

CALIFORNIA INSTITUTE OF TECHNOLOGY
Foundations of Political Economy
SS210a

TTh 10:30-12:00
19 Baxter

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Fall, 2002

Mathematical Models of Elections

This course is primarily about models of elections. Because some deep mathematics is required to address difficulties arising from multidimensional issue spaces, we will also go through a bit of math. The course will be primarily a lecture course, with perhaps some student presentations and possibly homework exercises.

There is no textbook for the course, but we will use parts of several books.

- W. Hildenbrand, *Core and Equilibria of a Large Economy*, 1974, Princeton: Princeton University Press.
- J. Kingman and S. Taylor, *Introduction to Measure and Probability*, 1966, New York: Cambridge University Press.
- N. Stokey and R. Lucas, *Recursive Methods in Economic Dynamics*, 1989, Cambridge: Harvard University Press.

You probably all own the last book, and I will distribute sections from the others, as needed. Another nice reference (but too advanced for this course) is the well-known. . .

- C. Aliprantis and K. Border, *Infinite Dimensional Analysis: A Hitchhiker's Guide*, 2nd ed., 1999, New York: Springer.

My idea for the course breaks up naturally into ten sections, each of which could occupy an entire quarter. Thus, we will be going deeply into some topics, while touching only superficially on others.

1. Preliminaries: binary relations, maximal elements, Zorn's lemma
 - Hildenbrand, pp.3-8.
 - Kingman and Taylor, Chapter 1.

2. Social Choice, Part 1: simple games, tournament solutions, Downsian elections, weak tournaments
 - H. Moulin, "Choosing from a Tournament," *Social Choice and Welfare*, 1986, 3:271-291.
 - G. Laffond, J.-F. Laslier, and M. Le Breton, "The Bipartisan Set of a Tournament Game," *Games and Economic Behavior*, 1993, 5:182-201.
 - B. Dutta and J.-F. Laslier, "Comparison Functions and Choice Correspondences," *Social Choice and Welfare*, 1999, 4:513-532.
3. Metric Spaces: background
 - Hildenbrand, pp.8-40.
 - Kingman and Taylor, Chapter 2.
 - Stokey and Lucas, Chapter 3.
4. Social Choice, Part 2: continuity properties of social preferences, top cycle, uncovered set, undominated set
 - R. McKelvey, "Covering, Dominance, and Institution-Free Properties of Social Choice," *American Journal of Political Science*, 1986, 30:283-314.
 - J. Banks, J. Duggan, and M. Le Breton, "Social Choice in the General Spatial Model of Politics," W. Allen Wallis Institute of Political Economy Working Paper, no. 26, 2002.
5. Measure Theory: background
 - Hildenbrand, pp.40-79.
 - Kingman and Taylor, Chapters 2-6.
 - Stokey and Lucas, Chapter 7.
6. Downsian Elections: equilibrium existence, bounds on equilibrium strategies
 - I. Glicksberg, "A Further Generalization of the Kakutani Fixed Point Theorem, with Application to Nash Equilibrium Points," *Proceedings of the American Mathematical Society*, 1952, 3:170-174.

- J. Banks, J. Duggan, and M. Le Breton, “Bounds for Mixed Strategy Equilibria and the Spatial Model of Elections,” *Journal of Economic Theory*, 2002, 103:88-105.
- P. Reny, “On the Existence of Pure and Mixed Strategy Nash Equilibria in Discontinuous Games,” *Econometrica*, 1999, 67:1029-1056.
- J. Duggan, “Equilibrium Existence in Discontinuous Zero-sum Games with an Application to the Spatial Model of Elections,” 2002, mimeo.
- G. Kramer, “Existence of Electoral Equilibrium,” in P. Ordeshook, ed., *Game Theory and Political Science*, 1978, New York: NYU Press.
- L. Simon and W. Zame, “Discontinuous Games and Endogenous Sharing Rules,” *Econometrica*, 1990, 58:861-872.

7. Policy-Motivated Candidates

- R. Calvert, “Robustness of the Multidimensional Voting Model: Candidate Motivations, Uncertainty, and Convergence,” *American Journal of Political Science*, 1985, 29:69-95.
- J. Duggan and M. Fey, “Electoral Competition with Policy-motivated Candidates,” W. Allen Wallis Institute of Political Economy Working Paper, no. 19, 2001.

8. Probabilistic Voting

- R. Calvert (cited above)
- R. Ball, “Discontinuity and Non-existence of Equilibrium in the Probabilistic Spatial Voting Model,” *Social Choice and Welfare*, 1999, 16:533-556.
- M. Hinich, “Equilibrium in Spatial Voting: The Median Voter Result is an Artifact,” *Journal of Economic Theory*, 1977, 16:208-219.
- M. Hinich, “The Mean Versus the Median in Spatial Voting Games,” in P. Ordeshook, ed., *Game Theory and Political Science*, 1978, New York: NYU Press.
- A. Lindbeck and J. Weibull, “A Model of Political Equilibrium in a Representative Democracy,” *Journal of Public Economics*, 1993, 51:195-209.

- P. Coughlan and S. Nitzan, “Electoral Outcomes with Probabilistic Voting and Nash Social Welfare Maxima,” *Journal of Public Economics*, 1981, 15:113-121.
- J. Banks and J. Duggan, “The Theory of Probabilistic Voting in the Spatial Model of Elections,” 1999, mimeo.
- R. McKelvey and J. Patty, “A Theory of Voting in Large Elections,” mimeo., 2002.

9. Citizen Candidates

- M. Osborne and A. Slivinski, “A Model of Political Competition with Citizen-candidates,” *Quarterly Journal of Political Science*, 1996, 111:65-96.
- T. Besley and S. Coate, “An Economic Model of Representative Democracy,” *Quarterly Journal of Economics*, 1997, 112:85-114.

10. Repeated Elections

- G. Kramer, “A Dynamical Model of Political Equilibrium,” *Journal of Economic Theory*, 1977, 16:310-334.
- J. Duggan and M. Fey, “Repeated Downsian Elections,” 2002, mimeo.
- A. Alesina, “Credibility and Policy Convergence in a Two-party System with Rational Voters,” *American Economic Review*, 1988, 78:796-803.
- R. Reed, “A Retrospective Voting Model with Heterogeneous Politicians,” *Economics and Politics*, 1994, 6:39-58.
- J. Banks and J. Duggan, “A Multidimensional Model of Repeated Elections,” mimeo., 2002.
- D. Austen-Smith and J. Banks, “Electoral Accountability and Incumbency,” in P. Ordeshook, ed., *Models of Strategic Choice in Politics*, 1989, Ann Arbor: University of Michigan Press.