Municipal Finance and Labor Mobility

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Motivation

- Prior municipal bond studies lack theoretical foundation, with few addressing this gap:
  - Carlson et al. (2024); Gordon and Guerron-Quintana (2023); Myers (2024)
- Public finance: Ricardian equivalence, tax-smoothing hypothesis
  - Barro (1979): "neglects any effects of public debt policy on migration, which would be an important consideration for a local government" (p. 941)
- Urban economics: tax and migration:
  - Tiebout (1956): how individuals "vote with their feet" based on local public goods and taxes, without considering debt

Research Questions

How does labor migration impact municipal tax and debt financing?

- What are the key empirical patterns?
- Can we build a model that explains these patterns?
- How does the elasticity of mobility affect the trade-off?
- Can the model offer guidance for municipal financing policies?
  - **Detroit**: fiscal distress
  - **Janesville**: sound management after 2008 GM plant closure

Main Results

- Empirically, an increase in working-age population:
  - increases tax rates while reducing debt reliance
  - robust to alternative measures and IV estimation

- Theoretically, tax elasticity of mobility determines the choices:
  - if high elasticity, debt $\succ$ tax; if low elasticity, tax $\succ$ debt
  - data indicate a low tax elasticity of $-0.14 \Rightarrow$ tax $\succ$ debt
  - simulation replicates Janesville's choices; but recommends alternatives for Detroit
  - mechanism test: low labor mobility drives the result
  - extension: In the case of risky bonds, in-migration leads to lower yields (Zimmerschied, 2025)

Contributions

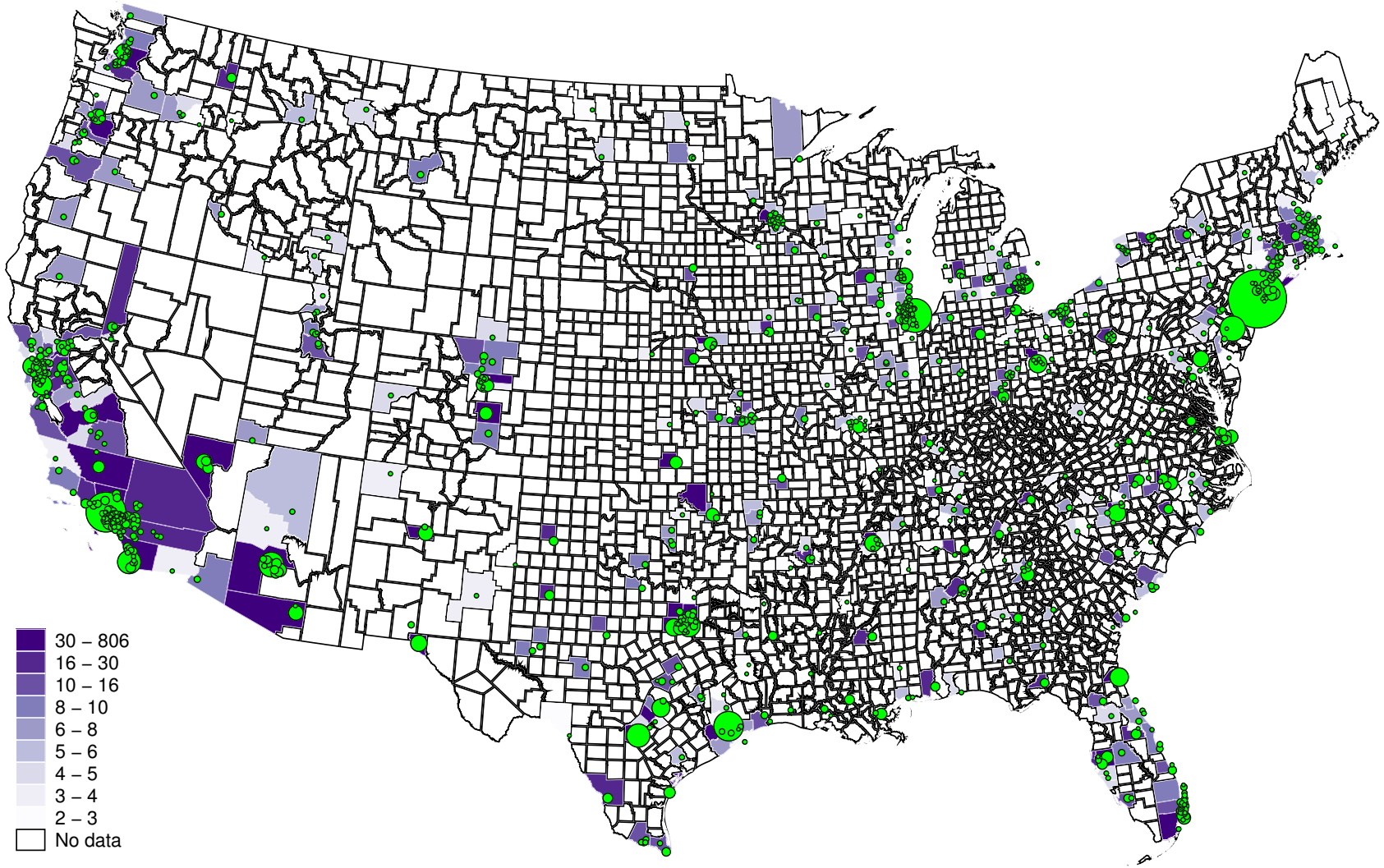
Construct a panel dataset of the 1,200 largest U.S. municipalities:

- source: 2008-2021 Annual Comprehensive Financial Report (ACFR)
- leverage the unique data to document new stylized facts

Develop a theoretical framework:

- rationalize empirical observations
- guide future empirical research on municipal finance or bond

Distribution of Municipalities



Source: United States Census Bureau

Empirical Methodology

- Key variables:
  - leverage: gross direct debt-to-total personal income ratio (analogous to the debt-to-GDP ratio at the national level)
  - tax: tax millage rate (i.e., property tax rate)
  - labor migration: change in working-age population

- Regression specification:
  - analyze the impact of labor migration on leverage and tax-rate adjustments over the past decade (from 2011 to 2020)
  - 10-year difference specification:

$$\Delta \text{leverage}_{i,t} = \beta_1 \Delta \ln \text{working-age population}_{i,t-1} + \beta_2' \Delta X_{i,t-1} + \Delta \epsilon_{i,t}$$

$$\Delta \text{tax rate}_{i,t} = \gamma_1 \Delta \ln \text{working-age population}_{i,t-1} + \gamma_2' \Delta X_{i,t-1} + \Delta \epsilon_{i,t}$$

Labor Migration and Leverage

	I. OLS			II. WLS		
	(1)	(2)	(3)	(4)	(5)	(6)
Δ WA population (log)	-0.028***	**-0.020*** **	-0.021***	-0.027***	**-0.019*** **	-0.020**
	(0.005)	(0.007)	(0.008)	(0.004)	(0.007)	(0.008)
Δ Surplus (or deficit) ratio		-0.013***	-0.012***		-0.013***	-0.013***
		(0.003)	(0.004)		(0.003)	(0.004)
Δ Capital-to-assets		-0.030***	-0.028***		-0.030***	-0.029***
		(0.008)	(0.009)		(0.008)	(0.009)
Δ Cash-to-assets		-0.030***	-0.027***		-0.030***	-0.028***
		(0.008)	(0.009)		(0.008)	(0.009)
Δ Size (log)		0.004*	0.004		0.004*	0.004
		(0.002)	(0.003)		(0.002)	(0.003)
Δ Productivity		0.005	0.008		0.004	0.008
		(0.005)	(0.006)		(0.005)	(0.006)
Δ Housing price (log)		-0.006*	-0.006*		-0.006*	-0.007*
		(0.003)	(0.004)		(0.003)	(0.004)
Δ Debt borrowing cost			0.024			0.020
			(0.177)			(0.181)
R-squared	0.030	0.088	0.072	0.028	0.087	0.071
No. of Obs.	864	827	696	864	827	696

Robustness

- different leverage measures:
  - (gross direct debt + net applicable overlapping debt)/total income (✓)
  - gross direct debt/tax revenue (analogous to the debt/equity for corporations ✓)
  - gross direct debt/total revenue (✓)
- different migration measure:
  - working-age population → population (✓)
- IV: China's accession to the WTO in 2001 (✓)
  - Autor et al. (2013); Pierce and Schott (2016)
  - increased U.S. exposure to Chinese imports.
  - more exposed areas saw larger, sustained employment declines

Labor Migration and Tax Rate

	Unweighted			Weighted		
	(1)	(2)	(3)	(4)	(5)	(6)
			A. OLS estimates			
Δ WA population (log)	-0.001	**0.012*****	0.016***	-0.001	**0.012*****	0.016***
	(0.001)	(0.004)	(0.003)	(0.001)	(0.004)	(0.003)
Other controls	No	Yes	Yes	No	Yes	Yes
No. of Obs.	853	815	667	853	815	667
			B. IV estimates			
	IV_1	IV_2	IV_3	IV_1	IV_2	IV_3
Δ WA population (log)	0.031**	0.028**	0.024**	0.033**	0.030**	0.026**
	(0.014)	(0.012)	(0.010)	(0.014)	(0.013)	(0.010)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs.	814	814	806	814	814	806

Summary

- empirically document: higher working-age population ($\uparrow$)
  - leads to higher tax rates ($\uparrow$) and a reduced debt reliance ($\downarrow$)
  - Surprising! As tax is typically viewed as distortive burdens.
- propose a theoretical model
  - explain these patterns
  - explore the resulting implications for municipal finance

Theoretical Framework

- build a partial equilibrium model of a municipality
- draw inspiration from dynamic corporate finance models

Table: **Corporations vs. Municipalities**

	Corporation	Municipality
Objective	maximize shareholder value	maximize community welfare
Investment	profitable projects	public infrastructure and services
Capital structure	debt vs. equity	debt vs. taxation
Cost of "equity"	purchase of shares	payment of taxes
Benefit of holding "equity"	dividend payments	access to infrastructure & transfer payments

Model Features

- infinite periods
- a municipal government:
  - values the total **utility** of local residents, derived from **public infrastructure (q)** and **transfer payments (e)**;
  - local working-age **population (N)** is determined by economic condition (z), local infrastructure, and **tax rates (τ)**:

$$\log N(z, q, \tau) = \kappa \log z + \alpha \log q + \theta \log \tau$$

  - is subject to productivity shocks;
  - **finances** operations and investment through a combination of **taxes** and **debt (b)**;
  - faces both real and financial frictions;
  - retains the option to declare a fiscal emergency.

The Municipal Government's Problem

- objective: maximize the expected discounted streams of infrastructure benefits and transfer payments
- periodic utility: $u(q,e) = Nq^{\psi} + \mathbf{e} - \Phi(e)\,1_{e<0}$
- "transfer payment" e:

$$e = \underbrace{wN(z,q,\tau)\tau}_{\text{tax revenue}} + \underbrace{\lambda q}_{\text{service charges}} + \underbrace{b' - (1+r)b}_{\text{change in debt}} - \underbrace{(c_0 + c_1 q)}_{\text{operating costs}} - \underbrace{[q' - (1-\delta)q]}_{\text{investment}} - \underbrace{[A(q,q') + A(\tau,\tau_{-1})]}_{\text{adjustment costs}},$$

- Bellman equation:

$$V(z,q,\tau_{-1},b) = \max_{q',\tau,b'} \left\{ N(z,q,\tau)q^{\psi} + e - \Phi(e)\,1_{e<0} + \beta EV(z',q',\tau,b') \right\}$$

Optimal Tax Policy

we set aside the emergency-declaration scenario:

$$\underbrace{-\frac{\partial N(z,q,\tau)}{\partial \tau}q^{\psi}+\frac{\partial A(\tau,\tau_{-1})}{\partial \tau}+\beta E\{\frac{\partial A(\tau',\tau)}{\partial \tau}\}}_{\text{marginal costs}}=\underbrace{\frac{\partial wN(z,q,\tau)\tau}{\partial \tau}}_{\text{marginal "benefit"}}$$

$$=z(1-\eta)N^{1-\eta}[1+(1-\eta)\theta]$$

marginal "benefits" of additional tax hike (right-hand side):

- $(1-\eta)\theta \leq -1$, high tax elasticity $\rightarrow$ tax revenue $\downarrow$ $\rightarrow$ debt $\succ$ tax
- $(1-\eta)\theta \in (-1,0)$, low tax elasticity $\rightarrow$ tax revenue $\uparrow$ $\rightarrow$ tax $\succ$ debt

Optimal Debt Financing

- Euler equation:

$$1 + \phi_1 1_{e<0} = E\{1 + \phi_1 1_{e'<0}\}$$

- marginal benefits (left-hand side):
  - the additional dollar increase in transfer payments
  - or the saved costs associated with the emergency declaration

- marginal costs (right-hand side):
  - foregone transfer payments next period
  - or costs associated with declaring an fiscal emergency next period

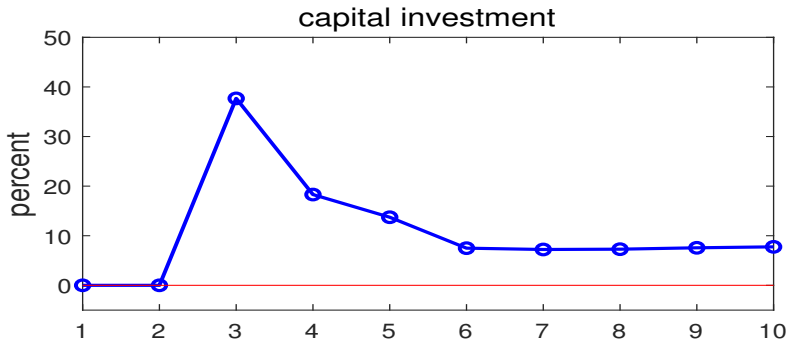
Model Parameterization

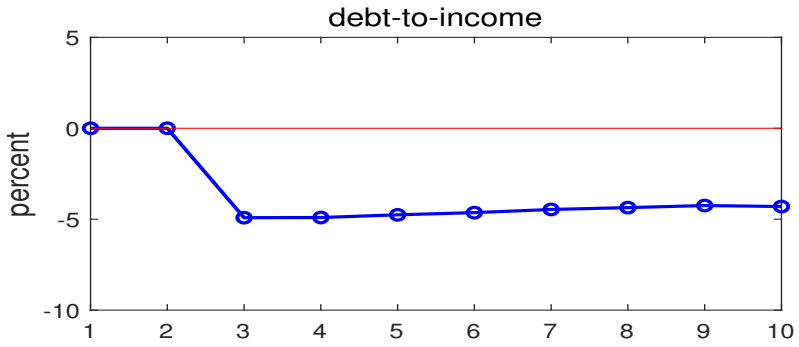
Parameter	Value
Direct Estimation	
discount factor (β)	0.98
curvature of preference function(ψ)	0.53
economic-condition elasticity (κ)	0.043
public-infrastructure elasticity (α)	0.034
tax elasticity (θ)	-0.14
capital share (η)	0.32
persistence of productivity shock (ρ_z)	0.76
standard deviation of productivity shock (σ_z)	0.032
capital depreciation rate (δ)	0.05
service charge (λ)	0.08
Matching Moments	
linear capital adjustment costs ($\gamma_{1,q}$)	0.05
quadratic capital adjustment costs ($\gamma_{2,q}$)	0.20
resale price for disinvestment (χ)	0.40
fixed operating costs (c_0)	0.13
linear operating costs (c_1)	0.24
quadratic tax adjustment costs (γ_t)	1.16
Assigned to make the emergency declare rare	
fixed costs of emergency declare (ϕ_0)	1.00
linear costs of emergency declare (ϕ_1)	1.00

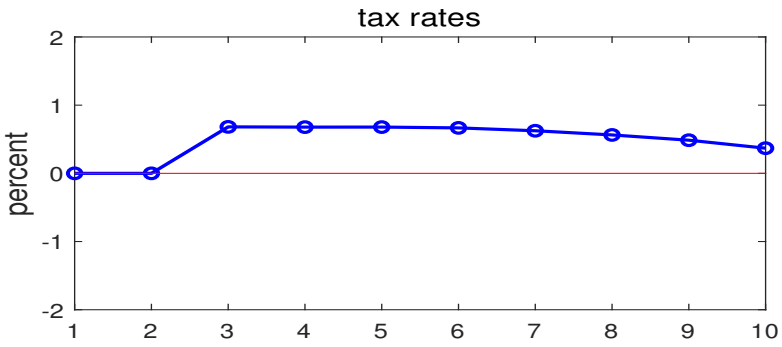
With the Parameterized Model

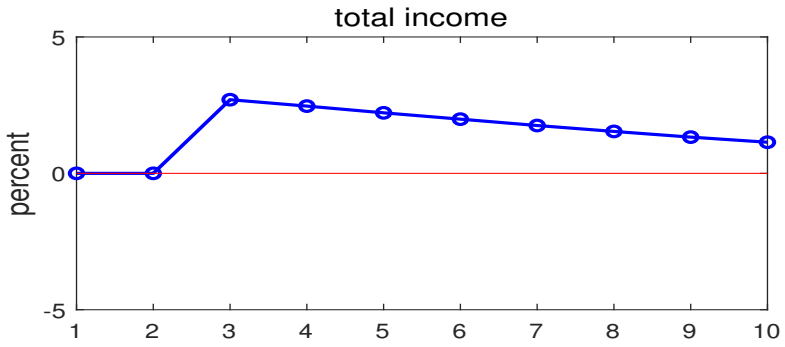
- validate the model by replicating key empirical patterns
- study the model's implications for municipal fiscal choices
  - Detroit vs. Janesville (Goldstein, 2024, *Financial Times*)
  - initialize the simulation with each city's conditions in 2009
  - feed in economic shocks each city experienced from 2010
- test underlying mechanism: the role of mobility elasticity

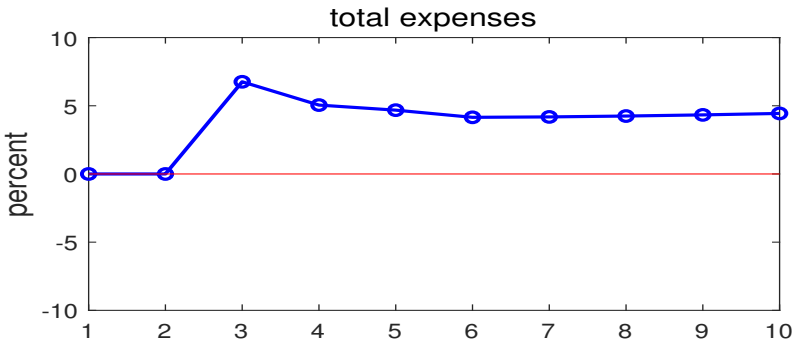
Impulse Responses to a 2.5% Positive Shock

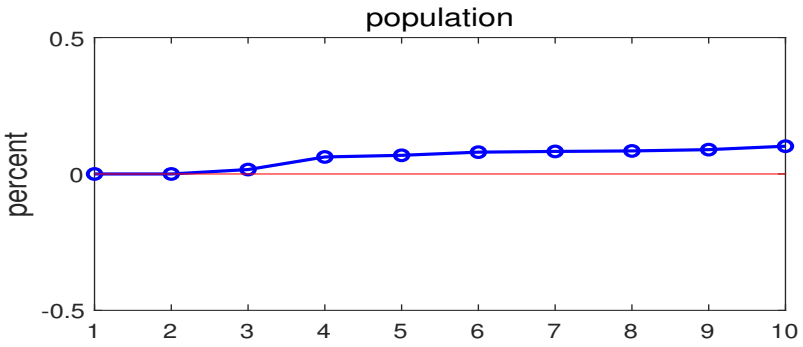






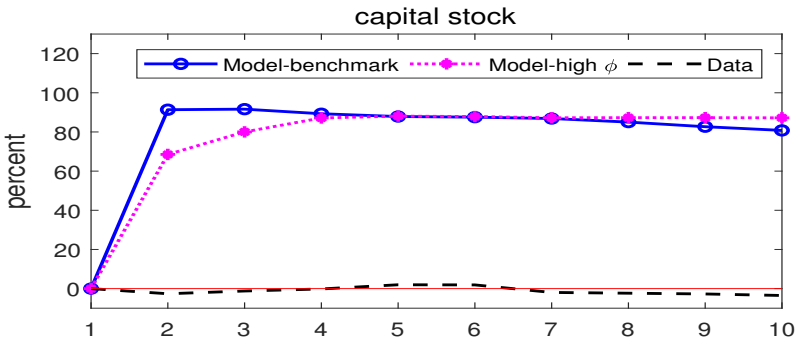


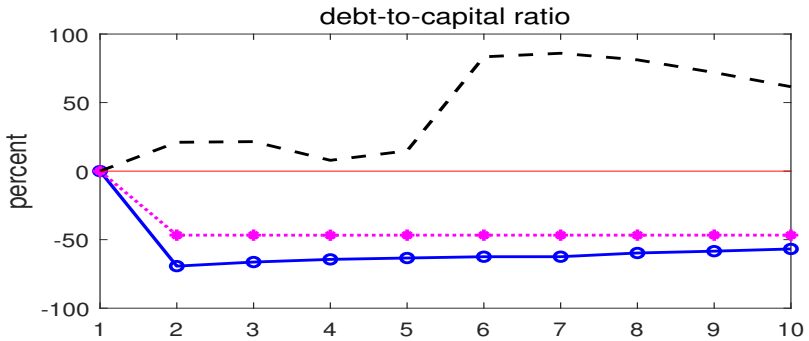


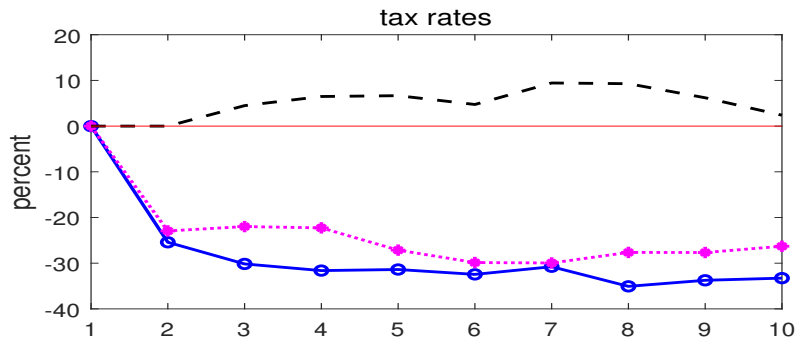


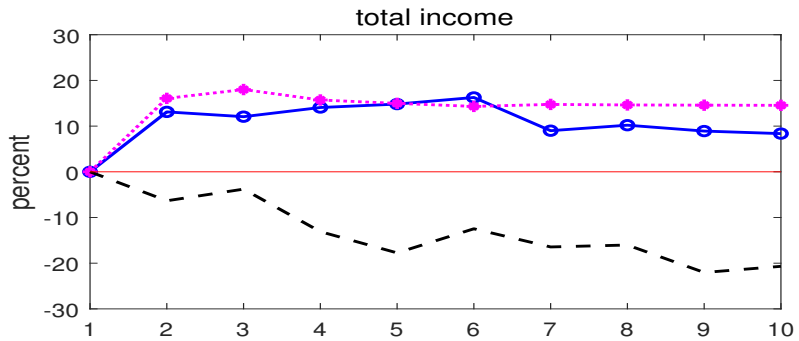
Model Simulation: Detroit

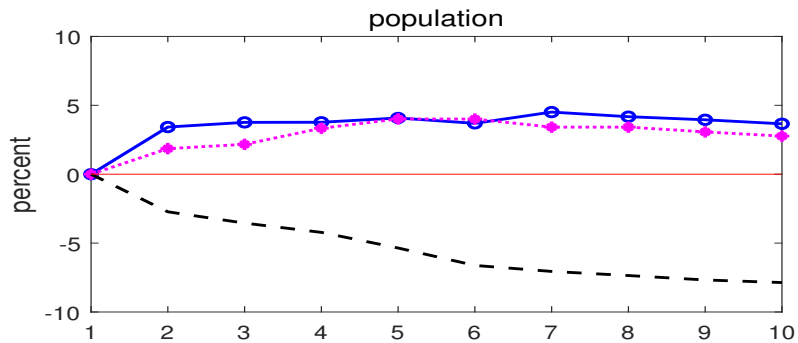
- initially: q - 37th percentile; τ - the 91st percentile; $b/q = 0.7$

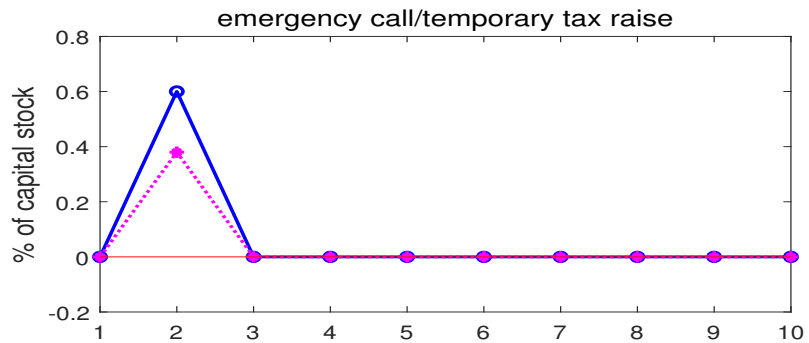






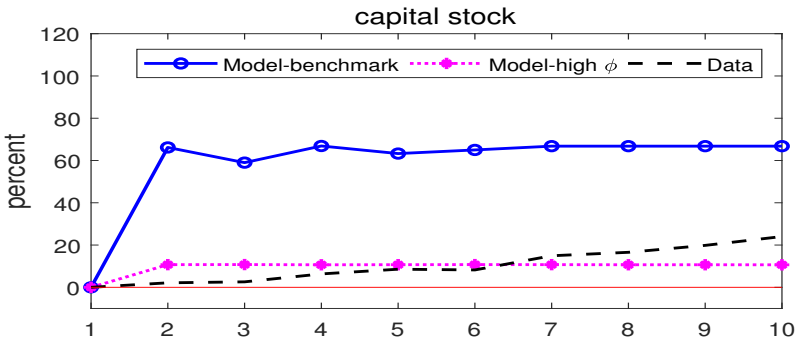


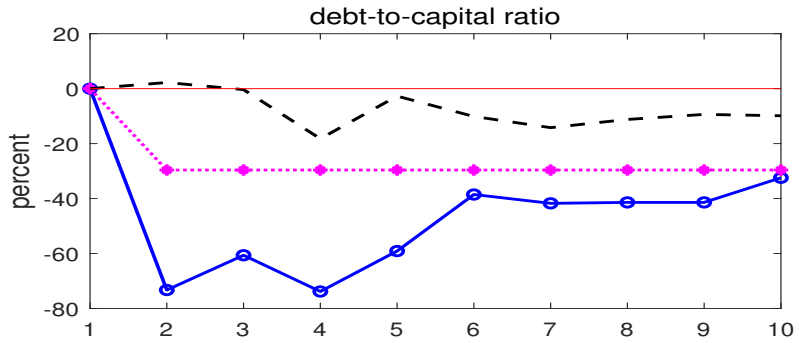


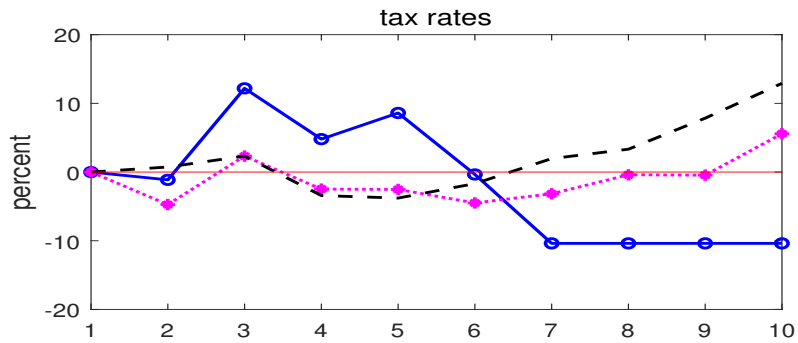


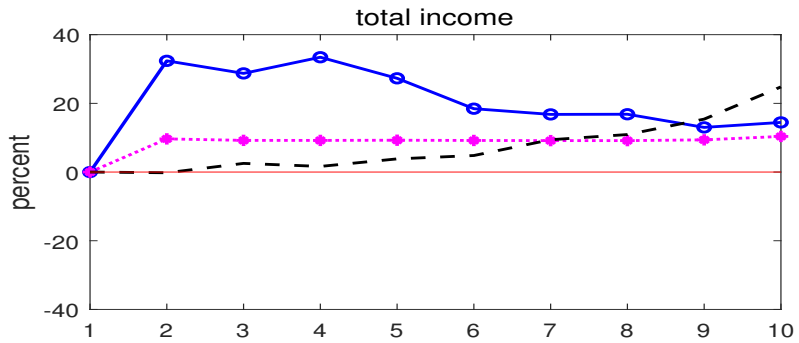
Model Simulation: Janesville

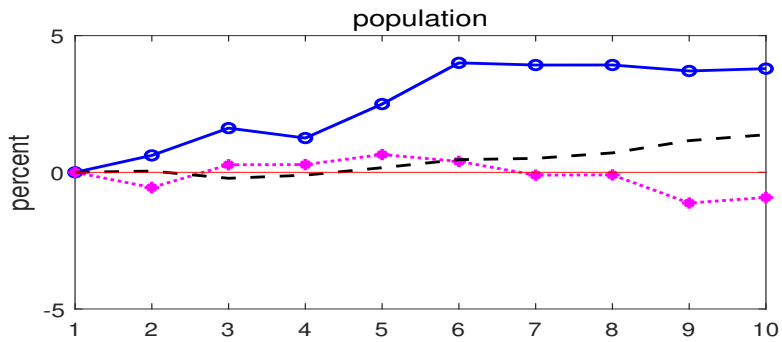
- initially: q - 61st percentile; τ - the 53rd percentile; $b/q = 0.53$

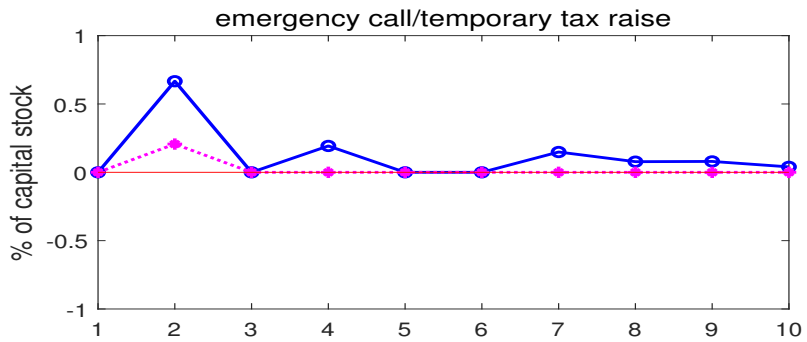








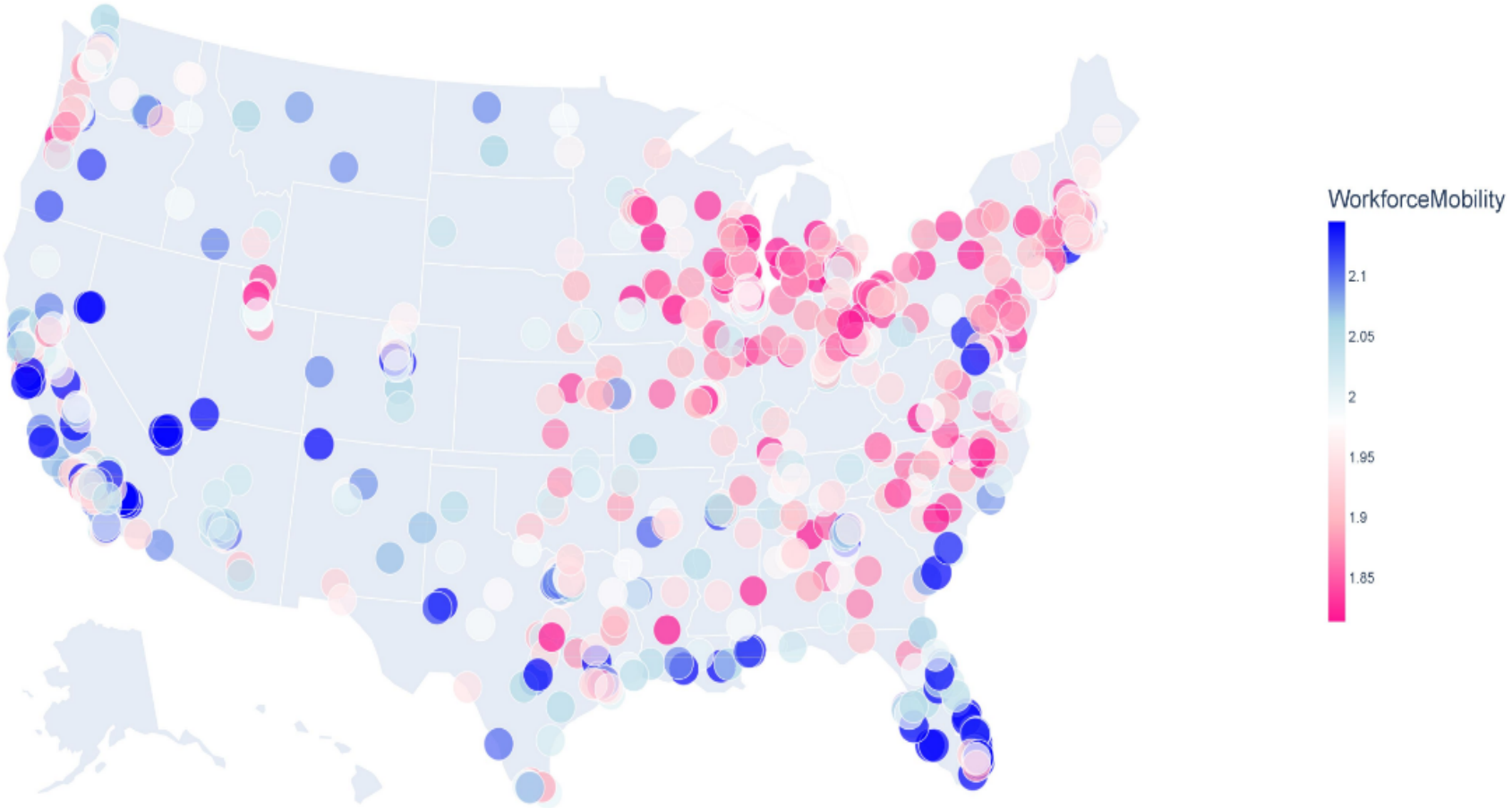




Suggestive Evidence for Model Mechanism

- Do cities respond differently based on labor mobility?
- We perform the following test:
  - classify sectors by labor mobility levels;
  - assign scores: 3 for high-mobility sectors, 2 for medium, and 1 for low;
  - calculate each city's labor mobility score in 2010 (pre-adjustment), weighted by sector employment shares.

U.S. City Workforce Mobility in 2010



Heterogeneous Financing Choices: Empirical Facts

high mobility: above 66-percentile; low mobility: below 33-percentile

	Unweighted		Weighted	
	(1)	(2)	(3)	(4)
	high mobility	low mobility	high mobility	low mobility
		A. Leverage		
Δ WA population (log)	**-0.013**	**-0.026****	-0.012	-0.026*
	(0.011)	(0.013)	(0.011)	(0.013)
Other controls	Yes	Yes	Yes	Yes
No. of Obs.	278	275	278	275
		B. Taxes		
Δ WA population (log)	**0.008****	**0.019*****	0.008**	0.019***
	(0.004)	(0.007)	(0.004)	(0.007)
Other controls	Yes	Yes	Yes	Yes
No. of Obs.	287	264	287	264

Conclusion

- Labor migration significantly shapes municipal financing decisions.
- In response to in-migration, cities tend to raise taxes and reduce reliance on debt.
- A structural model rationalizes these fiscal responses to migration, emphasizing the importance of mobility's tax elasticity.
- **Implication**: Migration-responsive policies can improve outcomes:
  - Detroit: recommends earlier and more proactive interventions.
  - Janesville: model simulations track actual fiscal adjustments.