



Modeling the Evolution of Political Ideologies

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ABSTRACT

Our work intends to shed new insights into the debate of polarization by using a multidisciplinary approach that applies Evolutionary Game Theory to study the evolution of public ideology in US.

In particular, we use the replicator equation to model political ideology as a dynamic game, where strategies reproduce at a rate proportional to their payoffs.

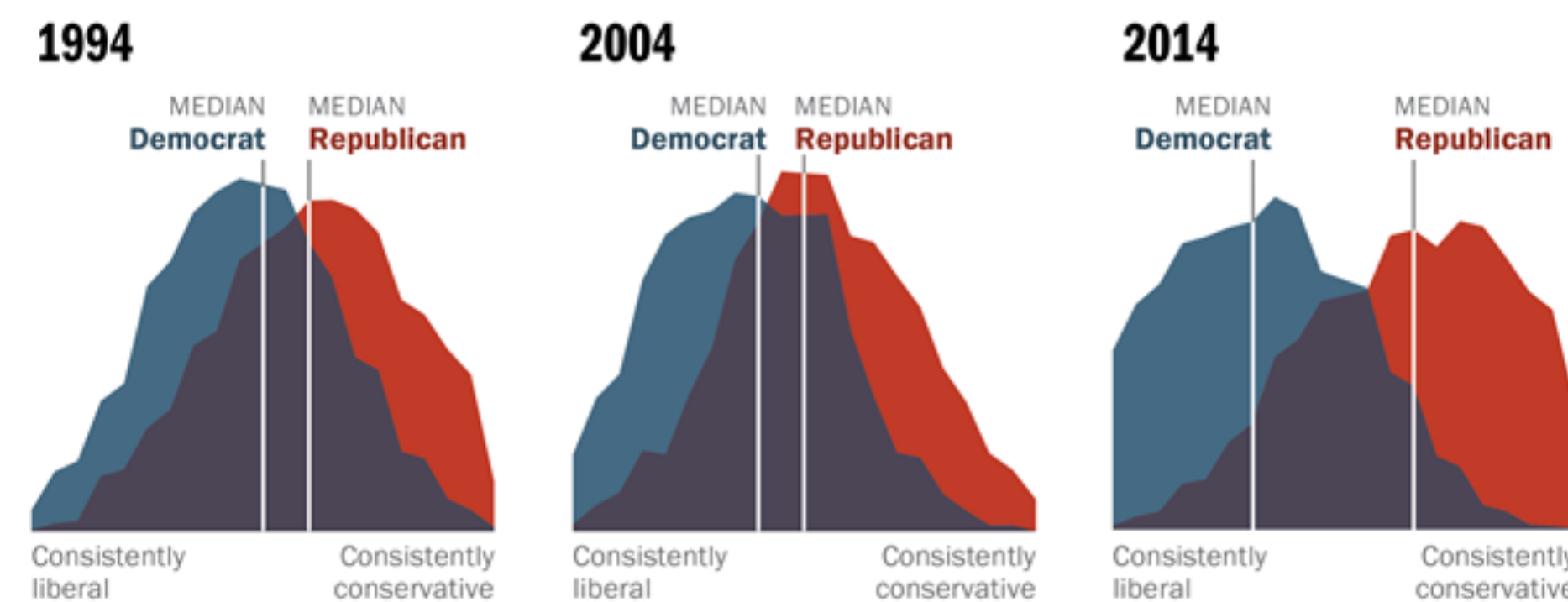
Evolutionary game theory has explicit biological roots, where payoffs represent fitness as the underlying process of natural selection.

However, these models can also be thought of as models of cultural evolution.

IDEOLOGY POLARIZATION

Democrats and Republicans More Ideologically Divided than in the Past

Distribution of Democrats and Republicans on a 10-item scale of political values



Source: 2014 Political Polarization in the American Public

REPLICATOR DYNAMICS

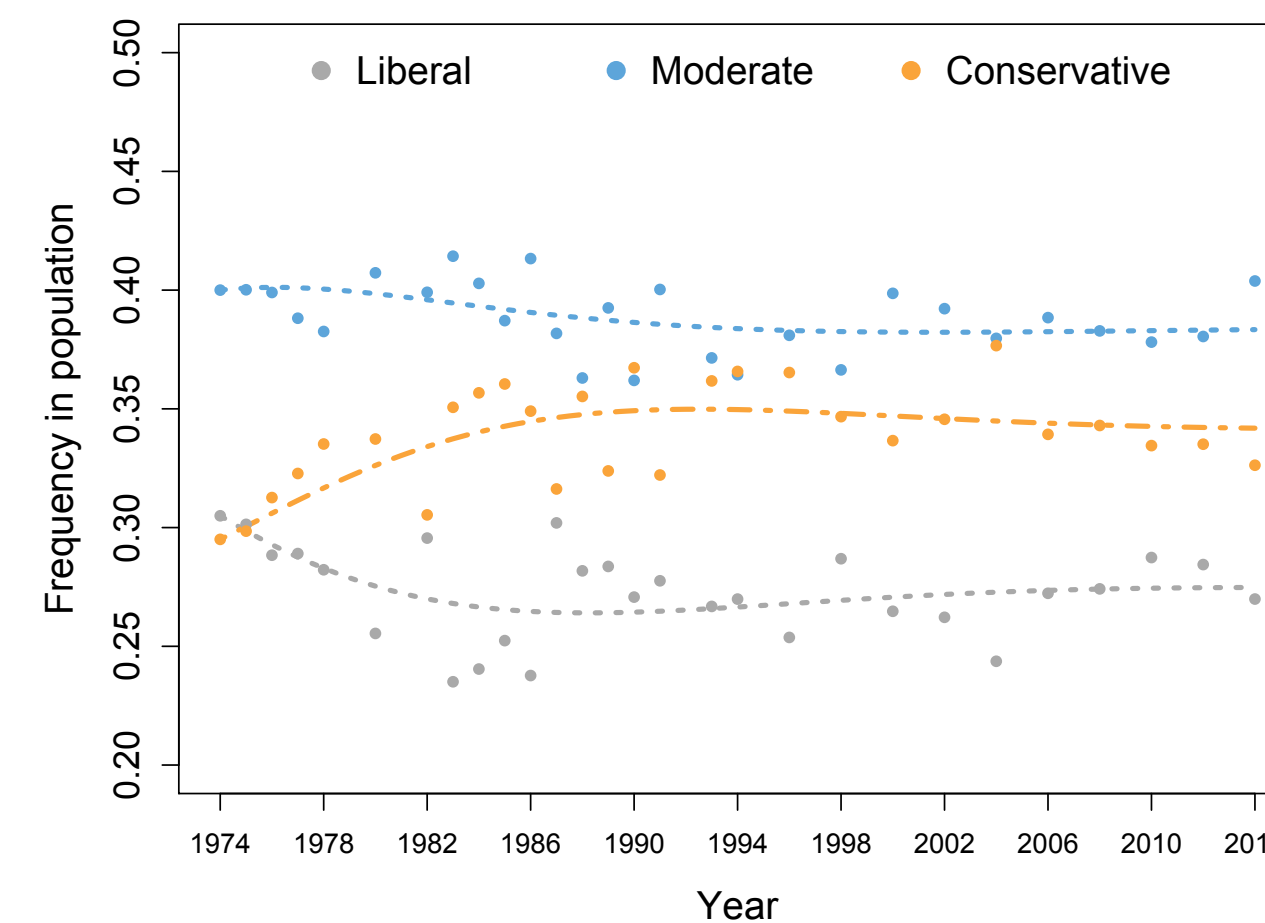
The growth rate of the frequency of a strategy is proportional to the difference between the payoff of individuals playing this strategy and the mean payoff in the population.

$$\dot{x}_i = x_i((Ax)_i - x^T Ax)$$

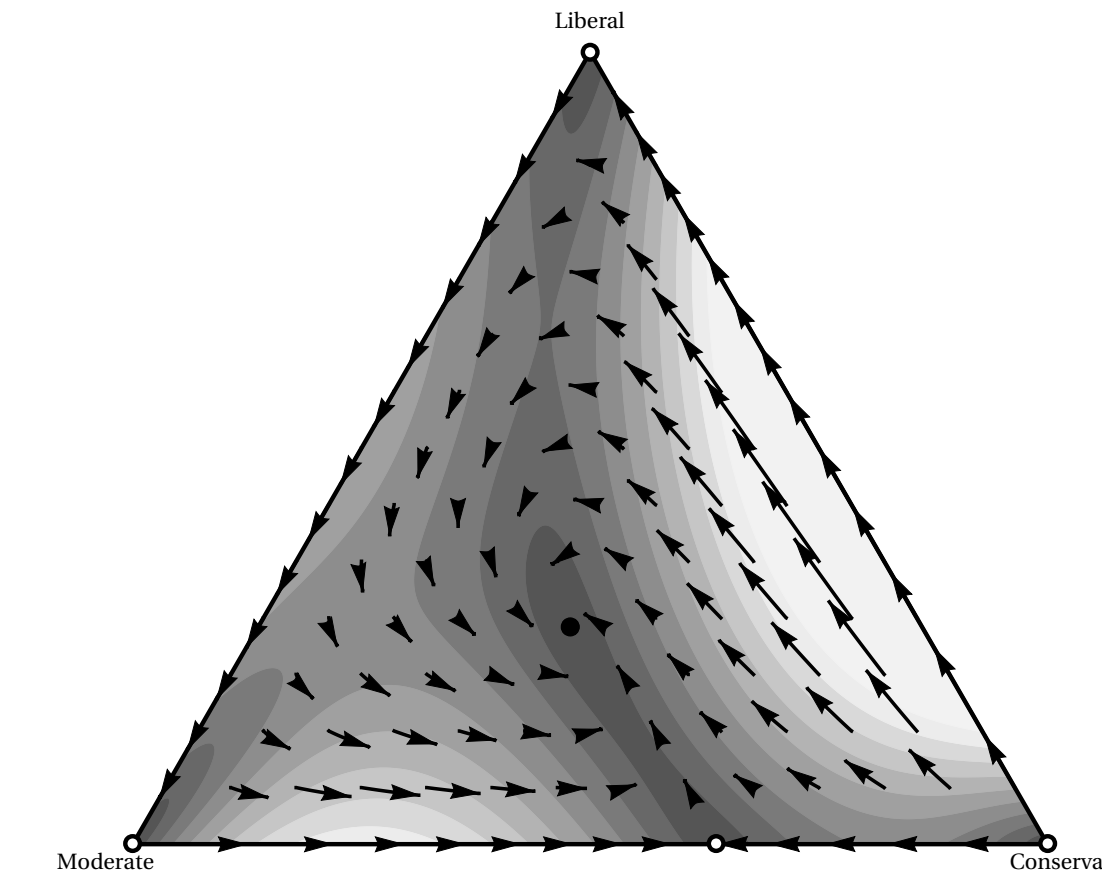
- x_i is the proportion of type i in the population.
- The payoff matrix A has entries $a_{ij} = \pi(i, j)$, representing the payoff of player i playing against j .
- $x^T Ax$ is the average population payoff.

RESULTS

Best fit under the replicator dynamics



Phase diagram



The GSS survey asks people to declare their political ideology in a seven-point scale: from extremely liberal—point 1—to extremely conservative—point 7.

Left picture: Replicator dynamics fitted to the data from the General Social Survey (GSS).
Right picture: Phase diagram of the replicator equation given estimated matrix. The black and white dots correspond to stable and unstable rest points of the dynamic.

Three-population Replicator Dynamics

