14.773 Political Economy of Institutions and Development.
Lecture 4. Dynamic Voting with Given Constituencies

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Introduction

- Most economic policy choices are dynamic.
- In addition, many of the inefficiencies discussed in the first lecture are related to commitment issues that can only be understood in dynamic models.
- Let us try to understand how voting worksin a dynamic world and what its implications are.
- Important distinction:
  1. *Given constituencies*
  2. *Endogenously changing constituencies.*
- We start with the first.

Myopic Dynamic Voting: Introduction

- Immediate application of the static models of Romer, Roberts and Meltzer-Richard to dynamic settings.
- Focus relationship between inequality and growth (and redistribution).
- Alesina-Rodrik, Persson-Tabellini.
- Simple models, but key assumption: *myopic voting.*
  - individuals vote *as if* they will never vote again.

Myopic Dynamic Voting: Model Basics

- Individual preferences are given by:

$$\sum_{t=0}^{\infty} \beta^t \ln c_t$$

- Output is given by the aggregate production function

$$y = Ak^{1-\alpha} g^{\alpha} l^{\alpha}$$

  where k is capital and g is government investment in infrastructure, and labor l is normalized 1.

- Government investment g is financed by linear capital taxation at the rate τ:

$$g = \tau \bar{k} \tag{1}$$

  where $\bar{k}$ is the average capital stock in the economy.

- Hence, government's provision of infrastructure creates a Romer-type externality.

Myopic Dynamic Voting: Solution I

- Assume that capital depreciates fully and that all factor markets are competitive. Then,

$$
\begin{aligned}
r &= (1-\alpha) A\tau^{\alpha} \\
w &= \alpha A\tau^{\alpha}\bar{k}
\end{aligned}
$$

- There is no tax on labor, but the take-home pay per unit of capital is

$$r - \tau = A(1-\alpha)\tau^{\alpha} - \tau$$

- Agents are heterogeneous in their holdings of capital (and all have labor $l = 1$).
- Then the earnings of individual i can be written as

$$y_i = \alpha\tau^{\alpha}\bar{k} + \left[A(1-\alpha)\tau^{\alpha} - \tau\right]k_i$$

- The first term is labor earnings, while the second term is the capital income of individual i.

Myopic Dynamic Voting: Solution II

- To make more progress, let θ_i be the the relative capital holding of individual i,

$$\theta_i = k_i / \bar{k},$$

so

$$y_i = \left[\alpha \tau^{\alpha} + \left[A\left(1-\alpha\right)\tau^{\alpha} - \tau\right]\theta_i\right]\bar{k}$$

- Logarithmic preferences and capital taxation means that the growth rate of consumption for all agents between two dates is given by

$$\frac{c_{t+1}}{c_t} = \gamma(\tau_t) \equiv \beta\left[A\left(1-\alpha\right)\tau_t^{\alpha} - \tau_t\right], \tag{2}$$

$\rightarrow$ all individuals accumulate income at the same rate.

- How can we think about the preferences of individuals over taxes?
- *Major shortcut:* solve for the equilibrium given a constant tax rate τ that applies in all dates. Then agents vote *once and for all* over this tax rate.

Myopic Dynamic Voting: Solution III

- Given a constant tax rate τ at all dates, and using the lifetime budget constraint, we obtain that time $t = 0$ consumption level of individual i is given by

$$c_{i0}(\tau) = \left[\alpha\tau^{\alpha} + (1-\beta)\left(A(1-\alpha)\tau^{\alpha} - \tau\right)\theta_i\right] k_0 .$$

- From (2), consumption of each individual grows at the constant rate $\gamma(\tau)$ per period, so the lifetime utility of individual i can be written as:

$$\begin{aligned}
\sum_{t=0}^{\infty} \beta^t \ln c_{it} &= \sum_{t=0}^{\infty} \beta^t \ln\left[(\gamma(\tau))^t c_{i0}(\tau)\right] \\
&= \frac{\ln c_{i0}(\tau)}{1-\beta} + \frac{\ln \gamma(\tau)}{(1-\beta)^2}.
\end{aligned} \tag{3}$$

- Since $c_{i0}(\tau)$ and $\gamma(\tau)$ are concave, each voter's utility is concave, and thus each voter has single-peaked preferences with a unique (political) bliss point.

Myopic Dynamic Voting: Solution IV

- The bliss point of voter i, $\tau(\theta_i)$, is the maximizer of (3) and is given as the implicit solution to

$$\frac{c_{i0}'(\tau)}{c_{i0}(\tau)} + \frac{\gamma'(\tau)}{(1-\beta)\gamma(\tau)} = 0. \tag{4}$$

- $\tau'(\theta_i) < 0$, so that the preferred tax rate is decreasing in θ_i. $\rightarrow$voters with greater capital holdings prefer lower taxes.
- Note also that equation (4) can hold only if $\gamma'(\tau)/\gamma(\tau) < 0$ and $c_{i0}'(\tau)/c_{i0}(\tau) > 0$.
- Therefore, the tax rate will be above the growth maximizing tax rate τ^* which sets $\gamma'(\tau^*) = 0$, which means that a lower value of θ_i corresponds to a higher prefered tax rate and a lower rate of economic growth.

Myopic Dynamic Voting: Solution V

- Now applied the MVT to this myopic voting problem.
  $\rightarrow$the equilibrium tax rate will be the bliss point of the median-ranked voter.
- What are the implications?
- As in the static model over distribution, a greater gap between mean and median will increase taxes.
- If capital ownership is skewed, so that average capital income is greater than the capital income of the median, greater inequality will tend to increase taxe.
- Moreover, since we are on ready above the growth maximizing tax rate, further increases in taxation reduce growth.
- Thus, conclusion of these models: *greater inequality leads to lower growth because of increased demand for redistribution.*

Markov Perfect Equilibrium

- So what is the alternative to myopic voting?
- Voters take into account how their current voting will affect future political decisions (as well as economic decisions).
- One way of doing this is to look for Markov Perfect Equilibria (MPE).
- Let us start with a simple example due to Hassler, Rodriguez Mora, Storesletten and Zilibotti, focusing on the survival or breakdown of a welfare state redistributing to agents who are "economically unsuccessful".

Model

- 2-period OLG, risk neutral agents, work in both periods of life.
- To focus sharply, we assume that individuals are born identical but become "successful" or "unsuccessful".
- Young individuals can affect the probability of becoming "successful" by an investment e, at the cost e^2,
- With prob. e the agent becomes type S (Successful) and earns 1 in both periods of her life.
- With prob. $1 - e$ the agent becomes type U (Unsuccessful) and earns 0 in both periods of her life.

Timing

- Political decision: set, each period, transfer $b_t \in [0, 1]$ to unsuccessful, financed by lump-sum tax τ_t under budget balance.
  1. Either: agents vote at the end-of-period for next period's benefits;
  2. Or: agents vote at the beginning of period but only the old are entitled to vote (extension: young vote but lower turnout).
- Young make private investment (e_t),
- Realization of uncertainty.

Utilities

- The utilities (net income) of agents alive at t are:

$$V_t^{os} = 1 - \tau_t, \;\; V_t^{ou} = b_t - \tau_t,$$
$$V_t^{y} = e_t\,(1+\beta) + (1-e_t)\,(b_t + \beta b_{t+1}) - e_t^2 - \tau_t - \beta\tau_{t+1}.$$

- Optimal choice of investment gives

$$e_t = 1 - \frac{1 - \beta + (b_t + \beta b_{t+1})}{2}$$

Evolutions I

- Let u_t denote the proportion of old U at t. Then,

$$u_{t+1} = (1 - e_t),$$

since all young are identical.

- Budget balance imposed each period requires

$$2\tau_t = (u_{t+1} + u_t)\, b_t$$

- Therefore

$$\tau_t = \frac{(1-\beta) + (b_t + \beta b_{t+1}) + 2u_t}{4} b_t.$$

- Politically decisive (median) voter chooses b to maximize her indirect utility.
- For simplicity, let us assume that only the old participate in the political process. (Otherwise, the young would always form a majority).

Evolutions II

- Agents are rational and forward-looking. In particular:
- The old at t care about b_{t+1} since this affects the incentives of the young to invest (and the taxbase of current redistribution).
- The old realize that their political choice affects future distribution of types, and, hence, b_{t+1} and their utility.

$$V^{os}(b_t, b_{t+1}, u_t) = 1 - \tau_t = 1 - \frac{(1-\beta) + (b_t + \beta b_{t+1}) + 2u_t}{4} b_t,$$

$$V^{ou}(b_t, b_{t+1}, u_t) = b_t - \tau_t = b_t - \frac{(1-\beta) + (b_t + \beta b_{t+1}) + 2u_t}{4} b_t.$$

Definition of Equilibrium

- *Markov Perfect Equilibria*: take strategies conditional only on the current state of the world.
- Then, a fixed point in the mapping from expectations about future redistribution.
- A (Markov perfect) political equilibrium is defined as a pair of functions $\langle B, U \rangle$, where $B : [0, 1] \rightarrow [0, 1]$ is a public policy rule, $b_t = B(u_t)$, and $U : [0, 1] \rightarrow [0, 1]$ is a private decision rule, $u_{t+1} = 1 - e_t = U(b_t)$, such that the following functional equations hold:
  - $B(u_t) = \arg\max_{b_t} V(b_t, b_{t+1}, u_t)$ subject to $b_{t+1} = B(U(b_t))$, and $b_t \in [0, 1]$,
    and $V(b_t, b_{t+1}, u_t)$ is defined as the indirect utility of the current decisive voter.
  - $U(b_t) = (1 - \beta + b_t + \beta b_{t+1}) / 2$, with $b_{t+1} = B(U(b_t))$.

Dictatorship of the Successful

- Let us first consider the situation in which only one type of old agents have political power, for example, the successful.
- The characterization of equilibrium under the dictatorship of the successful (PL for "plutocracy") is straightforward, since it will never involve any redistribution.
- Consequently, we have a unique equilibrium under PL where:

$$u_t = u^{pl} = (1 - \beta) / 2.$$

Dictatorship of the Unsuccessful I

- The equilibrium under dictatorship of the unsuccessful (DP for the "dictatorship of the proletariat") is more complicated.
- Now, a representative unsuccessful old agent will choose b_t to maximize:

$$V^{ou}(b_t, b_{t+1}, u_t) = b_t - \frac{(1-\beta) + (b_t + \beta B(U(b_t))) + 2u_t}{4} b_t$$

- Equilibrium first-order condition is:

$$2 - \left(u_t + \left(\frac{1-\beta}{2} \right) + b_t + \frac{\beta}{2} B(U(b_t)) + \frac{\beta}{2} b_t B'(U'(b_t)) \right) = 0$$

- The last term from the non-myopic political behavior. This is the equivalent of the dynamic linkage terms we so in the analysis of MPE in the previous lecture.

Dictatorship of the Unsuccessful II

- To characterize the equilibrium, use "guess and verify". Guess the form of the value function as

$$B(u_t) = a_1 + a_2 u_t,$$

which implies

$$B' = a_2.$$

- Therefore, we have

$$\begin{aligned} U(b_t) &= (1 - \beta + b_t + \beta B(U(b_t)))/2 \rightarrow \\ U(b_t) &= \frac{1 - \beta(1 - a_1) + b_t}{2 - \beta a_2}, \quad U'(b_t) = \frac{1}{2 - \beta a_2} \end{aligned}$$

Dictatorship of the Unsuccessful III

- Substituting B and U into the first-order condition and solving for b_t, we obtain

$$b_t = \left(\frac{3}{2} - \beta a_2 + \frac{1}{2} \beta \left(1 - a_1\right) \right) - \left(1 - \frac{1}{2} \beta a_2 \right) u_t$$

- Now verifying that this is a solution involves making sure that the following equality holds:

$$b_t = \left(\frac{3}{2} - \beta a_2 + \frac{1}{2} \beta \left(1 - a_1\right) \right) - \left(1 - \frac{1}{2} \beta a_2 \right) u_t = B\left(u_t\right) = a_1 + a_2 u_t.$$

- This will be the case as long as

$$a_1 = \frac{3\left(2+\beta\right) - \beta^2}{4 - \beta^2} \text{ and } a_2 = -\frac{2}{2-\beta}.$$

Dictatorship of the Unsuccessful III

- Thus the solution is:

$$B(u_t) = \max\left[\frac{3(2+\beta)-\beta^2}{4-\beta^2} - \frac{2}{2-\beta}u_t, 1\right]$$

$$U(b_t) = \frac{\beta(1+\beta)+2}{2(2+\beta)} + \frac{2-\beta}{4}b_t$$

(though we have to make sure that the constraint $b \in [0,1]$ and additional boundary conditions hold).

Decision Rules

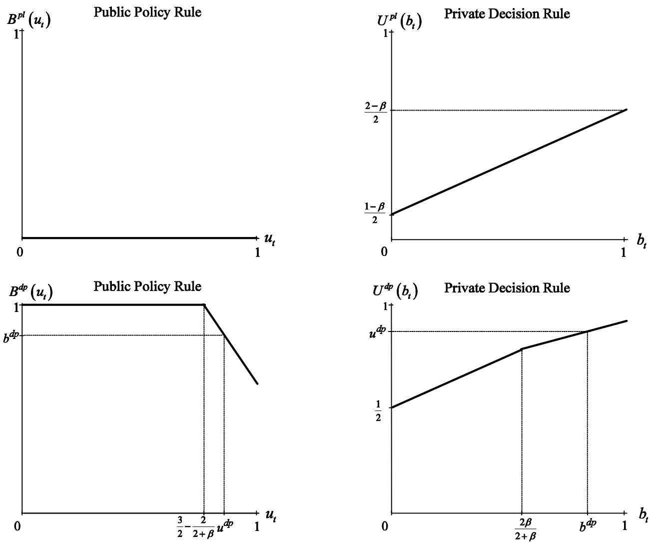

Figure 1. Public policy rule and private decision rule under Plutocracy (upper panels) and Dictatorship of Proletariat (lower panels)

Equilibrium under Majority Voting

- Let us now analyze the equilibrium under majority voting.
- Majority voting implies the following pattern:
  - If $u_t \leq 1/2$, the successful agents decide.
  - If $u_t > 1/2$, the unsuccessful agents decide.
- Therefore, we have the following pattern of results:

1. If $u_0 \leq 1/2$, no welfare state ever arises.
2. If $u_0 > 1/2$, two possible equilibria depending on expectations;
   1. Perpetual survival of the welfare state ("pro-welfare" expectations), and
   2. The welfare state is (strategically) terminated in, at most, two periods ("anti-welfare" expectations).

- The equilibrium (a) can be sustained for any parameter, but (b) only sustained if agents are sufficiently forward-looking (i.e., patient).

Equilibrium Survival of the Welfare State

- Intuition: an existing welfare state can regenerate its own political support, at least as long as the young have faith in its survival (i.e., as long as they have the right expectations).
- In particular: the existence of the welfare state implies low investment by young agents and a large future constituency for the welfare state.
- No welfare state, in turn, implies high investment and a small future constituency for the welfare state.
- How does the welfare state start? Perhaps an initial negative big shock, (depression, democratization, rise of labor movement) could start the welfare state, then it regenerates its support.

An Equilibrium Breakdown of the Welfare State

- The old unsuccessful agents want to be the last generation living in a welfare state, since their tax burden depends positively on b_{t+1}.
- Thus, if the young believe the welfare state to be fragile, the old can induce its breakdown by voting for sufficiently low b_t.
- The young work (invest) hard and $u_{t+1} \leq 0.5$
- The termination of the welfare state in finite time is an equilibrium if $\beta > \beta_M \approx 0.555$.
- Intuitively, to induce young to rationally believe that the welfare state is about to breakdown, the old unsuccessful must set b sufficiently low.
- How low is low depends on the young's expectations.

Wage Inequality and Equilibrium

- Parameterize inequality by assuming that the successful agents earn $w \neq 1$.

$$u_{t+1} = 1 - e_t^* = \frac{2 - (1+\beta)\, w + b_t w + \beta b_{t+1} w}{2}.$$

- If $w < 1/\left(1+\beta\right)$, the welfare state is the unique outcome ($u_{t+1} > 1/2$, for any non-negative sequence of b's).
- Intermediate w's multiple equilibria (as before).
- Large w's, on the other hand, imply that there is no welfare state equilibrium.
- Consequently, a shock, such as "skill-biased technological change" or "globalization," that increases equilibrium wage premium may undermine the put it will support for the welfare state.