Public Investment and Budget Rules for State vs. Local Governments

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Budget Rules and Tax Structure

- Federal level: no clear deficit/debt constraints, income tax
- State level: golden rule, income and sales tax
- Local level: heterogeneous limits on debt, property taxes
Budget Rules and Tax Structure

- Federal level: no clear deficit/debt constraints, income tax
- State level: golden rule, income and sales tax
- Local level: heterogeneous limits on debt, property taxes
- Fed govt running big deficits now...
- ... and giving transfers to state and local gov’ts
Plan of the talk

• Setup to quantitatively assess the consequences of these rules for gov’t investment
• Characterize political-economic equilibrium in terms of a system of functional equations
• Highlight role of mobility (exogenous and endogenous)
  1. Exogenous mobility more important across US states
  2. Endogenous mobility more important across cities, towns
• Preliminary numerical results
• Conclusions, work to do
Literature: local public finance

- Large literature, going back to Tiebout (1956)
- Key parameters: elasticity of mobility, elasticity of demand for land, zoning restrictions (e.g. Stiglitz, 1984)
Literature: dynamic political economy

- Relies on Generalized Euler equation method (formalized by Klein, Krusell, Ríos-Rull, 2008)
- Battaglini and Coate (2007,2008)
Population and Geography

- A continuum of households \( i \in I \)
  - May be infinitely lived, subject to exogenous moving shocks
  - May be OLG (Blanchard model)
  - May be a combination of the two (relevant for calibration)
- A continuum of identical towns \( j \in J \)
- Each town has \( \bar{L} \) units of uniform land
Preferences

\[ E_0 \sum_{t=0}^{\infty} \beta^t [c_{it} + w(L_{it}) + \nu \left( \frac{G_{jit}}{\mu_{jit}} \right) + \psi_{ijit}] \]

- Congestion externalities
- Idiosyncratic location shock: \( \psi_{ijt} \), over \( N \) (random) towns
- cdf for \( \psi_{ijt} \): \( \hat{F} \) (extreme value)
- cdf for different between one \( \psi_{ijt} \) and max of the others: \( F \) (logistic)
Preferences

\[ E_0 \sum_{t=0}^{\infty} \beta^t \left[ c_{it} + w(L_{it}) + v \left( \frac{G_{jit}}{\mu_{jit}} \right) + \psi_{ijt} \right] \]

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- Each period:
  \[
  \begin{cases}
    \text{Keep shocks from previous period} & \theta \\
    \text{Draw new locations, shocks} & 1 - \theta 
  \end{cases}
  \]
Technology

- Exogenous output per person: $y$
- Can be converted into public capital one for one
- Public capital depreciates at rate $\delta$
Government

- Can tax either income (lump sum) or land
- Can borrow up to a fraction $x$ of capital spending
- Must repay a fraction $\alpha$ of debt
- Choices by majority voting in each period
Markets

- Government and private debt
- Annuitization of wealth, if mortality risk
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- Annuitzation of wealth, if mortality risk
- Ownership of land
- No rental markets for land (for now)
- Households indifferent between renting and owning
- Sharply different political implications
Timing

1. Households realize shocks, decide location, trade land
2. Residents vote over provision of $G$
Symmetric SS CE

- allocation \((c^*, G^*, L^*)\),
- prices \((\rho^*, p^*)\),
- taxes and debt \((T^*, B^*)\)

such that:

- Households maximize their utility taking prices and government policy as given
- the towns’ budget constraints and borrowing limits are satisfied
- Market clearing for land \((L^* = \bar{L})\) and debt (trivial with quasilinear preferences).
# Characterizing a Symmetric SS CE

- $\rho^* B^* + \delta G^* = T^*$
- $\alpha B^* = \delta x G^*$
- $\rho^* = (1 - \beta) / \beta$
- Households live where $\psi_{ijt}$ is highest, pop. density 1 in all towns
- $\bar{L} = \hat{L}(r^*), \quad p^* = r^* / (1 - \beta)$
CE with town $j^0$ deviating: elements

- SSCE plus:
- $G_{j^0_t}$
- A location decision

$$J(\psi_{ij^0_t}, \psi_{ij^1_t}, ... \psi_{ij^{N-1}_t}) = \begin{cases} j^0 & \text{if living in } j^0 \text{ is optimal} \\ 0 & \text{if living elsewhere is optimal} \end{cases}$$

- Consumption, land holdings $L_{j^0_t}$, asset holdings; all households in $j^0$ choose same land holdings
- $p_{j^0_t}, T_{j^0_t}, B_{j^0_t}$
CE with town $j^0$ deviating: conditions

- Location decision, consumption, asset and land holdings are optimal given prices and policy;
- Towns $j^0$'s budget constraint and borrowing limits are satisfied, i.e.,
- The market for land clears in town $j^0$
CE with town $j^0$ deviating: characterization

- $(1 + \rho^*) B_{j^0 t-1} + G_{j^0 t} = T_{j^0 t} + (1 - \delta) G_{j^0 t-1} + B_{j^0 t}$

- $B_{j^0 t} - B_{j^0 t-1} (1 - \alpha) = \chi (G_{j^0 t} - G_{j^0 t-1} (1 - \delta))$

- $\frac{\bar{L}}{\hat{L}(r_{j^0 t})} = N \left\{ 1 - F \left[ u^* - \hat{w}(r_{j^0 t}) - \nu \left( \frac{G_{j^0 t} \hat{L}(r_{j^0 t})}{\bar{L}} \right) + \frac{T_{j^0 t} \hat{L}(r_{j^0 t})}{\bar{L}} \right] \right\}$

- $p_{j^0 t} = \sum_{s=t}^{\infty} \beta^{s-t} r_{j^0 t}$. 
Externalities in a CE with town $j^0$ deviating

- Congestion on goods and income taxes $\implies$ externality from movers
- Externality in town $j^0 \neq$ externality in other towns
- CE with town $j^0$ deviating inefficient
- Would need to charge a move-in (or move-out) fee
Markov Political-economic equilibrium

- Vector \((c^*, G^*, L^*, \rho^*, p^*, T^*, B^*)\);
- Functions \((\Gamma, \Lambda, \Pi)\) (of past \((G, B)\));

such that:

- Iteration on functions generates a CE;
- If \((G, B) = (G^*, B^*)\), implied CE is symmetric SS CE;
- \(\Gamma(G, B)\) Condorcet winner, taking future Markov mapping as given.
Characterizing Markov P-E-E

- Use local optimality condition
- Median voter: stayer
- Derive system of 4 functional equations (as functions of $G, B$)
First functional equation: Value along equilibrium

\[ W(G, B) = -\Pi(G, B) \Lambda(G, B) + \nu \left( \frac{\Gamma(G, B) \Lambda(G, B)}{\bar{L}} \right) + \]

\[ w(\Lambda(G, B)) - \]

\[ \Lambda(G, B) \left[ \left( \frac{\alpha + (1 - \beta)}{\beta} \right) B + (1 - x) (\Gamma(G, B) - (1 - \delta)G) \right] \]

\[ + \frac{\beta \Pi(\Gamma(G, B), B') \Lambda(G, B) + \beta \theta W(\Gamma(G, B), B') + \beta (1 - \theta) W(G^*, B^*)}{\bar{L}} \]

where \( B' := (1 - \alpha)B + x(\Gamma(G, B) - (1 - \delta)G) \)
Second functional equation: Generalized Euler equation

\[ 0 = \frac{\Lambda(G, B)}{L} \left[ \nu' \left( \frac{\Gamma(G, B)\Lambda(G, B)}{L} \right) - (1 - x) \right] + \beta \left[ \Pi_G(\Gamma(G, B), B') + x\Pi_B(\Gamma(G, B), B') \right] \Lambda(G, B) + \beta\theta \left[ W_G(G', B') + xW_B(G', B') \right] \]
Last functional equations: Equilibrium land price and location choice

\[ \Pi(G, B) = \hat{L}^{-1}(\Lambda(G, B)) + \beta \Pi(G', B') \]

\[ \frac{\bar{L}}{\Lambda(G, B)} = \]

\[ N \left[ 1 - F \left[ u^* - \hat{w} \left( \hat{L}^{-1}(\Lambda(G, B)) \right) \right] - v \left( \frac{\Gamma(G, B)\Lambda(G, B)}{\bar{L}} \right) + \left[ (\alpha + (1 - \beta)/\beta)B + (1 - x)(\Gamma(G, B) - (1 - \delta)G) \right] \frac{\Lambda(G, B)}{\bar{L}} \right] \]
Land taxes: a simple solution

\[ \Gamma(G, B) = G^* \text{ at the efficient level} \]

\[ \Pi(G, B) = \Pi^* + \frac{(1 - \delta)(G - G^*)}{\bar{L}} - \frac{B - B^*}{\beta \bar{L}} \]

\[ \Lambda(G, B) = \bar{L} \]

\[ W(G, B) = W^* + (1 - \delta)(G - G^*) - \frac{B - B^*}{\beta} \]
Power and limits of land taxes

- Attain efficient outcome (Conley and Rangel, 2001)
- Ricardian equivalence: future debt and capital fully priced in
- No price effect on impact, but no mobility either
- Works only if land prices remain positive, otherwise...
- ... large swaths of idle land and big distortions
- Example: Illinois could at best raise 1.5% of GSP
Numerical examples for income taxes

- $\beta = 0.96$, $\delta = 0.03$, $\bar{L} = 1$
- $v(G) := -G^{-2}/2$
- $w(L) := L^{1-\sigma}/(1 - \sigma)$
- $x = 0$
Efficiency Wedge

Measure of deviations from efficiency (chosen for robustness):

$$\tau = \frac{v'(\Gamma_t) - v'(\Gamma^*)}{v'(\Gamma^*)}$$
% Wedge with infinitely elastic mobility

Elasticity of demand for land
% Wedge with only exogenous mobility
Efficiency wedge (%) as a function of endogenous mobility

- $\sigma = 1.2$, $\theta = 0.97$
Conclusion

- Congestion dominates capitalization
- Distinction between capital/ordinary expenses at least as important at the local level
- Golden rule does extremely well with both endogenous and exogenous mobility
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• Congestion dominates capitalization
• Distinction between capital/ordinary expenses at least as important at the local level
• Golden rule does extremely well with both endogenous and exogenous mobility
• Costs of countercyclical fiscal policy higher at local level
Future agenda

- Calibration of endogenous mobility, quantitative answers
- Property taxes (introduce private structures)
- Distortionary taxes, federal bailout of states.