Infrastructure Spending

Leah Brooks and Zach Liscow

July 2019
Trump and Democrats Agree to Pursue $2 Trillion Infrastructure Plan

Dems eye infrastructure to deliver early win if they take the House

The US will need to invest more than $4.5 trillion by 2025 to fix its failing infrastructure

Lawmakers question price tag of Trump’s SOTU infrastructure pitch

By ELANA SCHOR and SEUNG MIN KIM | 01/31/2018 12:52 AM EST

Trump promised $1.5 trillion in infrastructure spending. He’s 1 percent of the way there.
Yet We Know Little About How Much We Get Per Dollar Spent

- Question of enormous import
  - US spends over $400 billion per year on infrastructure
  - And some would like to spend much more
- The more infrastructure costs, the lower the power of additional spending
- Widespread perception that costs are high in the US
Why Do We Know So Little?

- Data are limited
- International comparisons are difficult to interpret
- Even domestic comparisons are difficult
- What is a piece of “infrastructure”? 
Has per-unit infrastructure spending increased in the US?
Has per-unit infrastructure spending increased in the US?

Yes, 3-fold.
Has per-unit infrastructure spending increased in the US?

Yes, 3-fold.

Where and why?
Our Contributions

Focus on Interstate construction: limit analysis to relatively homogeneous good
Our Contributions

Focus on Interstate construction: limit analysis to relatively homogeneous good

1. Show a large increase in spending per mile over time
   - Generate new evidence
   - Date increase in spending to early 1970s onward
Our Contributions

Focus on Interstate construction: limit analysis to relatively homogeneous good

1. Show a large increase in spending per mile over time
   - Generate new evidence
   - Date increase in spending to early 1970s onward

2. Assess which pieces of evidence are consistent with spending growth
   - Per-unit costs of labor and materials unlikely to have driven increased spending
   - Increases in income account for roughly half of spending increase
   - Citizen voice: Change in institutions, c. 1970, that give citizens tools to modify government behavior
Light-Speed Relevant Background
Interstates are the Second Half of the Twentieth Century

- 1956 Federal-Aid Highway Act provides interstate funding
  - Plans a 41,000 mile system
  - Virtually all funding limited to initially determined routes
  - Feds pay 90%, states pay 10%
  - Similar federal standards for construction in all states and time

- Construction largely complete by 1993
Interstates are the Second Half of the Twentieth Century

- 1956 Federal-Aid Highway Act provides interstate funding
  - Plans a 41,000 mile system
  - Virtually all funding limited to initially determined routes
  - Feds pay 90%, states pay 10%
  - Similar federal standards for construction in all states and time
- Construction largely complete by 1993

System is fixed → States choose how much to spend, not how many miles to build
How States Get Money

- Feds authorize spending in amount of gas tax revenue
- Apportion spending
  - Divide tax revenue each year between states based on estimated “cost to complete”
- Feds reimburse states when they spend money
Part 1: Spending Per Mile Increases
Spending Per Mile has Tripled Since 1960s
Spending Per Mile has Tripled Since 1960s
Spending Increase Statistically Significant From Early 1970s Onward
Spending Increase Persists Controlling for Physical and Human Geography

![Graph showing spending increase over time relative to 1960, 2016$ with lines for state FE + physical and human geography and period FE.](image-url)
Spending Increases in Almost All States, Controlling for Geography

1958-1969 mean $/mile
1970-1993 mean $/mile

Part 2: What Explains This Increase?
What Explains this Increase?

We look at hypotheses with

1. Little support in the data
2. Some support in the data
3. Weak or insufficient evidence to draw conclusions
How Do We Measure Impact on Change?

<table>
<thead>
<tr>
<th>Year</th>
<th>Spending per mile relative to 1960, 2016$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>0</td>
</tr>
<tr>
<td>1966</td>
<td>0</td>
</tr>
<tr>
<td>1972</td>
<td>VS</td>
</tr>
<tr>
<td>1978</td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td></td>
</tr>
</tbody>
</table>
How Do We Measure Impact on Change?

Graph showing spending per mile relative to 1960, 2016$. The graph indicates:

- Pre-1970: average 0.5
- 1970 onward: average 8.2
- Summary measure of change: 7.3
2.A. Hypotheses With Limited Support in the Data
Hypotheses with Limited Support in the Data

- Geographically difficult segments built later
- Time invariant features
- Per-unit input prices: labor, material and land
- Changes in federal Interstate standards
Interstate Spending Per Mile, Indexed to 100 in 1961
Materials Prices are Roughly Flat Over the Period
Wages Are Flat, Too → Input Prices Cannot Explain Increase
2.B. Hypotheses With Some Support in the Data
Hypotheses with Some Support in the Data

- Demand for expensive highways increases in income
Hypotheses with Some Support in the Data

- Demand for expensive highways increases in income
  - Spending increase should decline, controlling for income
  - We should see more “stuff” associated with expensive highways: noise barriers, animal crossings, pedestrian bridges, etc.
Hypotheses with Some Support in the Data

- Demand for expensive highways increases in income
  - Spending increase should decline, controlling for income
  - We should see more “stuff” associated with expensive highways: noise barriers, animal crossings, pedestrian bridges, etc.
- Citizen voice
Baseline: Spending per Mile Increases by $7.3 Million, 1970 Onward
Controlling for Income Reduces Spending Increases by Half

Baseline

+ State Income

additional spending per mile, 1970 onward, $2016 millions
Controlling for Housing Value Reduces Spending Increases by Half

Baseline

+ State Income

+ Housing

0 2 4 6
additional spending per mile, 1970 onward, $2016 millions
Controlling for Income and Housing Value Explains All the Increase

- Baseline
- + State Income
- + Housing
- + Income & Home Values

Additional spending per mile, $2016 millions
Highway Miles Get More Stuff that Costs Money: Here Wiggliness

Similar pattern for number of lanes and bridges per mile
Citizen Voice

- Rise of institutions that allow for greater citizen voice in government
- Date to late 1960s and early 1970s
- An amalgam of the environmental movement, civil rights movement, and growing homeowner organization
- Plus changes in judicial doctrine and statute give citizens more tools to challenge government decisions
- Key dates include
  - 1970: National Environmental Policy Act mandates environmental review
  - 1971: Overton Park v. Volpe increases ability to challenge federal agency discretion via courts
If Increase in Citizen Voice Plays a Key Role We Expect

- Income more strongly related to spending after 1970
If Increase in Citizen Voice Plays a Key Role We Expect

- Income more strongly related to spending after 1970
  - Relationship between income and spending twice as strong after 1970
If Increase in Citizen Voice Plays a Key Role We Expect

- Income more strongly related to spending after 1970
  - Relationship between income and spending twice as strong after 1970
- Elected officials more responsive to citizens after 1970
Very Little Use of “Environ...” Near “Interst...” in 1950s

Number of Times Stem “Environ” Appears within 100 Words of “Interst” Divided by Number of “Interst”
Use of “Environ..” Near “Interst...” Rises with NEPA Passage

Number of Times Stem “Environ” Appears within 100 Words of “Interst” Divided by Number of “Interst”

- 1956: Federal Aid Highway Act
- 1970: National Environmental Policy Act
Prevalence of “Environ..” Near “Interst...” Remains Permanently Elevated

Number of Times Stem “Environ” Appears within 100 Words of “Interst” Divided by Number of “Interst”

- 1956: Federal Aid Highway Act
- 1970: National Environmental Policy Act
2.C. Hypotheses With Inadequate or Insufficient Evidence
Baseline Increase of $7.3 Million per Mile
Measures of Government Quality Unrelated to Spending Increase

- Baseline
- Has State Env. Protection Act
- Land Use Cases per 10k People
- Bond Score
- Num of Local Governments

additional spending per mile, 1970 onward, $2016 millions
Measures of Labor Strength Unrelated to Spending Increase

- Baseline
- Has State Env. Protection Act
- Land Use Cases per 10k People
- Bond Score
- Num of Local Governments
- Right to Work Law
- Share Unionized
- Share Voting Dem. Pres. Candidate

additional spending per mile, $2016 millions
We show

- Interstate spending per mile has risen sharply
- Beginning in roughly 1970

This knowledge helps us weigh benefits of infrastructure against substantial costs.
In Sum

We show

• Interstate spending per mile has risen sharply
• Beginning in roughly 1970

Why?

• Per-unit costs of labor and materials insufficient to explain increase
• Demand side factors including citizen voice likely culprits

This knowledge helps us weigh benefits of infrastructure against substantial costs
In Sum

We show

- Interstate spending per mile has risen sharply
- Beginning in roughly 1970

Why?

- Per-unit costs of labor and materials insufficient to explain increase
- Demand side factors including citizen voice likely culprits

This knowledge helps us weigh benefits of infrastructure against substantial costs