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DEPARTMENT OF ECONOMICS

Beyond the Flypaper Effect: Crowding-In from Federal Investment in Public Transit

Introduction

About 16% of all public goods and services in the US are financed by targeted federal transfers to state and local governments. The efficiency of these transfers depends on whether they crowd out↓ or crowd in↑ state and local funds.

> *The absence of a theory-predicted crowding-out has been called the flypaper effect ("money sticks where it hits").*

I study this issue in the context of public transit, which obtains substantial funding from all three levels of government.

Using the American Recovery and Reinvestment Act (ARRA) of 2009, I estimate how an unexpected one-time shock to federal funding affects transit expenditures. I find that

- each $1 of ARRA funding led to $3.8 of additional capital expenditures in the following 11 years, and
- this is initially driven by an increase in federally-funded expenditures, with no displacement of other funds (flypaper effect); and subsequently by an increase in state- and locally-funded expenditures (crowding-in).

Context

Most (70-75%) of federal funding for public transit in the US is apportioned to Urbanized Areas (UZAs) using formula programs:

- UZAs are densely-populated areas with population ≥ 50,000 that can span municipal and county boundaries.
- Formula programs distribute funds according to pre-determined calculations.

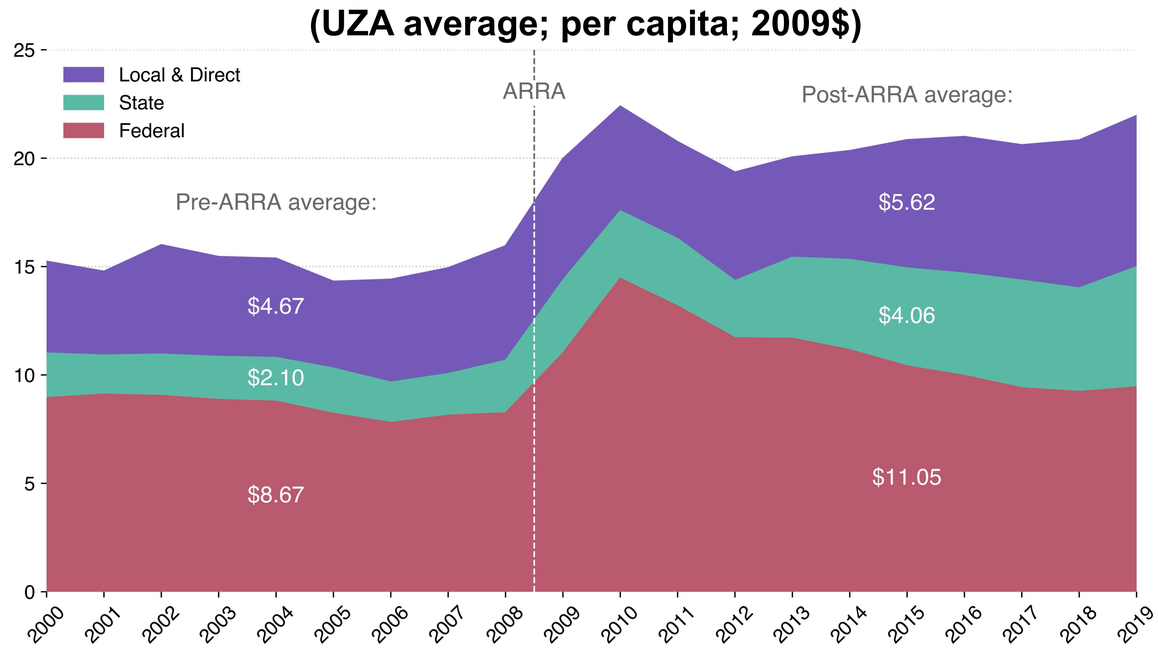
Urbanized Area Formula (UAF) is the largest program (~43% of all federal funding):

- The amount distributed to each UZA is approximately a linear combination of five inputs: population, population weighted by density, bus and fixed-guideway vehicle-revenue miles, and directional route miles.

In 2009, ARRA allocated $6 billion using the pre-existing UAF formula. Funds had to be obligated to specific projects in the following year and spent on capital expenditures before 2015.

I aggregate data on capital expenditures from the National Transit Database to the level of UZAs. My sample contains all 484 UZAs in the lower 50 states, excluding New York City. Average per capita spending across all UZAs, disaggregated by funding source, reveals suggestive evidence of ARRA's impact. ⇨

Annual Capital Expenditures by Funding Source (UZA average; per capita; 2009$)



Estimation

I estimate the casual effect of ARRA funding on capital expenditures via a Difference-in-Differences (DiD) with continuous treatment. To test for pre-existing trends, the years 2000 to 2007 are included in the Event Study (ES) specification:

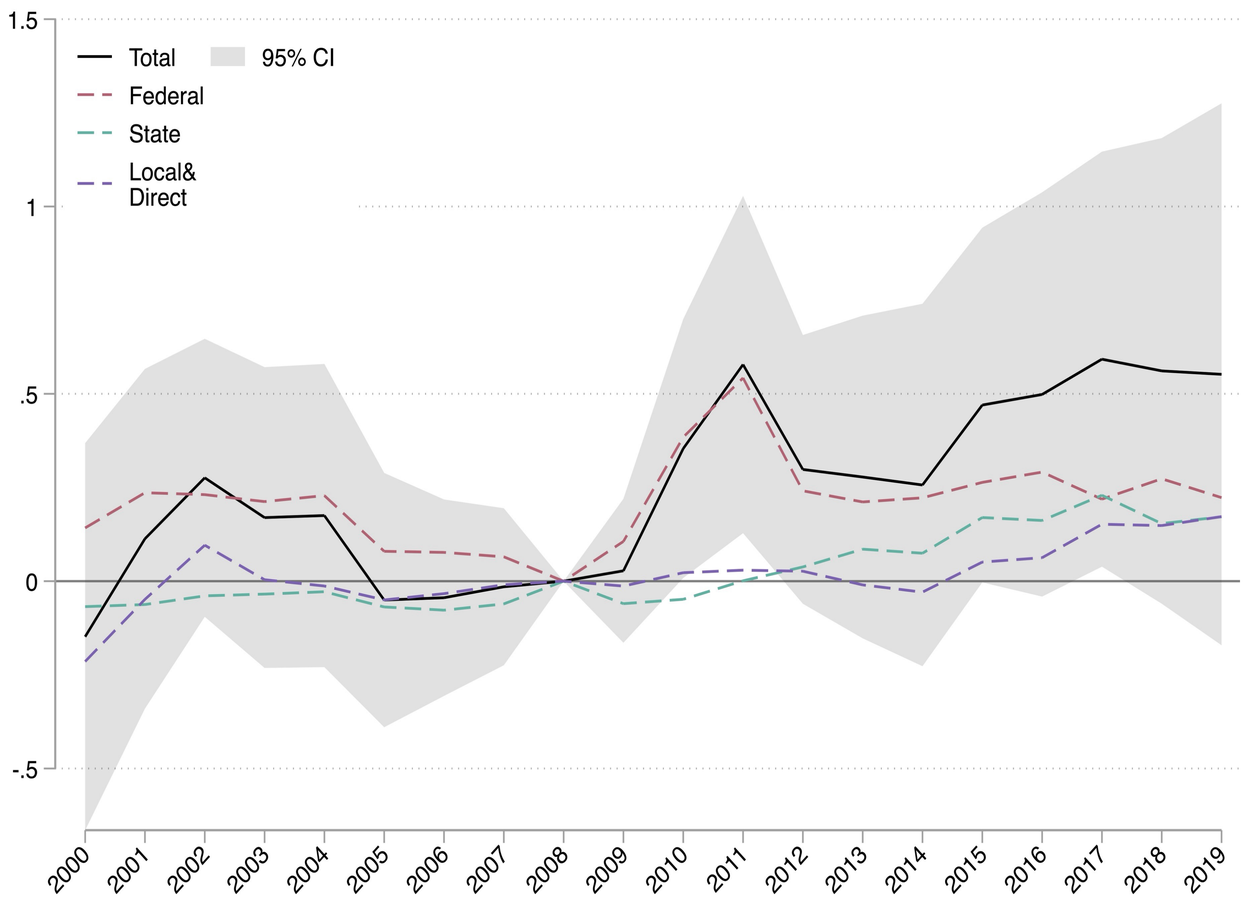
$$Y_{iy} = \sum_{z=2009}^{2019} \beta_z \times ARRA_i + \left[\sum_{z=2000}^{2007} \beta_z \times ARRA_i \right]^{ES} + \gamma_{Xy} X_{iy} + \gamma_i + \gamma_y + \varepsilon_{iy}$$

The causal interpretation of the estimates requires that the amount of funding distributed through ARRA is not correlated with the dynamics of other factors affecting expenditures:

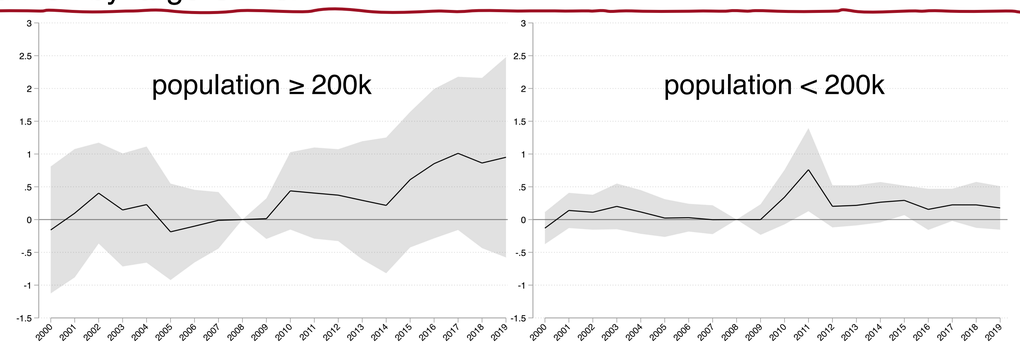
- Inputs to the formula that determined $ARRA_i$ are relatively stable through time (regular UAF amounts have within-group variation of only 9.7%).
- ARRA was a large unexpected level shock to funding, not related to changes in expenditures.

Results

Annual Effect of $1 of ARRA Funding on Capital Expenditures



ARRA increases expenditures everywhere, but the crowding-in in the later period is mostly driven by large UZAs.



Cumulative Effect of $1 of ARRA Funding on Capital Expenditures

	2009-14	2015-19	2009-19
Total	1.428*	2.370**	3.798***
	(0.759)	(0.982)	(1.145)
Federal	0.861	0.564	1.424**
	(0.529)	(0.549)	(0.668)
State	0.379	1.127*	1.506**
	(0.497)	(0.576)	(0.713)
Local&Direct	0.189	0.680	0.868
	(0.604)	(0.798)	(0.928)

Total cumulative effect of ARRA on capital expenditures.

=

Direct effect through an increase in federally-funded expenditures.

+

Crowding-in of state- and locally-funded expenditures.

Capital Expenditures in each year are deflated to 2009 constant dollars and divided by the population of the corresponding UZA, estimated as a linear projection between decennial Censuses. ARRA Urbanized Areas Formula amounts are divided by UZA population in 2009. UZA and year fixed effects are included. Population and the logarithm of population are included as controls with flexible coefficients. Standard errors are clustered at the UZA level. Cumulative effects are estimated as the sum of post-treatment coefficients in the DiD specification.

Discussion & Further Steps

- The unexpected nature of ARRA funding is key to generating crowding-in of state and locally-funded expenditures. In contrast, regular and predictable federal funding incentivizes state and local planners to divert some of the funds they would have otherwise spent on transit, to other purposes.
- Analyzing all UZAs together doesn't distinguish between effects occurring within a state versus those occurring between states. A state receiving more ARRA funds might increase its overall transit spending. Alternatively, states might increase transit spending in UZAs that received more ARRA funds relative to other UZAs in the same state.
- I aim to distinguish between the various channels through which federal funds can generate crowding-in effects. These channels include cost overruns on existing projects, convex costs associated with projects requiring large initial investments, and the establishment of political links facilitating funding access.