

Taxation and Public Goods under Federalism: Exit, voice, and revenue equalization

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Questions

- Does the interaction between mobility & voting generate:
 - ▶ residential segregation?
 - ▶ lower tax rates for the rich?
- Does revenue equalization:
 - ▶ ameliorate inequalities?
 - ▶ discourage local tax collection?
 - ▶ encourage residential integration?



Tiebout's "Pure Theory of Local Expenditures," 1956

● Theory

- ▶ areas offer baskets of public goods
- ▶ basket include tax rate
- ▶ households move, maximizing utility
- ▶ equilibrium provision of public goods
- ▶ reveals & aggregates preferences

● Critiques

- ▶ Unrealistic assumptions
 - ★ Perfect mobility
 - ★ Perfect information
 - ★ Wide array of public goods preferences
- ▶ Households consider *other* households' preferences
- ▶ Preferences correlate with income
- ▶ Optimize average utility, or distributional goals?

Policy implication: devolve

Brandeis “Race to the Bottom,” 1933

● Theory

- ▶ Competition between states to
 - ★ attract wealthy
 - ★ repel poor
 - ★ attract businesses
- ▶ Leads to the dismantling of the state
 - ★ environmental regulation
 - ★ social support
 - ★ taxes

● Empirical tests:

- ▶ Welfare benefits (Rom & Peterson; Schram)
- ▶ Tax competition (Nechyba; Feld)

Motivation for the EU common consolidated tax base commission (Estonia 0% tax on reinvested profit)
- ▶ Findings: some competition, but not to the bottom
 - ★ US Welfare 3-person family 2004: \$215 Alabama, \$709 Vermont
 - ★ Swiss taxes 2-person family, 200,000 CHF: Zug 8.3% cantonal tax vs. 13.37, 14.4, & 15.47% in Zürich, Aargau, and Luzern.

Policy implication: centralize

Hirschman's "Exit Voice and Loyalty", 1970

A theory of social or organizational change

- Voice: Change the organization from within
- Exit: Change the organization by leaving
- Use exit or voice depending on:
 - ▶ loyalty, freedom to leave, freedom of expression
- Devolution should increase exit and voice

Policy implication: devolve?



Many countries devolve tax collection

Tax Revenue by Level of Government

		income	sales / VAT	property	coporate	wealth
Switzerland 1999	federal	16	100	1	41	0
	cantonal	44	0	64	37	54
	municipal	39	0	35	23	46
	total	100	100	100	101	100

source: Swiss federal finance adminsitration

		income & social insurance	sales / excise	property	coporate	wealth
US 2006	federal	88	26	0	57	90
	state	12	74	3	43	10
	municipal	0	0	97	0	0
	total	100	100	100	100	100

source: IRS

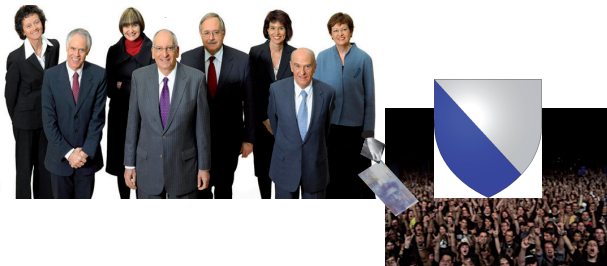
Share of Sub-National from Total Government Revenue 1997

USA	48.61	Hungary	23.22
Switzerland	46.90	Italy	23.21
Denmark	45.66	UK	22.10
Australia	43.32	Estonia	21.06
Belarus	37.86	Lithuania	21.04
Russia	37.62	Poland	20.90
Germany	37.54	Czech	19.85
Finland	35.96	Bulgaria	18.88
Sweden	34.46	Albania	15.89
South Africa	34.22	Portugal	12.83
Norway	33.82	Croatia	12.16
Austria	30.92	Slovenia	11.07
Iceland	28.81	Belgium	11.03
Moldova	25.41	New Zealand	10.84
Latvia	24.03	Slovakia	8.04

Source: IMF Government Statistics, 2001

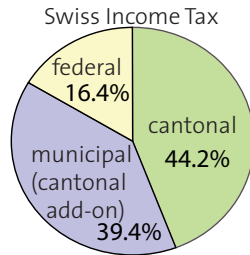
Many countries redistribute revenue

- Federal governments can
 - ▶ Split the tax base (i.e. federal gets VAT, state gets income)
 - ▶ Create overlapping tax rights (federal & state split income)
 - ▶ Or federal collects all tax, distributes to states
 - ▶ First 2 often include revenue equalization
 - ★ horizontally or vertically distributed
 - ★ based on collected or potential revenue
 - ★ equalization rate 0 to 100%

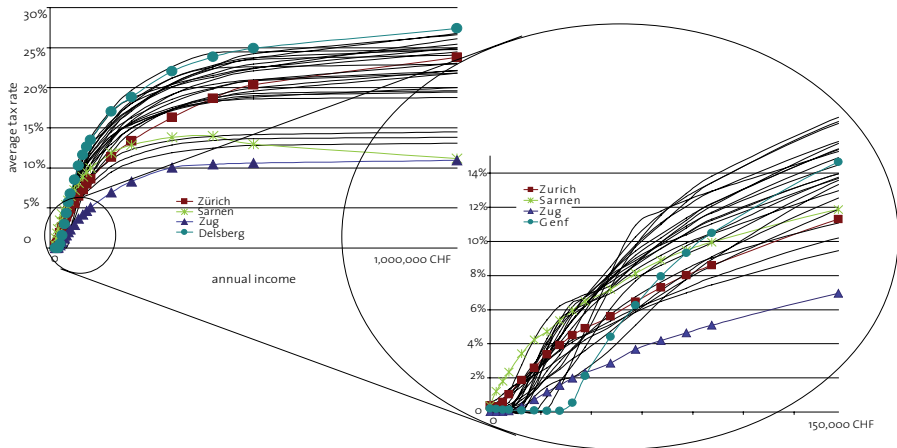


Why Switzerland?

- Most income tax set by cantons
- Tax rates can be voted on directly
- Possible to commute across cantons
- Evidence of tax-based migration

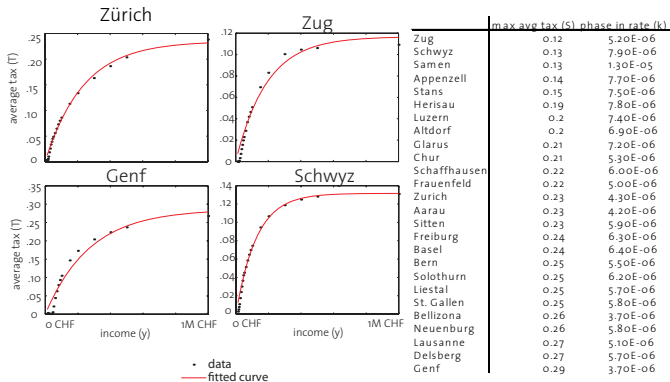


Swiss Cantonal Incomes Taxes



Swiss Cantonal Income Tax Formulae

$$T = S(1 - e^{-ky_i})$$



Swiss Federal Equalization Scheme: Tax capacity

$$E_i = .3NIC_i + .2\frac{100}{B_i}100 + .3\left(\frac{T_i + \sum T_{im}}{H_i}\right) + .1\left(\frac{U_i^p}{U_i}\right) + .1\left(\frac{H_i}{km^2}\right)$$

NIC_i national income for canton i

H_i inhabitants in canton i

B_i cantonal tax burden (income, wealth, profit, capital, & motor vehicle tax)

T_i tax revenue in canton i

T_m tax revenue in municipality m

U_i total agricultural land

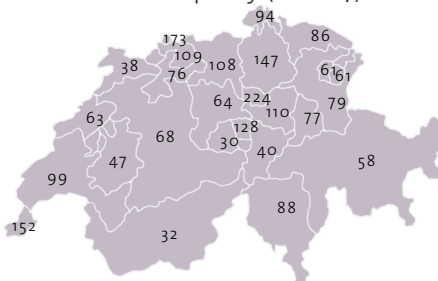
U_i^p agricultural land in plain region

- First: high income cantons have more capacity
- Second: high burden cantons have less capacity
- Third: how much more could be collected
- Fourth: less mountainous areas to have more capacity
- Fifth: low population density areas have less capacity

Swiss Federal Equalization Scheme

- Tax capacity (with adjustments) used in
 - ▶ Grants in aid
 - ▶ Revenue sharing
 - ▶ National Bank benefit
 - ▶ Contribute to fed social security
- Revenue equalization happened through > 10 formulae
- New goal: all > 85% of mean cantonal revenue/ capita

Fiscal Capacity (2006/7)



The Economic Approach: Optimize utility

Max Cobb Douglas Utility

$$U_j = \left(\frac{1}{n_i} \sum (y_i S(1 - e^{-ky_i})) \right)^\alpha * (h_j)^\sigma * (c_j)^\gamma$$

s.t. income constraint

$$y_j = y_j S(1 - e^{-ky_j}) + h_j + c_j$$

h_j

housing costs

c_j

consumption

$t_i = S(1 - e^{-ky_i})$

tax rate

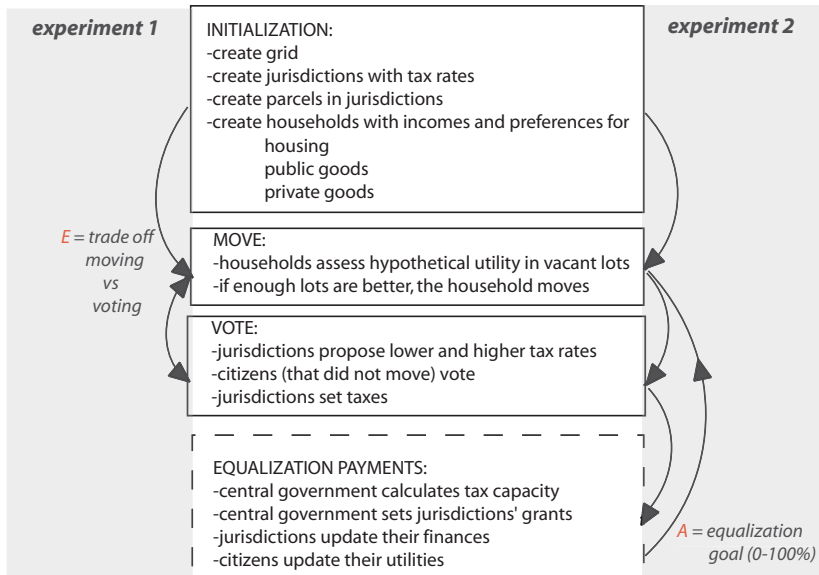
$p = \frac{1}{n} \sum (y_i * S(1 - e^{-ky_i}))$

public goods/capita

... or ABM

- inductive rather than deductive
- measure spatial sorting
- test policy interventions

The Agent Based Modeling Approach: Routine



Agent Based Modeling Approach: Program

The screenshot displays the 'Household Display' window, which is divided into three main sections: agent details on the left, a central spatial grid, and agent details on the right.

Left Agent Details:

- AlphaPubPref: 0.10869527453250764
- Class:
- DistanceToSource: 10.198039027185569
- GammaConsumptionPref: 0.5301866294828159
- ID: 840
- Income: 35466.0
- Moved: 0
- MyConsumption: 7399.029603881674
- MyHome:
- MyHousing: 6261.506270996095
- MyJurisdiction:
- MyPublic: 8971.953397767062
- MyTax: 805.4641251222315
- MyUtility: 5799.966621268866
- NewHome: Is Write-only
- NumberOfNeighbors: Is Write-only
- SigmaHousingPref: 0.3611180959846764
- X: 0
- Y: 12

Central Spatial Grid:

The grid is a 20x20 square lattice. The background is blue, representing a default state. Black squares represent the spatial distribution of the agent's home and housing. The agent's home is located at (X=0, Y=12). The housing is scattered across the grid, with a notable concentration in the lower-right quadrant.

Right Agent Details:

- AlphaPubPref: 0.10869527453250764
- Class:
- DistanceToSource: 12.727922061357855
- GammaConsumptionPref: 0.5301866294828159
- ID: 715
- Income: 214734.0
- Moved: 0
- MyConsumption: 19678.91015950395
- MyHome:
- MyHousing: 79348.55670014895
- MyJurisdiction:
- MyPublic: 6296.500800505419
- MyTax: 15706.53314034707
- MyUtility: 83069.96142436707
- NewHome: Is Write-only
- NumberOfNeighbors: Is Write-only
- SigmaHousingPref: 0.3611180959846764
- X: 19
- Y: 19

At the bottom of each agent details panel is an 'Inspect Agent' button.

Agent Based Modeling Approach: Starting values

- Housing
 - ▶ Sixteen jurisdictions, 625 units per jurisdiction
 - ▶ Vacancy of 8%
 - ▶ Occupied parcels' value = $\frac{1}{3}$ occupants' income
 - ▶ Empty parcels start with average of neighbors' prices
- Jurisdictions
 - ▶ Max tax (S) starts: $\mu_S = .35$ $\sigma_S = .076$
 - ▶ Phase-in (k) starts $\mu_k = 2.25e^{-5}$ $\sigma_k = .076$
- Households
 - ▶ Utility = $p^\alpha h^\sigma c^\gamma$
 - ▶ Preferences α, σ, γ have $\mu = .1, .3, .6$ & $\sigma = .02, .02, .04$
 - ▶ Normalized: $\alpha + \sigma + \gamma = 1$
 - ▶ Households assigned incomes = exp^y ($\mu_y = 11, \sigma_y = 1$)
- Only S & k change during the simulation

Agent Based Modeling Approach: Main dynamics

- Moving
 - ▶ Households look at 10 vacant lots
 - ▶ Household compares utilities to current location
 - ▶ If more than $\approx E$ proportion are better, household moves to best
 - ▶ **E** is *stickiness* or *exit-voice tradeoff*
- Voting
 - ▶ Government proposes a higher & lower tax scenario
 - ▶ k moves ± 0 to .000001
 - ▶ S moves $\pm - .01$ to .02 (crossover)
 - ▶ Households calculate utilities, vote for best scenario
 - ▶ Taxes change when over 60% vote higher or lower

Experiment 1 varies E (decision to move vs vote) .05 to .5.

Agent Based Modeling Approach: Experiment 2

- Tax Equalization

- ▶ Compare jurisdictions by tax capacity
- ▶ Transfer from high capacity to low capacity
- ▶ No negative budgets

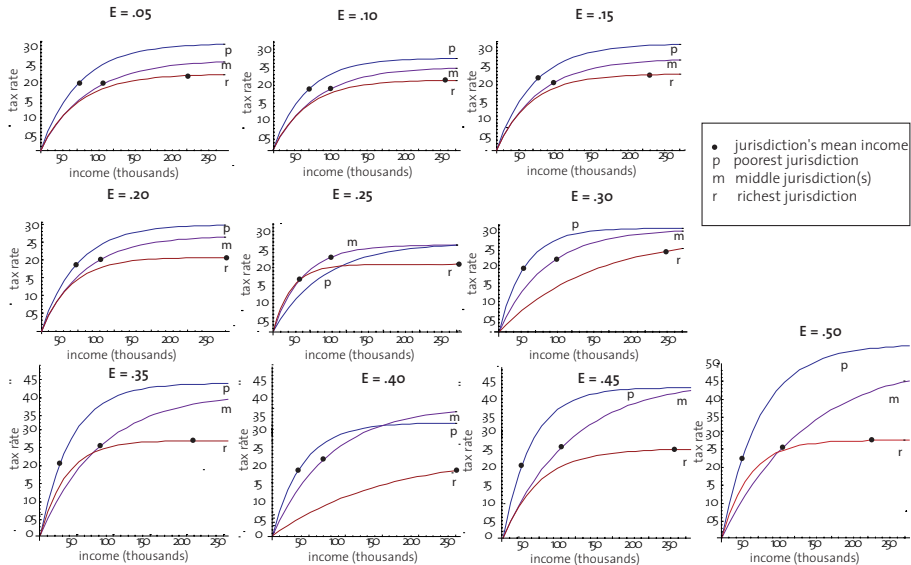
Cantonal Grant

$$G = AP_j(R_j^* - R_j)$$

G	jurisdiction grant from federal (+ or -)
A	redistribution goal (0 to 1)
P_j	population jurisdiction j
R_j^*	national per capita tax revenue w/ avg j 's tax rates
R_j	j 's per capita tax revenue w/ avg j 's tax rates

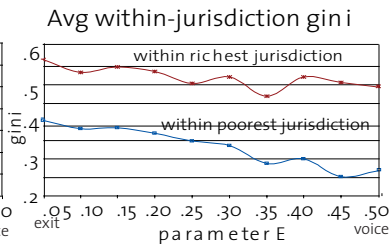
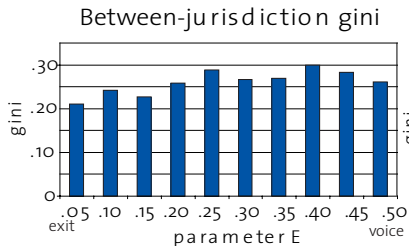
Experiment 2 varies A (redistribution) 0 to 1

Experiment One Results: Tax Inequality

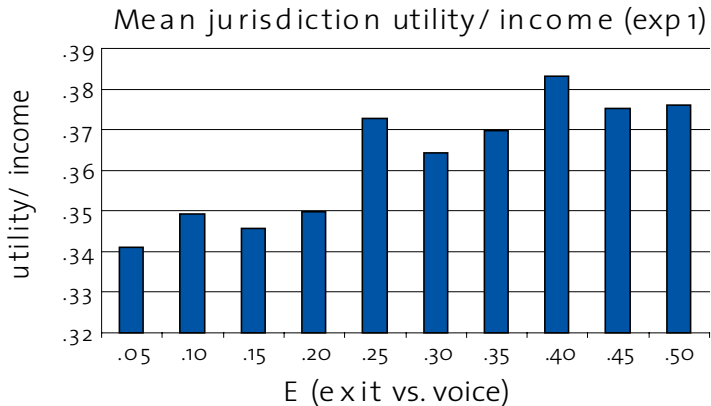


Experiment One Results: Segregation

- Always significant segregation
- Segregation might increase with stickiness
- Jurisdictions are more homogenous with stickiness



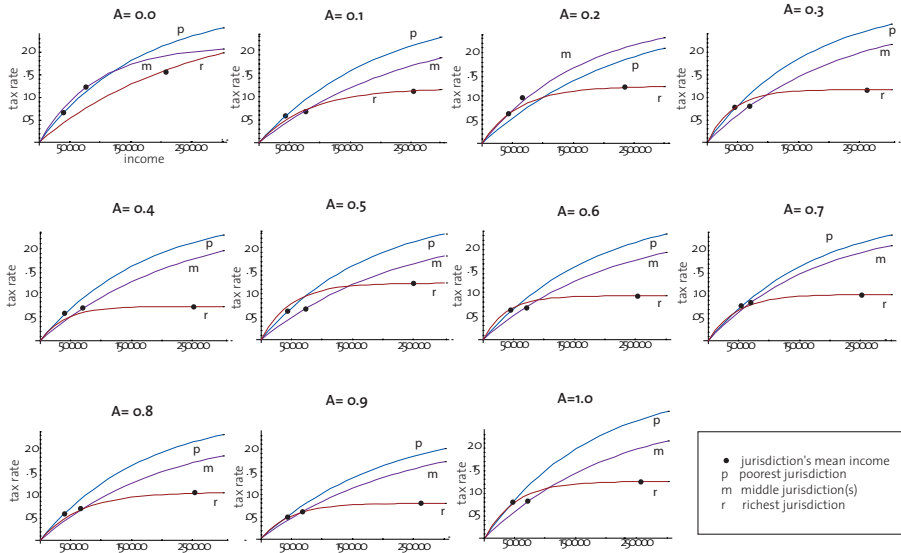
Experiment One: Higher utility through voting



Validation

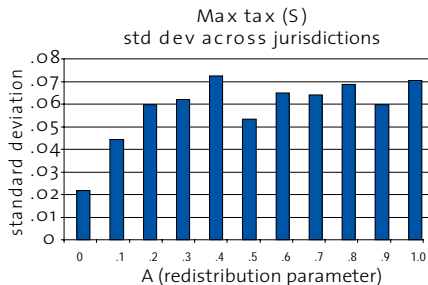
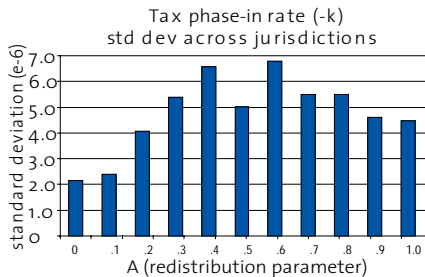
- Taxes too high for Switzerland data
- Jurisdictional differences match
- Chose $E = .3$ based on curve shape
- Better validation procedure necessary

Experiment Two Results: Tax Inequality



Experiment Two Results: Tax Rates

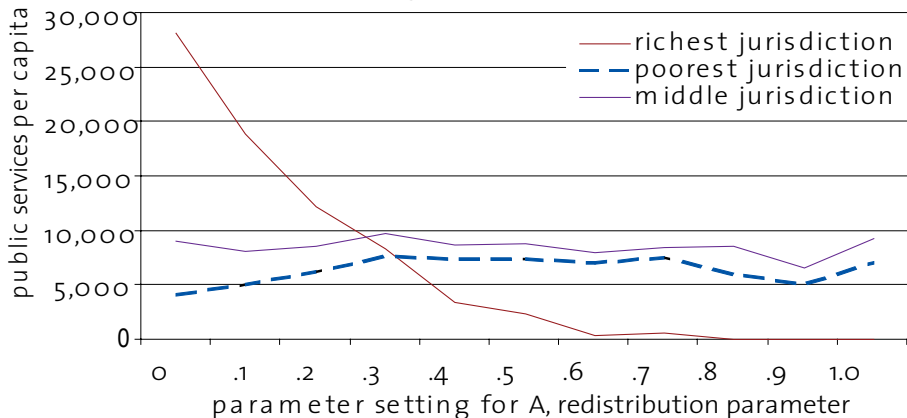
- Tax rates become more unequal as equalization increases
- Tax rates stabilize at 30% redistribution



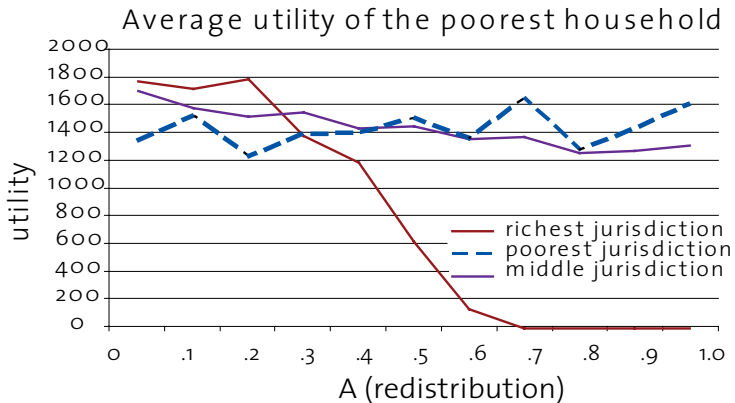
Experiment Two Results: Public Goods Provision

- Public goods plummet with equalization

Public goods per capita



Rawlsian Perspective



Conclusions

● Experiment One

- ▶ Rich jurisdiction have lower, flatter taxes
- ▶ Mean earner by jurisdiction pays about the same tax rate
- ▶ Segregation first increases with stickiness
- ▶ Jurisdictions become more homogenous with stickiness
- ▶ Stickiness makes people happier

● Experiment Two

- ▶ More equalization encourages rich areas to have lower, flatter taxes
- ▶ Average household in rich jurisdiction pays about the same tax as the average household in other jurisdictions
- ▶ Tax rates become more unequal with more equalization
- ▶ Equalization encourages rich jurisdictions to offer fewer public goods
- ▶ The poor in rich areas suffer from equalization

● Overall conclusion

- ▶ If equality is the goal, centralize?
- ▶ Real world stickiness makes sense

Improvements

- Model Specification
 - ▶ Households should move if best utility is $x\% >$ than current
 - ▶ Allow households to always vote?
 - ▶ Weak house pricing method...
 - ▶ Does segregation arise without house pricing mechanism?
- Problems
 - ▶ Model's utility in experiment 2 is higher (when $A=0$)
 - ▶ Produces consistently higher taxes than Switzerland
 - ▶ Vary *all* parameter settings
- Expansions
 - ▶ Calculate preference exponents for poorest in rich districts
 - ▶ Calculate mobility by income.
 - ▶ Apply to US school funding / property taxes, other cases?

