14.770-Fall 2017
Recitation 4 Notes

Arda Gitmez

October 6, 2017

Today:

- A review of the week.

- Another take on Acemoglu, Golosov and Tsyvinski (2008, Ecma).

- The theoretical model of Ferraz and Finan (2011, AER) – actually more like the model of Besley (2006).

What's Happening in This Class?

Most generally, we're done with the first one-third of Daron's lectures – those about *electoral politics*. We covered:

(i) the theoretical models: Median Voter Theorem, Downsian Convergence, probabilistic voting, swing voter's curse...

(ii) empirical evidence: tests of strategic voting, Downsian Convergence, policy responsiveness...

(iii) some further ideas on why things may not go as smoothly as predicted by the theoretical models: lobbying, vote buying, clientelism, populism...

Now we're in the second one-third: those about *politicians*. The fancy name for these lectures is *political agency*, because we're treating the voters as principals and politicians as agents. Very similarly:

(i) We covered the theoretical models: the models where elections work as a *disciplining device* on politicians. Two broad classes of models here:

  1. Those where voters *punish* the politicians if they fails to deliver. Three examples:

     - The Barro-Ferejohn baseline model with complete information and stationary equilibrium.

     - The incomplete information model with stationary equilibrium.

     - The Acemoglu-Golosov-Tsyvinski (2008) model with complete information and nonstationary equilibrium (also, endogenous production).

  2. Those where voters choose politicians who deliver, because they believe they're better politicians – and politicians thus have an incentive to deliver, because they want to stay in office. Two examples:

     - The career concerns model.

     - Today's adverse selection model by Besley (2006).

(ii) We covered some empirical evidence: effects of term length, scrutiny, renumeration...

(iii) Next lecture, we will cover why things may not go as smoothly.

Beginning the week after that, we'll start the last one-third of Daron's part: those who analyze how *policies* are determined. We'll cover models of legislative bargaining, political compromise etc.

Today, I'll zoom in to two of the bullet points mentioned above.

Acemoglu, Golosov and Tsyvinski (2008)

There are three reasons why I'm covering this model today:

1. The Barro-Ferejohn models of political agency focus on stationary strategies. As we discussed in the lecture, non-stationary equilibria has interesting features: the possibility of **backloading** (i.e. promising more payments in the future if the politician behaves well in the short term) may make the voters better off – because it incentivizes the politician better and because there is more consumption today. Of course, backloading may not work if the politician is impatient.

   - This model generates exactly these predictions: the optimal SPE features backloading (i.e. politician's per period payoff increasing over time) as long as the politician is not impatient.

2. The Barro-Ferejohn models do not have a notion of **productive efficiency**: the output is given endogenous. Productive efficiency seems to be a relevant concern: if voters know that the politician will steal, they don't have much incentives to work hard. Therefore, the possibility of politician behaving badly introduces output distortions. Should we worry about these distortions?

   - This model, by introducing endogenous production, shows that the output distortions vanish in the long term as long as the politician is not impatient.

3. Technically, this is an analysis which relies on the **recursive dynamic programming** approach – a useful tool for dynamic games and for future lectures as well. Good to know!

The Model

We discussed this in the lecture, so I'll just repeat the basics:

Citizen (per period) utility:
$$u(g) - h(y)$$

y is the output (produced by citizens), $h(y)$ is the (convex) cost. g is public good, $u(g)$ is the (concave) utility. Think of a world where citizens produce everything and hand them in to the politician, and then politician decides how much of the output to return in the form of public goods. Consequently, what's left to the politician is $y - g$.

- Note: the productive efficiency (what would happen in the absence of politician) requires that $y = g$ and $u'(g) - h'(y) = 0$ every period.

Politician (per period) utility from $y - g$:
$$v(y - g)$$

- $v(.)$ is concave. This is important: if utility was linear, the citizens would keep promising larger and larger (unbounded) payoffs to the politician in the future, and ensure that $y = g$ in all periods.

Assume that citizens have a discount factor $\beta \in (0, 1)$, and the politician has a discount factor $\delta \in (0, 1)$.

- The model in class assumed $\beta = \delta$, but I'm giving the more general version here, because I also want to discuss what happens when politician is impatient ($\delta < \beta$).

The equilibrium is not stationary anymore, so everything is indexed by time:

$$(y_t, g_t)_{t=0}^{\infty}$$

We're looking for the best SPE for citizens. It is given by:

$$\max_{(y_t, g_t)_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t (u(g_t) - h(y_t))$$

subject to

$$u(g_t) \geq h(y_t) \qquad \forall t \qquad (IC - C)$$

$$w_t := \sum_{s=0}^{\infty} \delta^s v(y_{t+s} - g_{t+s}) \geq v(y_t) \qquad \forall t \qquad (IC - P)$$

$(IC - C)$ tells that the citizens have incentives to work each period, and $(IC - P)$ tells that the politician has incentives to stay rather than stealing everything and running away. Note that we can see why it may be useful to distort output right away: a lower y_t makes it less likely that the politician will steal everything, because there is less to steal. The appeal of backloading is also apparent: keeping w_t high via future rents to politican relaxes $(IC - P)$ whereas giving high consumption to citizens today.

Recursive Formulation

The problem above is well-formulated and all, but admittedly hardly tractable (infinitely many first-order conditions!). Instead, we'll work with the recursive formulation (you'll see why this is simpler):

$$V(w) := \max_{y, g, w^+} u(g) - h(y) + \beta V(w^+)$$

subject to

$$v(y - g) + \delta w^+ = w \qquad (\gamma) \qquad (PK)$$
$$v(y - g) + \delta w^+ \geq v(y) \qquad (\psi) \qquad (IC - P)$$

The basic story: assume that citizens have somehow promised a (lifetime discounted) utility w to the politician. They are now optimizing within this period: they decide how much to produce (y) and how much rents to leave to the politician (g), as well as how much to promise for the next period (w^+). $V(w)$ is the "value" they obtain by making the optimal decision when they start the period with a promise w. The tricky part is: they know they'll do another optimization with another promise w^+ next period, so next period's "value" $\beta V(w^+)$ is also a part of their utility.[1] The constraint (PK) ensures that the promise is kept, $(IC - P)$ once again ensures that the politician does not steal everything and run away.

But now you should see why this is a more preferred formulation: this is essentially a static problem (only three first-order conditions!). You can also easily show that this is a nicely behaved optimization problem (in particular, $V(.)$ is concave and decreasing).

Let's just write the Lagrangian and take the three FOCs:

$$(FOC_y) \qquad -h'(y) + \gamma h'(y - g) + \psi \left(v'(y - g) - v'(y) \right) = 0 \qquad (1)$$
$$(FOC_g) \qquad u'(g) - \gamma v'(y - g) - \psi v'(y - g) = 0 \qquad (2)$$
$$(FOC_{w^+}) \qquad \beta V'(w^+) + \gamma \delta + \psi \delta = 0 \qquad (3)$$

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[1]This is called the *recursive formulation* because we're plugging $V(w^+)$ into the calculation of $V(w)$. If you're not familiar with this approach, Stokey-Lucas-Prescott is the resource.

On top of the FOCs, a fourth equation we can derive is via the envelope theorem:

$$V'(w) = -\gamma \tag{4}$$

Let's play around with these conditions a bit. Combining (1) and (2) gives:

$$u'(g) - h'(y) = \psi v'(y) \tag{5}$$

- As long as the incentive constraint binds ($\psi > 0$), we have: $u'(g) - h'(y) > 0$. That is: output is distorted!

- Keeping the politician disciplined introduces output distortions. Or, a better way to put it: citizens find it optimal to work less in order to discipline the politician. Intuition: first order gain-second order loss argument.

Combining (3) and (4) gives:

$$\frac{\beta}{\delta}V'(w^+) = V'(w) - \psi \tag{6}$$

Some analysis now:

1. You can show that we must have the politician's incentive constraint binding in $t = 0$, i.e. $\psi > 0$. Intuition: if this constraint is slack, you're promising too much to the politician. Just promise less and consume more!

2. Since $\psi > 0$, by (5), $u'(g) - h'(y) > 0$ and **there are output distortions** at $t = 0$.

3. Once again, since $\psi > 0$ at $t = 0$, by (6), we have: $\frac{\beta}{\delta}V'(w^+) < V'(w)$. Consider the case $\beta = \delta$ (i.e. politician is patient). Then this condition becomes: $V'(w^+) < V'(w)$. Combine it with the concavity of $V(.)$, and we have:
$$w^+ > w$$

   That is, each period, you promise more and more to the politician for the future! In other words, there is **backloading**. Moreover, w cannot grow unboundedly (this is due to concavity of $v(.)$). This implies that we must have w increasing and converging to some value w^*.

4. In the limit we have $w = w^+ = w^*$. In the case $\beta = \delta$, (6) implies that we must have $\psi = 0$ in the limit. That is, **distortions disappear in the long run**.

5. Finally, note that the above reasoning does not work with $\delta < \beta$ (i.e. politician is impatient). In that case, w converges to some $\hat{w}$ with
$$\frac{\beta}{\delta}V'(\hat{w}) = V'(\hat{w}) - \psi$$

   Consequently, $\psi > 0$ even in the limit, and **distortions do not disappear**.

Nice, huh?

Besley (2006)

Shifting gears now. I'll present a (really simple) model of political agency – this is based on Besley's "canonical model" in Chapter 3 of his 2006 book *Principled Agents? The Political Economy of Good Government*. Ferraz and Finan (2011) takes this model to set up a theoretical framework around their findings.

The model will be in many respects similar to the career concerns model we covered in class – a two period model where citizens vote for the politician in the second round because they believe she is a better type. The difference will be that: unlike a career concern model, the politician knows about her type. Technically, this assumption turns this into a model of *adverse selection*.

The Model

We have two periods: $t \in \{0, 1\}$. The discount factor is $\delta \in (0, 1]$.

The politician has a (persistent) type $i \in \{c, nc\}$, where c is corrupt and nc is noncorrupt. Each politician's type is drawn from an iid distribution with $Pr\{i = nc\} = \pi \in (0, 1)$.

In each period $t \in \{1, 2\}$, there is a state of the world $s_t \in \{0, 1\}$, privately observed by the politician. The state of the world is drawn from an iid distribution with $Pr\{s_t = 1\} = \frac{1}{2}$.

In each period $t \in \{1, 2\}$, the elected politician of type i observes the state s_t and picks a policy $e_t(s_t, i) \in \{0, 1\}$. The citizens have a payoff of

$$u_t(s_t, e_t) = \begin{cases} V, & \text{if } e_t = s_t \\ 0. & \text{if } e_t \neq s_t \end{cases}$$

A noncorrupt politician simply maximizes the citizen's payoff – the interesting one is the corrupt politician. A corrupt politician receives "ego rents" of W from being in the office. In addition, she receives a payoff of

$$u_t^c(s_t, e_t) = \begin{cases} 0, & \text{if } e_t = s_t \\ r_t & \text{if } e_t \neq s_t \end{cases}$$

where r_t is the "private benefit" from setting the wrong policy. (Consider the case of a procurement deal which should be signed with the most efficient firm. Nevertheless, only the politician observes firm efficiency, and corrupt politicians get a bribe for choosing the inefficient firm.) Here, r_t is iid drawn from a disrtibution $G(r)$ with mean μ and support $[0, R]$. To make model interesting, assume R is sufficiently high:

$$R > \delta(W + \mu)$$

This condition guarantees that the corrupt politician with highest r_t prefers to take the rents immediately, rather than waiting for the next period.

Timing:

1. An incumbent politician is in the office. The incumbent's type is drawn, and she privately observes her type.

2. s_1 is drawn and observed by the politician.

3. If the incumbent is corrupt, r_1 is drawn and observed by the politician.

4. The incumbent chooses e_1, and citizens observe their payoffs.

5. Citizens decide whether to keep the incumbent or elect a new politician. If they elect a new politician, her type is drawn randomly from the same distribution.

6. In the second period, s_2 is drawn and observed by the elected politician, (if she is corrupt) r_2 is drawn and observed by the politician, and the elected politician chooses e_2. Payoffs are realized.

Analysis

We will look for a Perfect Bayesian Nash Equilibrium of this game. As usual, use backward induction.

In the second period, there is no control over the elected politician, so

$$e_2(s_2, nc) = s_2$$
$$e_2(s_2, c) = 1 - s_2$$

Following this, the citizens maximize the probability that a noncorrupt politician is elected in the second period. Note that if they elect a new politician, the aforementioned probability is π.

Suppose, in equilibrium, citizens keep the incumbent if and only if she provides them V in the next period (this is to be verified later). Now, consider the first period. A noncorrupt politician always chooses $e_1(s_1, nc) = s_1$, but corrupt politician faces a trade off. If $e_1(s_1, c) = 1 - s_1$, she receives a payoff of r_1 (and is kicked out of the office). If $e_1(s_1, c) = s_1$, she receives a payoff of 0 in period 1 but an expected payoff of $\mathbb{E}[r_1] + W = \mu + W$ in the second period. Consequently,

$$e_1(s_1, nc) = s_1 \Leftrightarrow r_1 \leq \delta(\mu + W)$$

and the probability that a corrupt incumbent will set $e_1 = s_1$ is:

$$\lambda := G(\delta(\mu + W))$$

Note that as long as $R > \delta(W + \mu)$, $\lambda \in (0, 1)$. The fact that $\lambda > 0$ (i.e. some of the corrupt politicians behave in favor of the citizens' interests) is the *disciplining effect*. Check the comparative statics to make sure it makes sense to you!

Finally, we have to verify that citizen behavior we assumed earlier is indeed optimal. With the above behavior, if $u_1 = 0$, the incumbent immediately reveals herself to be a corrupt type, so replacing her is optimal. When $u_1 = V$,

$$Pr\{i = nc | V\} = \frac{\pi}{\pi + (1 - \pi)\lambda} > \pi$$

So keeping the politician is indeed optimal.

One intuitive prediction of this model is that: if the disciplining effect is strong enough, then rent extraction is higher in the second period than in the first period. That is, if $\frac{\lambda}{1-\lambda} \geq \pi$,

$$(1 - \pi)(1 - \lambda)\mathbb{E}[r | r \geq \delta(\mu + W)] \geq ((1 - \pi)\lambda + (1 - \pi)(1 - \lambda)(1 - \pi)) \mathbb{E}[r]$$

Ferraz and Finan (2011) utilize this prediction to motivate their empirics: a first-term mayor should be involved in less corruption due to the disciplining effect.

14.770 Introduction to Political Economy
Fall 2017