Tiebout model replication

This is a description of the Netlogo replication of Kollman et al. (1997). The model captures the process of voting of your feet by residents in different jurisdictions to improve their utility, as well as parties adapting their positions in the elections.

Given is a number N_J of jurisdictions, and a total of N_a citizen agents. Each jurisdiction offers a particular platform of local public goods and policies. Each jurisdiction's platform is determined by a political institution that aggregates the preferences of the agents currently residing in the jurisdiction. Once new platforms are determined, agents are allowed to move to jurisdiction that give them a higher expected utility, and the process is iterated. Agents do not take into account the effects of their own movements on future policies.

Within any jurisdiction, the local government is obliged to decide position on a set of N_i local public issues. All jurisdictions must take positions on each of the N_i issues. Each of those positions are assumed to binary. Let $p_{j,i} \in \{Yes, No\}$ give the position of jurisdiction j on issue I, and let a platform, $P_j \in \{Yes, No\}^{Nj}$, denote the vector of decisions across all N_i issues in jurisdiction j. Finally, define a configuration as a mapping of agents to jurisdictions.

The preferences of agents for each issue lies in the interval [$-400/N_i$, $400/N_i$] distributed uniformly. Let v_{ai} give agent a's utility for issue i. The total utility of an agent for a platform of various issues is defined as

$$u_a(P_j) = \sum_{i=1}^{N_i} v_{ai} \cdot \delta(p_{ji})$$

Where δ(Yes)=1 and δ(No)=0. The expected value of a random platform is 0 and the expected value of the optimal platform is 100.

Parties have incomplete information and adjust their positions over time. Initially platforms are generated randomly. When a party is given a chance to adapt.to a new platform is proposed by randomly perturbing up to three issues. If the newly proposed platform leads to more votes, the proposed platform will become the new platform (assuming the party knows the preferences of the residents). For eight iterations this process of adaptation is happening before another party can adapt. The hill-climbing process of five cycles of adaptive iterations is implemented before each election.

With the model we explore the consequences of different ways the votes are aggregated into platforms in the jurisdictions. Three political institutions are implemented: democratic referenda, direct competition and proportional representation.

Democratic referenda: For each jurisdiction a democratic referendum result in the majority rule on each issue.

Direct competition: Each agent votes for the party that gives her the highest utility, and the winning party implements its platform in the jurisdiction

Proportional Representation: Each agent votes for the party that gives her the highest utility. Each party has a proportion of seats proportional to popular vote. On each issues the parties vote and the weighted (by popular vote) sum of each party's platform position on each issue defines the outcomes.

We will explore the model outcomes published in Kollman et al. (1997) with out own outcomes and with Seagren (2015) a Repast replication. The simulations are done with N_a = 1000 and 11 issues, and for each parameter setting 200 repetitions are done. In the Tables below we show the results of the 3 implementations, and it confirms out Netlogo implementations performs reasonably well.

	KMP	Seagren	Janssen
Single Jurisdiction	Per-Capita Utility (SE)	Per-Capita Utility (SE)	Per-Capita Utility (SE)
Democratic reference	2.69 (0.12)	2.32 (0.10)	2.65 (0.10)
Direct competition (two parties)	1.45 (0.13)	1.74 (0.11)	1.83 (0.09)
Direct competition (three parties)	0.67 (0.13)	0.61 (0.12)	0.83 (0.11)
Direct competition (seven parties)	0.33 (0.13)	0.27 (0.11)	0.46 (0.11)
Proportional representation (three parties)	1.33 (0.13)	1.21 (0.12)	1.37 (0.10)
Proportional representation (seven parties)	1.36 (0.13)	1.23 (0.11)	1.29 (0.11)

Note. KMP = Kollman, Miller, and Page's model; SE = standard error.

	KMP	Seagren	Janssen
Multiple Jurisdictions	Per-Capita Utility (SE)	Per-Capita Utility (SE)	Per-Capita Utility (SE)
Three Jurisdictions			
Democratic referenda	34.39 (0.15)	33.78 (0.16)	34.25 (0.12)
Direct competition (two parties)	34.15 (0.14)	34.56 (0.11)	34.72 (0.09)
Proportional representation (three parties)	35.56 (0.11)	34.85 (0.11)	35.09 (0.10)
Seven jurisdictions			
Democratic referenda	48.29 (0.13)	48.18 (0.12)	48.09 (0.11)
Direct competition (two parties)	49.90 (0.13)	49.13 (0.12)	49.81 (0.10)
Proportional representation (three parties)	51.80 (0.12)	50.60 (0.10)	50.01 (0.10)
Eleven Jurisdictions			
Democratic referenda	55.46 (0.12)	55.34 (0.11)	54.99 (0.11)
Direct competition (two parties)	57.03 (0.13)	56.14 (0.12)	56.72 (0.10)
Proportional representation (three parties)	58.93 (0.12)	57.61 (0.10)	57.74 (0.10)

Note. KMP = Kollman, Miller, and Page's model; SE = standard error.

References

Kollman, K., J.H. Miller and S.E. Page (1997) Political Institutions and Sorting in a Tiebout Model, American Economic Review 87(5): 977-992.

Seagren, C.W. (2015) A Replication and Analysis of Tiebout Competition Using an Agent-Based Computational Model, Social Science Computer Review 33(2): 198-216