Does Corruption Reduce Efficiency in Public Capital Spending?

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Study’s Motivation

- Liu & Mikesell (2014): corruption $\rightarrow$ increased state capital spending
- Liu et al (2017): corruption $\rightarrow$ increased state-local debt

- How does the corruption elevate capital spending level?
  - Leviathan government
  - Greedy bureaucrats

- Do we have more specific (economic) explanation; and if so, is it tested?
  - Allocative Efficiency?
  - Technical Efficiency?
Corruption and Public Spending

- Grease in the wheels Versus Sands in the wheels hypotheses (Moen, 2010)
- Rents and rent seeking behaviors in public projects (Aidt, 2016)
- Free market prices interrupted by bidding collusion (Arozamena & Weinschelbaum, 2009)
- Allocative efficiency:
  - lowest cost firms lose contract awards; higher prices for the similar qualities (Bose, 1995)
  - “white elephant projects” (Lambsdorff, 2003)
  - Project cost include bribes and kickbacks added by winning bidders (Dastidar & Mukherjee, 2014)
- Large projects saw more corruption; relatively low opportunity cost, if detected (Gautier & Goyette, 2016)
U.S. State Highway Production

- In 2014, 26,784 contracted projects; $42 billion in total (American Road and Transportation Builders Association, 2015)

- Scoring auctions: cost, time, road user price (Dastidar & Mukherjee, 2014)

- Corruption Procurement Coalition (CPC) (Hudon & Garzon, 2016)
  - CPC was a set of informal networks
  - Members form different organizations with discretion and authorization power
  - Effects were to inflate contracting values, circumvent monitoring, and redistribute rents
  - When the Canadian government dismantled the CPC infrastructure contract values were reduced by 20-30%
  - Modus operandi in public construction projects

- Data availability (U.S. Federal Highway Administration, Highway Statistics, various years)
Model

- Cobb-Douglas Production Function*
  
  \[ Q(L,K) = A L^\beta K^\alpha \]

  Where:
  - \( Q \) is the quantity of products.
  - \( L \) is the quantity of labor.
  - \( K \) is the quantity of capital.
  - \( A \) is a positive constant.
  - \( \beta \) and \( \alpha \) are constants between 0 and 1

- K/L, Natural Resources, Human Capital

- O'Toole & Tarp’s (2014) Testing Model:

  Productivity growth = \( f(\text{capital, labor, natural resources, human capital, corruption incidences, cross-state variation in production process}) \)

*Source: https://economicpoint.com/production-function/cobb-douglas
Highway Spending Efficiency Measurement

- Productivity Measurement
  - Output/Input
  - Input:
    - Total state administered lane mile
    - % mileage in good condition
    - Total traffic flows
  - Output
    - Total outlays for new projects
    - Maintenance spending
- Annual Productivity Growth Rate (%)

<table>
<thead>
<tr>
<th>Observation</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>480</td>
<td>1.4</td>
<td>1.2</td>
<td>0.1</td>
<td>6.6</td>
</tr>
</tbody>
</table>

North Dakota: 7.6%, 3.8%, -2.1%, -5.3%, -7.4%
Texas: 9.2%, 6.5%, 3.7%, 0.9%, -1.1%
Indiana: 7.8%, 5.1%, 2.3%, -0.5%, -2.7%
South Dakota: 8.1%, 5.4%, 2.6%, 0.8%, -1.0%
Vermont: 9.3%, 6.6%, 3.8%, 1.0%, -1.2%
Florida: 8.3%, 5.6%, 2.8%, 1.0%, -1.2%
Rhode Island: 8.5%, 5.8%, 3.0%, 1.2%, -1.4%
Nevada: 8.7%, 6.0%, 3.2%, 1.4%, -1.6%
New Mexico: 9.0%, 6.3%, 3.5%, 1.7%, -1.9%
Pennsylvania: 8.9%, 6.2%, 3.4%, 1.6%, -1.8%
Iowa: 8.7%, 6.0%, 3.2%, 1.4%, -1.6%
Illinois: 8.8%, 6.1%, 3.3%, 1.5%, -1.7%
Arizona: 9.1%, 6.4%, 3.6%, 1.8%, -1.9%
Delaware: 9.3%, 6.6%, 3.8%, 2.0%, -2.1%
Georgia: 9.5%, 6.8%, 4.0%, 2.2%, -2.3%
Ohio: 9.2%, 6.5%, 3.7%, 1.9%, -2.1%
Montana: 9.0%, 6.3%, 3.5%, 1.7%, -1.9%
Kentucky: 8.8%, 6.1%, 3.3%, 1.5%, -1.7%
Maine: 9.1%, 6.4%, 3.6%, 1.8%, -1.9%
Oregon: 9.4%, 6.7%, 3.9%, 2.1%, -2.2%
Idaho: 9.2%, 6.5%, 3.7%, 1.9%, -2.1%
New Hampshire: 9.1%, 6.4%, 3.6%, 1.8%, -1.9%
Connecticut: 9.0%, 6.3%, 3.5%, 1.7%, -1.9%
Minnesota: 9.3%, 6.6%, 3.8%, 2.0%, -2.1%
Mississippi: 9.0%, 6.3%, 3.5%, 1.7%, -1.9%
Utah: 9.2%, 6.5%, 3.7%, 1.9%, -2.1%
Washington: 9.1%, 6.4%, 3.6%, 1.8%, -1.9%
Dakota: 9.0%, 6.3%, 3.5%, 1.7%, -1.9%
Missouri: 9.2%, 6.5%, 3.7%, 1.9%, -2.1%
Wisconsin: 9.0%, 6.3%, 3.5%, 1.7%, -1.9%
Arkansas: 9.0%, 6.3%, 3.5%, 1.7%, -1.9%
South Carolina: 9.0%, 6.3%, 3.5%, 1.7%, -1.9%
New York: 9.2%, 6.5%, 3.7%, 1.9%, -2.1%
New Jersey: 9.0%, 6.3%, 3.5%, 1.7%, -1.9%
Massachusetts: 9.3%, 6.6%, 3.8%, 2.0%, -2.1%
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<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Standard Errors</th>
<th>t-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta$ Federal grant (% to total capital outlay)</td>
<td>-.324</td>
<td>.001</td>
<td>-243.19</td>
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<tr>
<td>$\Delta$ Construction size (total construction/total state highway disbursement)</td>
<td>.156</td>
<td>.000</td>
<td>356.59</td>
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<td>$\Delta$ Administrative size (total state highway administrative spending/total state highway disbursement)</td>
<td>-.888</td>
<td>.006</td>
<td>-144.31</td>
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<td>$\Delta$ Labor (total number of state government employment/total employment)</td>
<td>1.226</td>
<td>.071</td>
<td>17.8</td>
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<td>$\Delta$ Human capital 1 (% civil engineers/total employment)</td>
<td>-.76</td>
<td>.02</td>
<td>-48.7</td>
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<td>$\Delta$ Human capital 2 (% civil engineering technician/total employment)</td>
<td>.85</td>
<td>.009</td>
<td>87.43</td>
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<tr>
<td>$\Delta$ Natural resource (precipitation, inch of rain &amp; snow)</td>
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<td>.000</td>
<td>141.01</td>
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<td>$\Delta$ Corruption incidences (corrupt employees / 10,000 population)</td>
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<td>.000</td>
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<td>$\Delta$ Corruption controlling effort (# caseloads per judge)</td>
<td>-.000</td>
<td>.000</td>
<td>-116.96</td>
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State fixed effects | INCLUDED |
Time fixed effects | INCLUDED |
State production processes | INCLUDED |
Adjusted R-square | 0.68 |
## Summary Statistics (back-up)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
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<tr>
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<td>448.17</td>
<td>160.97</td>
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