Teachers or Roads: How Fluctuations in Public Finances Erode Public Infrastructure

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Infrastructure spending matters
- Direct consumption welfare
- Costly disrepair feedback cycles

Key contributing factors?
- Public choice (policymakers)
- Committed costs
- Concern for votes

This paper:
Study how volatility in public budgets can exacerbate disinvestment

Implications for public expenditures:
- Hedging/smoothing
- Balanced budget requirements
Almost Ideal Demand System, Deaton and Muellbauer (1980) in 1st differences:

\[
\Delta w_{ig} = \beta_i \Delta \log \left( \frac{X_g}{P} \right) + \sum_j \gamma_{ij} \Delta \log(p_{jg})
\]

**Variables**

- \(\Delta w_{ig}\): government g’s budget share for good i
- \(X_g/P\): g’s real expenditure on good i
- \(p_{jg}\): prices of the J goods available to g.

(Each good i’s demand is a function of all prices.)
Almost Ideal Demand System, Deaton and Muellbauer (1980) in 1st differences:

$$\Delta w_{ig} = \beta_i \Delta \log \left( \frac{X_g}{P} \right) + \sum_j \gamma_{ij} \Delta \log (p_{jg})$$

**Features**

1. $\beta_i$ is the sensitivity of budget share to a changes in real expenditures.
2. Sum of all goods elasticities, $\beta_i$, equals zero in first differences.
3. The null, $\beta_i = 0$, is proportional changes in expenditures with changes in budget.
4. $\beta_i < 0$ means that an income reduction leads to an increase in relative budget share for good $i$ (less than one-for-one cuts). ... a “necessity” good.
5. $\beta_i > 0$ means that an income reduction leads to a decrease in relative budget share for good $I$ (more than one-for-one cuts) .... a “luxury” good.
Near-universe of public entities: **86,608 governments**, including
- 50 states
- 3,021 counties
- 35,241 cities and towns
- 13,430 independent school districts
- 34,866 special government districts

All governments surveyed every five years (...2002, 2007, 2012...)

$3$ trillion portfolio of public goods and services
ESTIMATING SAMPLES

Real Revenue by Gov Type (Base Year: 2000)


Fiscal Stress: Great Recession (2007-2012)
<table>
<thead>
<tr>
<th>Sums (combined cap &amp; current)</th>
<th>2007 -$B</th>
<th>2012 -$B</th>
<th>2007 - %</th>
<th>2012 - %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Administration</td>
<td>$252</td>
<td>$263</td>
<td>10.7%</td>
<td>9.8%</td>
</tr>
<tr>
<td>Education – Elementary</td>
<td>$535</td>
<td>$562</td>
<td>22.7%</td>
<td>20.9%</td>
</tr>
<tr>
<td>Education – Higher</td>
<td>$239</td>
<td>$304</td>
<td>10.2%</td>
<td>11.3%</td>
</tr>
<tr>
<td>Public Safety</td>
<td>$227</td>
<td>$255</td>
<td>9.7%</td>
<td>9.5%</td>
</tr>
<tr>
<td>Health</td>
<td>$194</td>
<td>$238</td>
<td>8.2%</td>
<td>8.9%</td>
</tr>
<tr>
<td>Transport</td>
<td>$193</td>
<td>$220</td>
<td>8.2%</td>
<td>8.2%</td>
</tr>
<tr>
<td>Parks Recreation</td>
<td>$77</td>
<td>$77</td>
<td>3.3%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Utilities</td>
<td>$191</td>
<td>$204</td>
<td>8.1%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Welfare</td>
<td>$145</td>
<td>$151</td>
<td>6.1%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Debt (current only)</td>
<td>$106</td>
<td>$125</td>
<td>4.5%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Retirement (current only)</td>
<td>$167</td>
<td>$193</td>
<td>7.1%</td>
<td>7.1%</td>
</tr>
<tr>
<td>Unemployment (current only)</td>
<td>$29</td>
<td>$96</td>
<td>1.2%</td>
<td>3.6%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$2,356</strong></td>
<td><strong>$2,688</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Compute total allocation changes:

1. Estimate elasticities, $\{\beta_i\}_{i=1}^{21}$:
   - By **expenditure category** (education, health, etc.) and by **jurisdiction type** (state, county, etc.)
   - Our best specification: Allow $\beta_i$ for sub-state entities to vary within state (**heterogeneity in regional preferences**)

2. Calibrate negative shock
   - Realistic and flexible model for impact of **severe macroeconomic downturn**
     - Whittaker (2020) state-level estimates of reduction in revenues arising from COVID 19
     - **General magnitude:** ~9% decline in state revenues; and ~5% decline in local revenues

3. Elasticities drive government-level response to shock; aggregate across all governments
These are the rebalancing effects
Necessities:
• K-12 Educ.
• Higher Ed
• Retirement
• Safety
• Debt
These are the rebalancing effects

Necessities:
- K-12 Educ.
- Higher Ed
- Retirement
- Safety
- Debt

Luxuries:
- Welfare
- Civil Admin
- Transport
  - Current
  - Capital
- K-12 Ed
- Capital
TOTAL FLOWS DUE TO PORTFOLIO REBALANCING

**Contraction-Implied Rebalancing:**

- -23.5B from transportation (capital)
- -20B from transportation (current)
- -7B from K-12 (capital)
- -5.2B from other capital expenditures
- -6.1B from civil administration
- -5.1B from welfare services

Total of $67B additional cuts; $56B infrastructure

Allocated to: education (33B), safety (7B), financial flows (27B)
POSITIVE SHOCK

- Elasticities estimated from expansionary period after dot-com bust (2002-2007)
- Similar split into luxuries and necessities
- Rebalancing effect is order of magnitude smaller
TOTAL FLOWS DUE TO PORTFOLIO REBALANCING

**Contraction-Implied Rebalancing:**
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- -20B from transportation (current)
- -7B from K-12 (capital)
- -5.2B from other capital expenditures
- -6.1B from civil administration
- -5.1B from welfare services

Total of $67B additional cuts; $56B infrastructure

**Expansion-Implied Rebalancing:**
- +2.4B from transportation (capital)
- +1.1B from transportation (current)
- +.8B from K-12 (capital)
- +.8B from other capital expenditures
- +2B from civil administration
- +.4B from welfare services

$7.5B in additional allocations; $5.1B infrastructure

*Sources: education (5B), safety (1B), financial flows (2B)*

Allocated to: education (33B), safety (7B), financial flows (27B)
RESULTS – PART 2: HETEROGENEITIES BY STATE

MAP WHAT MATTERS MORE / LESS ACROSS STATES
Add 2 maps

Reduction due to Rebalancing, 2nd Wave Scenario: Elem Ed (CUR)

[Map showing reduction due to rebalancing for elem ed (CUR)]

Rebalance Effect as % of Baseline

- 0: Lightest green
- 1: Light green
- 2: Dark green
Reduction due to Rebalancing, 2nd Wave Scenario: Parks/Rec (CUR)
TAKEAWAYS

1. In contractions:
   • Infrastructure acts like a luxury
   • Allows for governments to treat education like a necessity

2. Yet in fiscal expansion:
   • Infrastructure loses its luxury-like properties
   • Additional allocations across goods more or less in proportion

3. Implications
   • Massive decline in infrastructure over time
   • Single expansion/contraction cycle \( \Rightarrow \downarrow \$50B \) infrastructure allocation

4. Policy
   • Smoothing (i.e., relaxing balanced budget requirements; increased hedging) might have welfare benefits ... need future research