Political Economy of Institutions and Development: 14.773
Problem Set 3

Due date: April 18, 2008.

Question 1

A policymaker chooses the level of a policy vector, $\mathbf{x}$, which affects the welfare of several interest groups and the general public. Each group i offers a non-negative payment schedule C_i to influence policy. The schedule C_i is a contract stipulating that if the policymaker sets the policy at $\mathbf{x}$, then group i will pay the policymaker $C_i(\mathbf{x})$. The utility of the policymaker is $G(\mathbf{x}) = a \sum_{i=0}^{n} W_i(\mathbf{x}) + \sum_{i=1}^{n} C_i(\mathbf{x})$, where $W_i(\mathbf{x})$ is the welfare of group i, and this formulation implicitly assumes that there are n groups that are organized and group $i = 0$ is unorganized and represents all other citizens. The utility of each group i is $U_i(\mathbf{x}, c_i) = W_i(\mathbf{x}) - C_i(\mathbf{x})$. The order of play is as follows: First, all groups simultaneously choose their payment schedules. Next, the policymaker observes the schedules and chooses $\mathbf{x}$. An equilibrium is defined as a subgame-perfect Nash equilibrium. Assume $W_0, W_1, ..., W_n$ are strictly concave, twice continuously differentiable functions.

(1) Show that if contribution schedules are continuously differentiable, then each group $i > 0$ making a positive payment in equilibrium will offer a payment schedule that must satisfy $\partial C_i(\mathbf{x}^*)/\partial x_j = \partial W_i(\mathbf{x}^*)/\partial x_j$, for each component x_j of $\mathbf{x}$. Interpret this condition. What happens if we do not make this continuous differentiability assumption. Is this assumption plausible?

(2) Show that the equilibrium policy maximizes a weighted sum of aggregate welfare and the sum of the groups' welfares. What are the weights?

(3) Suppose $\mathbf{x} = (x_1, x_2)$, and suppose W_0 can be written as $W_0(\mathbf{x}) = \beta W_0^1(x_1) + (1-\beta) W_0^2(x_2)$. Also, suppose there are two lobby groups,

one that cares only about x_1 and one that cares only about x_2. Suppose the first policy dimension becomes relatively more salient to the public, in the sense that β increases. What happens to x_1 and x_2, and to the equilibrium contributions made by each group?

Question 2

Consider a probabilistic voting model with two periods and three types of agents. There is continuum of citizens with unit mass, and two politicians indexed by A and B, an incumbent politician and a challenger. In the first period citizens make an investment decision. Following this the politicians both non-cooperatively announce a policy platform - which will be a tax rate on income. Citizens then decide who to vote for and the outcome of the election is determined. Finally whichever politician wins the election takes power and chooses a policy.

The citizens are differentiated by their ideological bias for the incumbent politician. A representative citizen i has utility function U^i which depends on post-election consumption, c, the amount of investment made initially, I, a parameter δ^i, which is the individual specific ideological bias for the incumbent, and θ which is a random variable which captures the ideological bias of the whole population. We assume utility to be linear so that,

$$U^i(c^i, I, \delta^i, \theta) \equiv \begin{cases} c^i - I + \delta^i + \theta & \text{if } A \text{ is elected} \\ c^i - I & \text{if } B \text{ is elected} \end{cases}$$

We assume that δ^i is uniformly distributed across the population on the interval $\left[-\frac{1}{2\phi}, \frac{1}{2\phi}\right]$ where δ^i for all i has density $\phi > 0$. We further assume that θ is uniformly distributed on the interval $\left[-\frac{1}{2\psi}, \frac{1}{2\psi}\right]$ and thus has density $\psi > 0$, and θ is revealed after policy platforms have been announced.Consumption is equal to income which is $(1 - \tau^j)f(I)$ where $\tau^j \in [0, 1]$ is the tax rate levied by politician $j \in \{A, B\}$ after the election, and f is a differentiable, strictly increasing and strictly concave production function. Assume that $f(0) > 0$.

The politicians attempt to maximize expected utility. If $\mathcal{P}(\tau^A, \tau^B)$ is the probability that A wins as a function of the policy platform (τ^A, τ^B) then the expected utility of A is,

$$\mathcal{P}(\tau^A, \tau^B)\left(\tau^A f(I) + R\right)$$

where $\tau^A f(I)$ is total tax revenues and R are the rents from being in office which are independent of the investment decision. We assume that a politician who looses the election gets a zero payoff. Clearly, politician B wins the election with probability $1 - \mathcal{P}(\tau^A, \tau^B)$.

1. Using the standard techniques, calculate how many people support each politician for a given policy platform and consequently $\mathcal{P}(\tau^A, \tau^B)$.

2. First study the equilibrium of this model when the politicians cannot commit to a tax policy. What is the equilibrium tax poIicy without commitment and how much do citizens invest?

3. Now consider equilibrium with commitment. Solve for the Nash equilibrium choices of τ^A and τ^B when politicians can commit to any tax rate. How much do citizens invest?

4. Imagine that policy commitment can be achieved by introducing an institution, which is costless to create. Does the incumbent politician wish to introduce such an institution (Hint: contrast his expected utility in the above two outcomes)? Explain the costs and benefits of introducing such an institution.

Question 3

Consider the following infinite horizon economy populated by two groups, denoted 1 and 2, of equal size. All agents in both groups maximize the expected present discounted value of income, with discount factor β. In any period one of the groups is in power while the other group is out of power. When either group is in power, it loses power with probability $q < 1/2$ in every period.

Income is generated in the following way: group j has an asset stock of $A_{j,t}$ at time t. Using these assets, it can produce income $A_{j,t}f(i_{j,t})$ if it invests $i_{j,t}$ which costs $i_{j,t}$ in terms of utility. Investments are made before nature realizes whether the group in power will lose its position.

Assume that income can be hidden in a non-taxable sector that generates a net return of $(1-\tau)\, A_{j,t}f(i_{j,t})$, as long as the assets are not expropriated.

So the net return to the group is

$$(1-e_{j,t})\,(1-T_{j,t})\,A_{j,t}f(i_{j,t}) - i_{j,t} \tag{1}$$

where $T_{j,t}$ is a tax rate faced by this group, and $e_{j,t} \in [0,1]$ denotes the proportion of group j's assets that are expropriated in period t.

The law of motion of assets, as a function of expropriation of assets, is given by:

$$\begin{aligned} A_{1,t} &= A_{1,t-1} - e_{1,t}A_{1,t-1} + e_{2,t}A_{2,t-1} \\ A_{2,t} &= A_{2,t-1} - e_{2,t}A_{2,t-1} + e_{1,t}A_{1,t-1} \end{aligned} \tag{2}$$

1. First suppose that asset expropriation is not allowed, so $e_{j,t} = 0$, and the only decision each group takes is the tax rate it sets when in power. Characterize the pure strategy Markov Perfect Equilibria (MPE) of this repeated game. Show that the output level is less than first-best, and is constant over time.

2. Next suppose that the group in power can expropriate the assets of the other group (so the two decisions now are taxes and expropriation). Characterize the MPE, and show that output can actually be higher in this economy than the economy without asset expropriation. Explain why. Show also that now output is no longer constant, but fluctuates over time.

3. Next consider a model endogenizing q. In particular, imagine that the group out of power can choose to take power in any period but to do so must pay a non-pecuniary cost c. This cost c is drawn each period from the distribution $G(c)$. First consider the case without asset expropriation. Show that there will exist a level of c^* such that when $c \leq c^*$, the group out of power will take power (Hint: write the Bellman equations in terms of c^*—or the probability of regime change in the future—and obtain a fixed-point recursion for c^*).

4. Next consider the case with asset expropriation (where the group that comes to power can cost is the expropriate all the assets of the other group). Show that there will exist a level of c^{**} such that when $c \leq c^{**}$, the group out of power will take power, and show that $c^{**} > c^*$. Show also that this economy with endogenous power switches has higher volatility than the corresponding economy with exogenous power switches.

5. Discuss whether the two theoretical channels, highlighted by the model, linking security of property rights to economic instability are plausible. Feel free to give real world examples.

Question 4

Consider the model of campaign contributions discussed in the lecture. Suppose that there are two parties, $P = A, B$, and one organized and one unorganized groups. Suppose that the two parties also have policy preferences, so that their "utilities" are

$$V_P(p_A, p_B) = \text{Prob}_P[p_A, p_B]\, R - \frac{1}{2}\left(p - \hat{p}^P\right)^2,$$

where $\hat{p}^P$ is the political bliss point of party P and $\text{Prob}_P[p_A, p_B]$ is the probability with which the party in question comes to power when the policy offers are (p_A, p_B). Assume as in the lecture that campaign contribution to party P is $C_o^P = \alpha_o c_o^P$ where α_o is the size of the oranized group and c_o^P is the per capita contribution from group o. Assume also that a voter of group g votes for party A if $U_{i,g}(p_A) - U_{i,g}(p_B) - \delta - \sigma^{i,g} > 0$, and $\delta = \overline{\delta} + \eta(C_o^A - C_o^B)$, where $\overline{\delta} \backsim \text{Uniform}\left[-\frac{1}{2\psi}, \frac{1}{2\psi}\right]$ and $\sigma^{i,g} \backsim \text{Uniform}\left[-\frac{1}{2\phi}, \frac{1}{2\phi}\right]$.

1. Calculate the probability that party P comes to $\text{Prob}_P[p_A, p_B]$ as a function of its own and the other party's policies.
2. Characterize the subgame perfect equilibrium of this game and show that the organized lobby will typically make positive transfers in equilibrium. Explain why this result is different from that in the lecture.

Question 5

Consider an infinite-horizon model in which policies are set by a politician and N citizens can replace the politician at any date $t = 0, 1, ...$ with a new politician. All politicians are identical. Citizen i has preference is given by

$$\sum_{t=0}^{\infty} \beta^t \left[u(c_{i,t}) - h(l_{i,t})\right],$$

where $l_{i,t}$ is labor supply. Total output is $Y_t = \sum_{i=1}^{N} l_{i,t}$. The politician in power decides a tax rate τ_t on earnings at each date and consumes the proceeds. The politician's utility is

$$\sum_{t=0}^{\infty} \beta^t v(x_t),$$

where $x_t = \tau_t Y_t$. Suppose that there is a maximum tax rate equal to $\bar{\tau} \in (0, 1)$. Citizens decide whether to replace the politician at time t after τ_t and x_t have been announced and implemented.

1. Suppose first that citizens use retrospective voting rules in replacing the politician, that is, they only consider their current utility in deciding whether to do so (without conditioning on time, history or the identity of the politician). Show that in the best equilibrium with such retrospective voting rules, we have

$$\tau_t = \tau^* \in (0, \bar{\tau}), \; c_{i,t} = c^* \text{ and } l_{i,t} = l^*$$

for all t and

$$u'(c^*) < h'(l^*).$$

Explain why these retrospective voting rules can arise as part of the (subgame perfect) equilibrium.

2. Now suppose that replacing the politician costs $\varepsilon > 0$ units of consumption for each citizen. Show that in this case the equilibrium with retrospective voting rules involves

$$\tau_t = \bar{\tau}$$

for all t. Explain what this result implies in terms of the effectiveness of electoral control of politicians.

3. Now relax the assumption that there are retrospective voting rules. Sketch the structure of the subgame perfect equilibrium that maximizes citizens' time $t = 0$ utility without costs of replacing politicians. Will taxes be constant in this equilibrium? Will they limit to 0? Why or why not?

4. Show that if the cost of replacing politicians ε is sufficiently small, the best subgame imperfect equilibrium looks similar to that in part 3. Why is this result different from that with retrospective voting?