about Rhode Island, Liscow told Target 12, "I'm reluctant to talk tons about individual states because when we're talking about cost per

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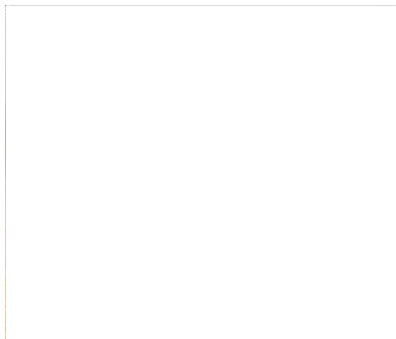
Charles St. Martin, RIDOT’s chief of public affairs, downplayed the study’s findings as “an academic exercise,” noting that the authors only “used a limited set of examples.”

RIDOT has spent \$754 million over the last 10 years to improve 2,000 lane miles of road “with brand-new paving, clearly evident to every Rhode Islander riding on our roads,” St. Martin said.

Added Pettengill: “It is important to also note that because our roads were in such terrible condition when we started to repair or replace them, we faced additional challenges that we would not have if the maintenance prior to 2016 had been performed.”

“Decades of neglect had taken their toll,” she said. “Now, we cannot just pave. We have to dig down to the subpavement, address drainage and other stormwater abatement issues, and make sure the new road is ADA compliant. A lot of our roads are also in dense urban environments with an aging infrastructure. All these factors make road repair slower to do and more expensive.”

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‘All done as outsourcing’

But in their paper, Liscow and his colleagues flagged another potential cost driver: over-reliance on outside consultants.

The researchers found that states where officials cited consultant costs as a significant factor had notably higher spending per lane mile. Nearly 90% of transportation officials surveyed said their departments were understaffed, forcing greater reliance on outside firms for project design

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“We do not have the in-house capability — nor should we — to be able to do the design, the inspection or any of the expert kind of work that needs to be done,” Alviti said. “That is all done as outsourcing.”

“My concern, director,” Cunha said, “is that it sounds to me like you hire these consultants at great cost and are then helpless to assess whether their work is adequate.”

Liscow said RIDOT is far from alone among state transportation departments in relying heavily on outside consultants, but argued the results show the approach hasn't worked. When he examined California highway projects, he found that a more effective engineer saved roughly \$220,000 per project — about three times the engineer's salary.

“We've tried out this experiment, cutting down the number of people in government and outsourcing a lot,” he said. “Look, maybe it could have worked. But I think the evidence is there now, and it has not.”

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The paper also cited a lack of competition among contractors as another factor that can drive up costs. RIDOT's quarterly reports show a small pool of contractors consistently winning the vast majority of the agency's major construction work, including J.H. Lynch & Sons, Manafort Brothers, J.R. Vinagro Corp. and Aetna Bridge.

Aetna is one of 13 defendants in the state's lawsuit against contractors that worked on the Washington Bridge prior to its closure.

‘That is a concern’

RIDOT's spending is now under growing scrutiny at the State House

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agency would be barred from preview
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conducting the RIDOT audit. The
se Minority Leader Mike Chippendale,

The two bills had their first committee
administration's Office of Management

pressing support. The McKee
concern about the potential timeline.

RIDOT, for its part, pointed out that RhodeWorks already requires the agency to meet performance standards and submit quarterly progress reports to the General Assembly.

However, those reports do not include a number of key metrics identified by Liscow and his coauthors, including cost per lane-mile, bidders per project, or consultant spending as a share of project costs. While the reports track progress on bridge condition, they contain no similar metric for pavement condition.

A [Target 12 investigation](#) last month found RIDOT had removed more than 700 bridges from its quarterly reports, allowing the agency to claim it met its long-promised goal of getting 90% of the state's bridges into good condition.

Zurier argued lawmakers should apply the same standard to RIDOT that they applied to RIPTA, the state's public transit agency, which was required to complete an efficiency study before receiving additional taxpayer funding.

"Ideally we would treat RIDOT the way we treated RIPTA and say, we have questions about your funding until you are able to demonstrate that you are spending our dollars efficiently," he said.

Ted Nesi (tnesi@wpri.com) is a Target 12 investigative reporter and 12 News politics/business editor. He co-hosts [Newsmakers](#) and writes [Nesi's Notes](#) on Saturdays. Connect with him on [Facebook](#), [Instagram](#), [X/Twitter](#), [Bluesky](#) and [LinkedIn](#).

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EXHIBIT 4

State Capacity and Infrastructure Costs

Zachary Liscow, Cailin Slattery and Will Nober*

August 21, 2025

Abstract

Why is it so expensive to build infrastructure in the United States? We collect new project-level data on infrastructure costs and conduct a survey on how states plan, procure, and deliver these projects. While there are many determinants of project costs, the survey results suggest that low state capacity at the agency delivering the projects is a primary cost driver. We investigate this with administrative data that links individual personnel to infrastructure projects. We find that higher-quality government engineers deliver observationally similar projects at significantly lower cost; going from the 25th to 75th percentile of engineer quality is associated with a 14% reduction in project-level costs, amounting to more than three times the average engineer salary. Further, losing expertise to retirement has substantial consequences: the cost increase arising from engineer departures is six times the size of their wages. Our results highlight the value of experience and human capital in public organizations.

*Liscow: Yale University, zachary.liscow@yale.edu; Slattery: UC Berkeley, cailin.slattery@berkeley.edu; Nober: Columbia University, whn2105@columbia.edu. We thank the Department of Transportation and the National Bureau of Economic Research for generous funding, and we thank Michael Best, Ernesto Dal Bó, Erica Bosio, Rob Clark, Ed Glaeser, Joe Gyourko, Karam Kang, Jeff Liebman, Karthik Muralidharan, Jim Poterba, David Schleicher, Steve Schooner, Steve Tadelis, Francesco Trebbi, Shoshana Vasserman, Reed Walker, Guo Xu, Chris Yukins, and anonymous highway contractors and DOT employees for helpful comments. Audrey Cheng, Hannah Lu, Nicholas Whitaker, and Connor Wilke provided excellent research assistance. A previous draft of this paper circulated under the title “Procurement and Infrastructure Costs.” All errors are our own.

1 Introduction

There is widespread concern over the cost and quality of infrastructure provision in the United States. Highway construction costs have increased substantially over time (Brooks and Liscow, 2023; Turner et al., 2023), and the cost of urban rail is about three times more expensive in the U.S. than in other rich countries (Goldwyn et al., 2023). Despite the magnitude of the investment and the importance of infrastructure as a driver of economic growth, experts have emphasized the poor condition of U.S. transit, roads, and bridges (American Society of Civil Engineers, 2021).¹ Leading theories for high infrastructure costs include overregulation and litigation (Klein and Thompson, 2025; Liscow, 2025), citizen opposition (Brooks and Liscow, 2023), and political distortions (Fajgelbaum et al., 2023; Rosenthal, 2017).

We provide an additional explanation for the high cost of U.S. infrastructure: state capacity. We bring three new pieces of evidence to bear. The first is qualitative: a survey of experts shows that state Departments of Transportation (DOTs) across the country are concerned about a decline in the size and experience of their workforce. We also observe these trends in Census data, and find that states with fewer transportation employees per capita have higher costs. The second is an analysis of the individual engineers who manage projects, wherein we create a measure of engineer quality that captures experience and skill. When a higher quality engineer is assigned to a project, costs are reduced substantially. The third piece of evidence comes from variation in district-level retirements. An increase in retirements is followed by an increase in average project costs, cost overruns, and duration. Retaining high-quality employees and preventing early retirements is therefore one possible policy to manage costs.

We begin by studying highway resurfacing projects, which are the bread and butter of American infrastructure spending.² We start with the basics. How much does it actually cost to resurface a road in the United States? We collect data on *project-level* costs in each state, via public records requests, and then extract details from project plans to calculate the cost per mile of resurfacing: a homogeneous measure that we can compare across projects and space. This dataset is the first of its kind; previous work on infrastructure investment across states relies on aggregate spending data. We document significant variation in costs across states. These cost differences are not explained away

¹The fact sheet for the 2021 Infrastructure Investment and Jobs Act stated that “1 in 5 miles of highways and major roads, and 45,000 bridges, are in poor condition.” See <https://www.presidency.ucsb.edu/documents/fact-sheet-the-bipartisan-infrastructure-deal>.

²Total capital transit spending across the U.S. is an order of magnitude less than highway spending (70% of which is rehabilitation and maintenance). In 2022, the Federal Transit Administration reported an expenditure of \$27B across all transit authorities, compared to \$266B on highways in the same year (Federal Transit Administration, 2022).

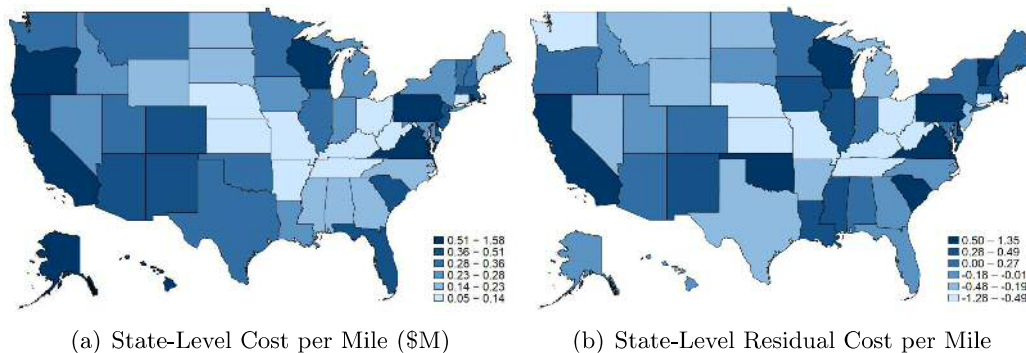
D Cost Data

In this Appendix we review some additional descriptives on costs and then compare our data with state-level aggregates provided by the Federal Highway Administration (FHWA).

We request data on project-level costs directly from each state DOT. The states provide data in a variety of formats, and include different subsets of the variables that we request. For example, in some states we receive data on three cost variables: winning bid, realized cost, and amended contract cost. However, in some states we only receive one or two of the three. In the states that we only observe winning bid, for example, we want to be convinced that it is a good enough proxy for realized costs for the projects in our subsample.

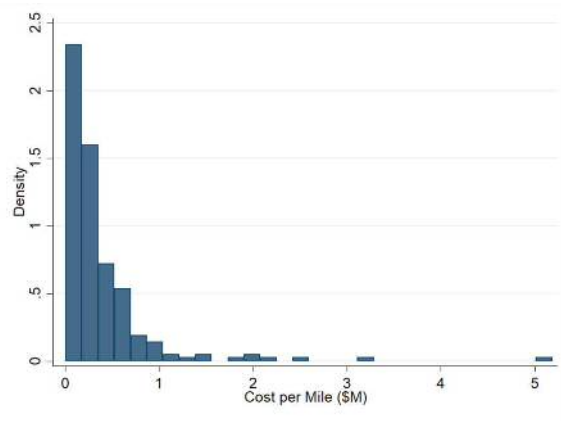
Figure D.1 shows the distribution of cost per mile across states, while Figure D.2 shows the distribution of costs per mile, total cost, and mileage, at the project level. Figure D.3 shows the spending and length of the projects across space. Figure D.4 compares winning bids with realized costs, in the states where we have both (22 states). The panel on the left plots the two objects in the project-level data, and the panel on the right shows the differences, in a histogram. The two objects are highly correlated, with a correlation coefficient of 0.98. Figure D.5 compares winning bids with “current contract” costs, in the states where we have both (17 states). Current contract costs are the winning bids plus or minus any contract amendments. Current contract costs are essentially realized costs, unless the project has not been completed. All of the projects in our data have been completed, therefore we can treat current construction costs as realized costs. The two objects have a correlation coefficient of 0.99. Our final sample uses the realized cost or current contract cost when available (35 states), and the winning bid for the remainder (15 states). As a final exhibit, Figure D.6 shows the correlation between the costs and the duration of the project.

Figure D.1: Resurfacing Costs per Mile (\$M) across States

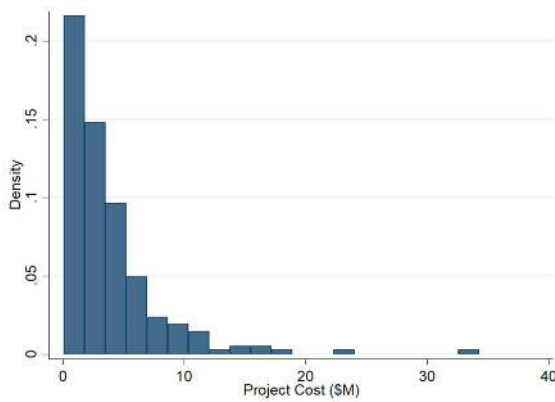


Notes: The figure on the left takes the average of project cost per mile at the state level. The figure on the right displays the state-level average of residualized costs. Residual costs are determined using a project-level regression of project costs per mile on the observables included in Column (2) of Table 1. There are 250 projects in the sample: 5 projects per state. Data collected by the authors.

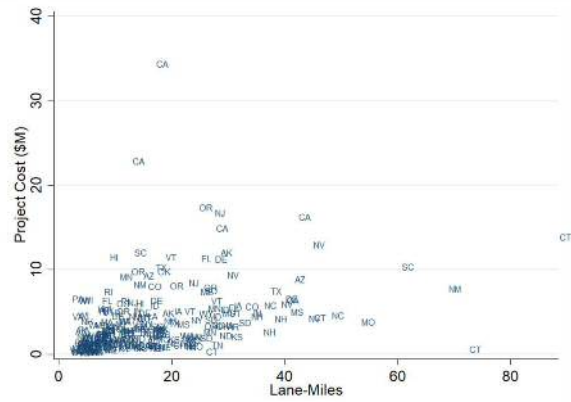
Figure D.2: Project-Level Costs(\$M) and Mileage



(a) Project-Level Cost per Mile



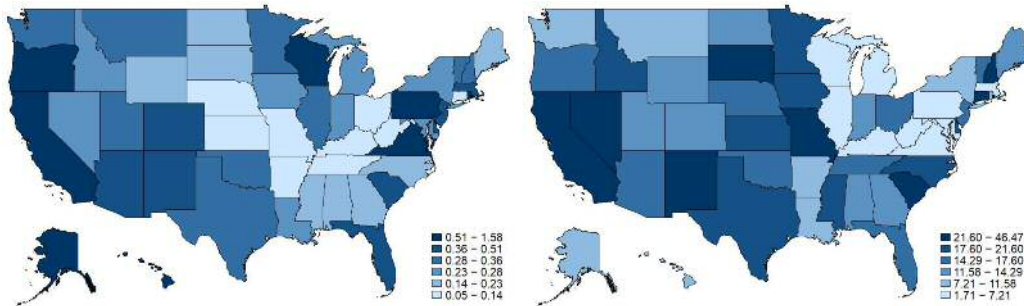
(b) Project-Level Total



(c) Total vs Mileage

Notes: The top figure (a) shows the histogram of project-level resurfacing costs per mile. There are 250 projects in the sample: 5 projects per state. The histogram on the left (b) shows the distribution of project-level costs in the data collected by the authors. The scatter plot on the right (c) takes each project cost and plots it against total mileage of the project (in lane miles).

Figure D.3: Spending and Project Characteristics

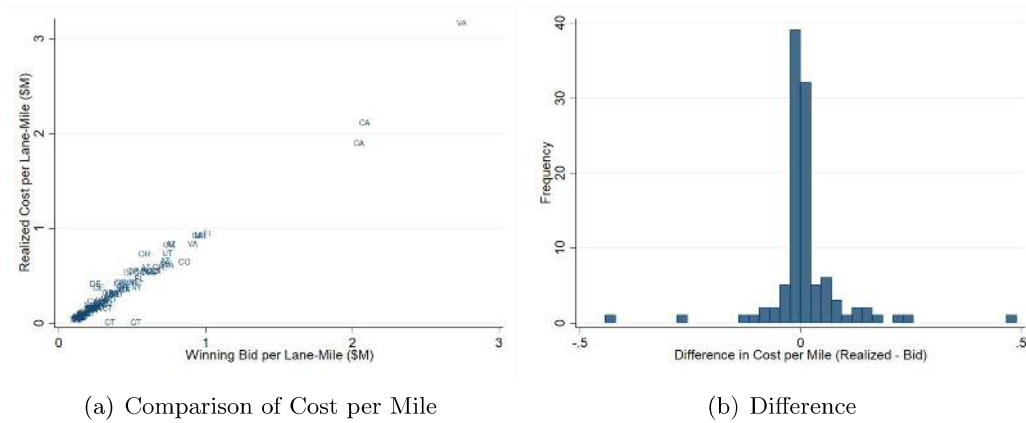


(a) State-Level Spending

(b) State-Level Mileage

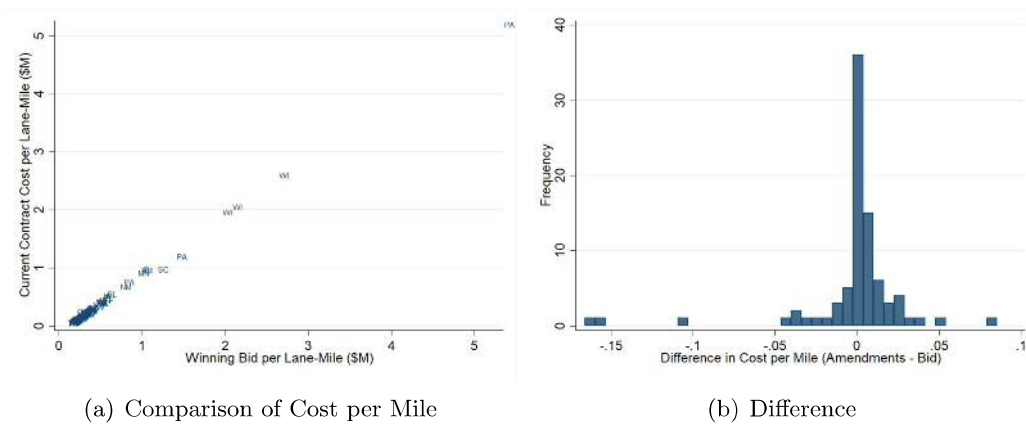
Notes: The map on the left shows project costs per mile, and the right shows the mileage for these projects (reproduced from Figure D.2 in the main text). The cost data collected by the authors is for resurfacing projects started in 2018 or 2019, with a length between 1 and 20 miles, on a non-interstate highway. There are 5 such projects per state, and the state average is used for this map. Interestingly, project length does seem to vary by state, with some states undertaking much longer projects, on average, than others.

Figure D.4: Bids vs Realized Costs



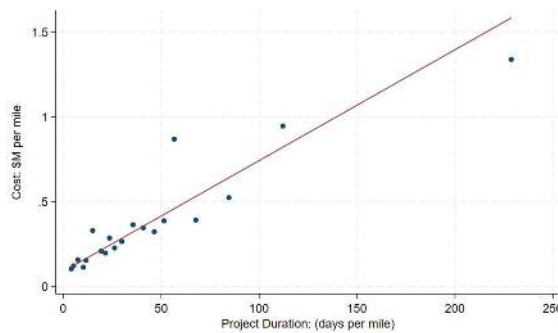
Notes: This figure compares winning bids with realized costs. The panel on the left plots the two objects in the project-level data, and the panel on the right shows the differences, in a histogram.

Figure D.5: Bids vs Amended Contracts



Notes: This figure compares winning bids with “current contract” costs. Current contract costs are the winning bids plus or minus any contract amendments. The panel on the left plots the two objects in the project-level data, and the panel on the right shows the differences, in a histogram.

Figure D.6: Costs and Project Duration

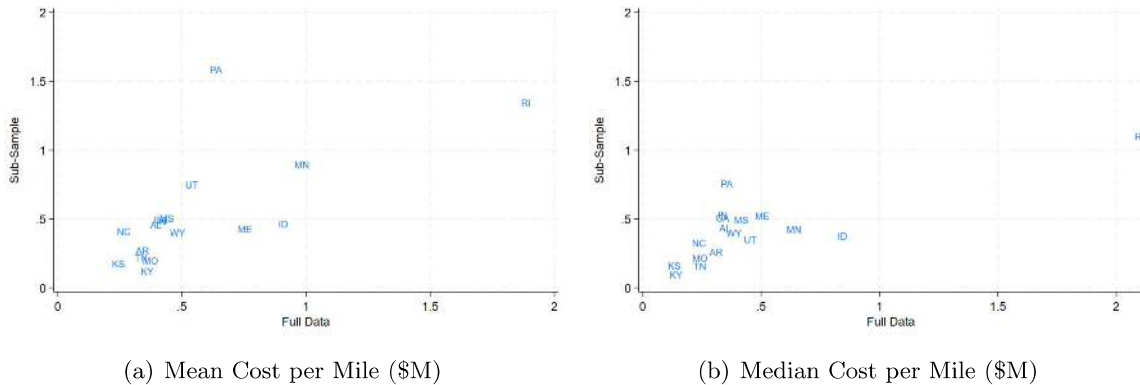


Notes: This is a binned scatter plot of project-level costs and duration. The y-axis shows the cost per mile, in \$M. The x-axis shows the duration per mile, in days. The data was collected by the authors, as part of the project-level cost data. The project duration variable is only available for 33 states.

D.1 Comparing Our Subsample to All Available Data

We use a subsample of 5 projects per state to facilitate the collection of detailed information for each project. However, we have more than 5 projects in 22 states. Figure D.7 plots the mean and median cost per mile of our subsample against the mean and median cost per mile observed in the full data. For this comparison, we restrict the full data to match our selection criteria for the subsample (non-interstate resurfacing projects between 1 and 20 mile that began in 2018 or 2019). The correlation coefficient for mean cost per mile is 0.67 and the correlation coefficient for median cost per mile is 0.78. In this figure we restrict California, which is an outlier (the subsample data exhibits higher costs than the full sample). This allows us to visualize the remainder of the states. However, when we include all of the data from California in Table 1 we do not find different results.

Figure D.7: Subsample vs Full Data by State



Notes: The figure on the left displays the mean cost per mile of our subsample versus the mean cost per mile of all available data, by state. The figure on the right performs the same comparison with median cost per mile. Both figures restrict to states with at least 5 projects observed in the full data. This leaves us with 18 states. California is omitted from both figures to better visualize the other states. Projects included in the subsample are excluded from the full data sample. Data collected by the authors.

D.2 Comparison with the FHWA Data

We can compare our data with state-level cost data from the Federal Highway Administration (FHWA). The FHWA requires states to report spending on a variety of categories and types of roads via an annual survey. As such, these data are self-reported by the states. A potential concern is that states do not all report resurfacing spending, for example, in the same narrow category. A second concern is that we do not have a denominator of miles resurfaced; we only have total miles in the state. Therefore, it is hard to know if costs are higher in one state because they completed more projects than other states or because the projects are more expensive. However, this is the only comprehensive dataset on state-level costs and is often used in reports about spending across states

(e.g., Reason Foundation, 2018).

The FHWA data includes spending by category, as we mentioned earlier. Therefore we need to select certain categories to compare with our sample of resurfacing projects. Due to potential reporting issues, we are fairly broad in the categories we include in the series we create. We define our series of interest as “Resurfacing + Maintenance cost per vehicle-mile.” This includes all maintenance cost variables and certain capital outlay variables.¹⁰⁹ Vehicle-miles are the estimated number of miles traveled by vehicles on roads in that state. We use all road types in all definitions, but the series looks similar when we exclude local roads. These data are very similar to the series used by Turner et al. (2023). For the FHWA data, we think spending per vehicle-mile is a better measure of cost efficiency, as it implicitly controls for the expected degradation due to heavy road use.

Figure D.8 shows the variation in spending across states for the two sources. There is a striking amount of variation in the FHWA data with Maine, Delaware, and Nebraska spending 4 times per vehicle mile than Mississippi, Georgia, and Alabama. Our series, although still exhibiting variation across states, does not exhibit as much heterogeneity. Importantly, there is very little correlation between the two series. Since we have directly collected resurfacing cost data from the states, this suggests the FHWA data is not a good proxy.

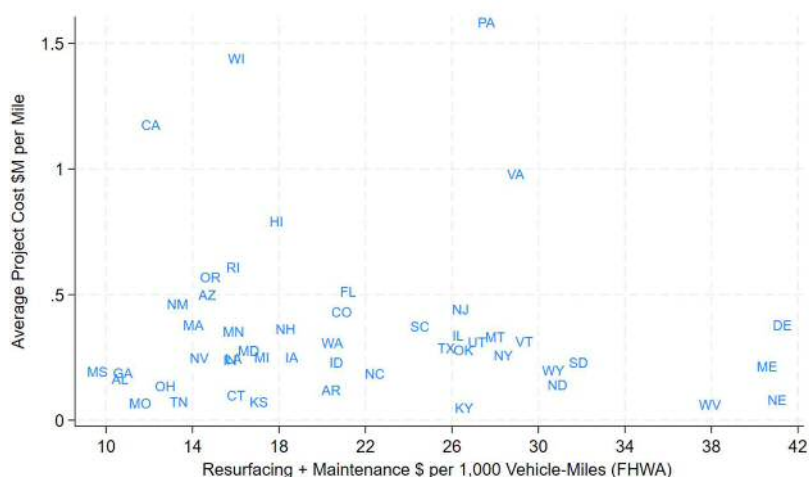
Moreover, it does not seem that costs are higher in areas where roads are rougher in the FHWA data, while our data show a stronger correlation between costs and road quality (Figure D.9). We would expect maintenance costs per lane mile to be higher on rougher, poorer-quality roads. We also compare the FHWA total spending measure to cost totals in our data for California, a state where our data covers the universe of highway construction projects.¹¹⁰ Here, the total spending in the FHWA data and our own are very similar.¹¹¹ These comparisons bolster our confidence that the project-level cost data that we collected consists of the individual projects underlying the aggregate FHWA data series.

¹⁰⁹The capital outlay variables are “Relocation,” “Reconstruction: Added Capacity,” “Reconstruction: No Added Capacity,” “Major Widening,” “Minor Widening,” “Restoration & Rehabilitation,” and “Resurfacing.”

¹¹⁰For most other states, our raw data is not as comprehensive and we are not confident that they cover the universe of DOT projects. One exception is Texas, but we are missing a measure of project completion year for over half of the projects, limiting our ability to compare it to the FHWA totals.

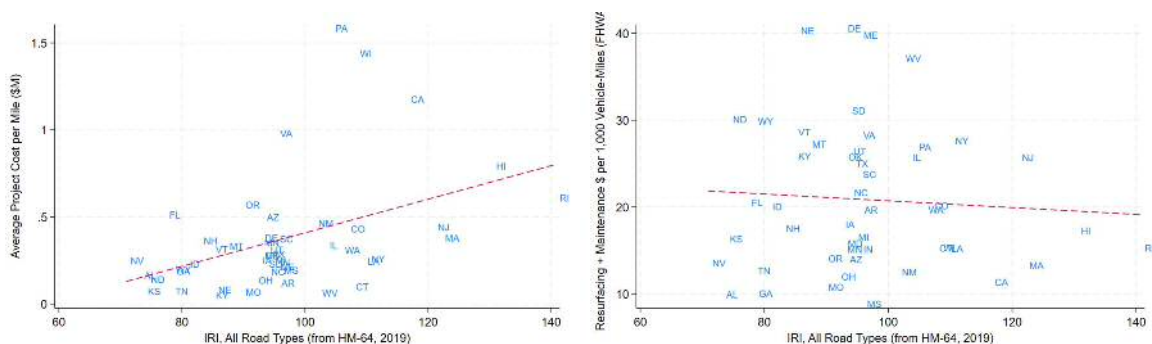
¹¹¹Between 2015 and 2019, the total spending observed in California in our data is \$28.1 billion and the total spending observed in California in the FHWA data is \$24.9 billion. We believe the small difference in the total is partially due to some imprecision in how we assign project costs across years. With our data, all costs for a project will be attributed to a single year, even if some spending occurred outside of that year. With the FHWA data, the state reports totals by spending year, not project completion year.

Figure D.8: Comparison of Cost Data



Notes: This is a scatter plot with cost data collected by the authors on the y-axis and cost data collected by the FHWA on the x-axis. The cost data collected by the authors is for resurfacing projects started in 2018 or 2019, with a length between 1 and 20 miles, on a non-interstate highway. There are 5 such projects per state, and the state average is used for this plot. The FHWA cost data is spending on resurfacing and maintenance per vehicle mile.

Figure D.9: Costs and Road Roughness



(a) Cost per Mile and Roughness

(b) FHWA \$ per Vehicle-Mile and Roughness

Notes: The panel on the left shows a scatter plot of state-level resurfacing cost per mile and road roughness (IRI). The cost data collected by the authors is for resurfacing projects started in 2018 or 2019, with a length between 1 and 20 miles, on a non-interstate highway. There are 5 such projects per state, and the state average is used for this plot. The panel on the right shows the same using cost from Highway Statistics (FHWA). To create the cost series we include a subset of capital outlay costs (relocation, reconstruction, major widening, minor widening, restoration, rehabilitation, resurfacing) plus maintenance costs. We use the International Roughness Index (IRI) as the quality measure.

D.2.1 Comparison of FHWA and BidX Data

To further probe the reliability of the Highway Statistics spending data, we compare it to spending totals that we aggregated from BidX, a private-sector service that many state DOTs contract for its construction bidding software. Data from BidX has also recently been used for research purposes (e.g., Bolotnyy and Vasserman, 2023; Kroft et al., 2022). BidX posts winning bids for state DOT construction projects for 38 states. They post descriptions for each project, allowing us to select

projects of a similar scope to those we look at in FHWA Highway Statistics.¹¹²

As a validation exercise, we compare cross-state spending differences in the BidX data with those from Highway Statistics. We first examine Georgia and South Carolina, a pair of states that are similar on observables but have divergent levels of spending per vehicle mile (VM) levels in the Highway Statistics data. In 2018 and 2019, spending per VM is higher in South Carolina in both data sources, but the difference is much larger in Highway Statistics than in BidX.

We repeat the exercise with Georgia and Alabama, two states with very similar spending per VM in Highway Statistics. In the averaged totals across 2014, 2018, and 2019, we find a 15 percent difference between the two states in BidX, whereas the averages in Highway Statistics are virtually identical.

Lastly, we compare New York and North Carolina, which both have high spending per VM in Highway Statistics, to Georgia and Alabama, which both have low spending levels. In 2019, the two datasets disagree: Highway Statistics has the spending per VM significantly higher in NY and NC, whereas BidX has spending per VM significantly higher in Alabama and Georgia. The last comparison also raised a red flag about the internal consistency of the BidX data, as NY has just over 1/3 of the spending per VM as Alabama, which is unlikely to reflect the full universe of spending.

We compare magnitudes of spending in addition to cross-state relative differences. To improve precision, we focus on two categories of spending: resurfacing, rehabilitation, and restoration (3R) and widening/reconstruction. These activities are accounted separately in Highway Statistics and are often grouped together in BidX projects. We choose Georgia for this exercise due to its detailed project descriptions on BidX. In this exercise, the BidX magnitudes are well below those we observe in Highway Statistics.

Overall, it appears that BidX does not typically include the universe of spending laid out in Highway Statistics, and that the degree of the coverage gap in BidX data varies widely by state.

¹¹²The following keywords are indicative of the projects we are looking for: “resurface,” “rehabilitation,” “widening,” in addition to “mill,” “surface,” “CMRB.” We focused on states that had the most detailed descriptions.