Lecture XII: Theory of Public Choice (II)

Charles B. Moss [1]

[1] University of Florida

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Two Type of Logrolling

- "In all those cases where a reasonably small number of individuals vote openly on each measure in a continuing sequence of measures, the phenomenon seems pervasive."
- " Logrolling may occur in a second way, which we shall call *implicit logrolling*."
  - "Large bodies of voters may be called on to decide on complex issues, such as which party will rule or which set of issues will be approved in a referendum vote."
  - "The political 'entrepreneurs' who offer candidates or programs to voters make up a complex mixture of policies designed to attract support."
  - "In so doing they keep firmly in mind the fact that the single voter may be so interested in the outcome of a particular issue that he will vote for the one party that supports this issue, although he may be opposed to the party stand on other issues."

Simple Prisoner's Dilemma Problem – Start of Game

- While not explicitly necessary in the simple logrolling model, game theory helps explain the simple case of logrolling.
- We assume that the police capture two criminals who have pulled off a heist. They separate the prisoners in an attempt to "break them."
  - The classic scenario is that you better spill the beans because your partner in the next room could.
  - Let us offer you a deal.

	Player 2	
Player 1	Hold	Defect
Hold	{1,1}	{-1,0}
Defect	{0,-1}	{-1/4,-1/4}

Simple Prisoner's Dilemma Problem – Solution

- The way the math works out (maximizing expected utility following von Neumann and Morgenstern) the optimal choice is for both criminals to defect

$$\begin{aligned} \mathrm{E}\left[a_1\right] &= a_1\left[\pi_2 U\left(1\right) + \left(1-\pi_2\right) U\left(-1\right)\right] + \\ &\quad \left(1-a_1\right)\left[\pi_2 U\left(0\right) + \left(1-\pi_2\right) U\left(-1/4\right)\right] \\ \mathrm{E}\left[a_2\right] &= a_2\left[\pi_1 U\left(1\right) + \left(1-\pi_1\right) U\left(-1\right)\right] + \\ &\quad \left(1-a_2\right)\left[\pi_1 U\left(0\right) + \left(1-\pi_1\right) U\left(-1/4\right)\right] \end{aligned} . \tag{1}$$

- This would be a "non-repeated" game.
- If we allow the game to be repeated N times, however, it is likely that the criminals will not defect – the return for not defecting is an infinite sequence of $U\left(1\right)$.

Farmers and Local Roads

- The setup is that 100 farms live in a county with local roads providing access to 'limited access freeways.'
- They must tax to raise money to fix the local roads. However, sets of farmers have access to different local roads.
- The question is then: How does the community decide which road improvement to fund?
- The vision is that different collections of farmers live on different roads:
  - Road 1 (R_1) - $\{ f_1, f_5, f_{20}, \cdot \}$
  - Road 2 (R_2)- $\{ f_2, f_{21}, f_{30}, \cdots \}$
  - Etc.
- The question facing each farmer is how to vote on the level of road maintenance for each road.

Simplest Solution

- In the simplest formulation - assume that only ten farmers(on average) live on each road. Ten is too small to generate a yes vote - 51.
- The solution is logrolling - if say six groupings (i.e., six pools of farmers from six roads) get together (given the assumption that some farmers may support more than one road) that should give a sufficient group to form a majority.
- They then support the maintenance of six road.
- Other questions and complications occur – at what level do they choose to maintain each road.

Game Theory and Majority Voting

- It is know time to complicate the question further - let us play a game with three players.
- The setup is that we need to choose a policy based on majority voting with three individuals.
- The crunch becomes – should the players of the game ever go for unanimity?

Expected Utility – the Payouts

- The real crunch is the joint utility function. First, consider the utility of individual actions

$$v(1) = v(2) = v(3) = 0 \tag{2}$$

Any player that is left out of the "group" get a zero utility level.

- If two players collaborate or are in the "group" they share a utility of one

$$v(1,2) = v(1,3) = v(2,3) = 1 \tag{3}$$

- Finally, if all three players agree they share the same aggregate payoff

$$v(1,2,3) = 1 \tag{4}$$

Dominant Strategy

- The Dominant strategy set F is

$$\left(\frac{1}{2}, \frac{1}{2}, 0\right), \left(\frac{1}{2}, 0, \frac{1}{2}\right), \left(0, \frac{1}{2}, \frac{1}{2}\right) \tag{5}$$

- Note that the solution

$$\left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right) \tag{6}$$

  is not in the dominant set. Why?
- Note that only two are required to form a majority – hence player 1 can approach player 2 with a plan to redistribute player 3's share in some way.
- Under this proposal player 1 and player 2 would be better off.

Side Payments

- To develop a full model of logrolling, we need to consider the roll of side payments.
- As a starting point, consider the scenario where no side payments are possible.
- Next, we need to modify the original game – assume that some source of funding is going to give farmers $ 10 to fix the roads, but the payoffs are not the same.
  - The payoff for spending $ 1 on the first road is $ 1.00
  - The payoff for spending $ 1 on the second road is $ 0.50
  - The payoff for spending $ 1 on the third road is $ 0.25

Payouts and Reactions – No Side Payments

- The possible set of funding decisions from the original formulation are

$$\left(\frac{1}{2}, \frac{1}{2}, 0\right), \left(\frac{1}{2}, 0, \frac{1}{2}\right), \left(0, \frac{1}{2}, \frac{1}{,}2\right) \tag{7}$$

- However, the payoffs for these actions are

$$(1.00, 0.50, 0), (1, 0, 0.25), (0, 0.50, 0.25) \tag{8}$$

- These strategies yield the possible set of payoffs is

$$(5.00, 2.50, 0.00), (5.00, 0.00, 0.50), (0.00, 2.50, 0.25) \tag{9}$$

Allowing Side Payments

- If we allow side payments the optimal investment is obvious – invest all the money in road 1.
- This investment will a return of $ 10 on the roads, but we have to decide how to allocate the returns.
  - As a first scenario, assume that since individual 1 captures $ 10, he can pay individual 2 to vote with him to get the project passed – the payout will then be $(5, 5, 0)$.
  - The same possible exists for individual 1 paying individual 3.
  - The final scenario is for individuals 2 and 3 to form a coalition to fund road 1 and then tax individual 1 for the created surplus.
- The dominant strategies are then

$$(5, 5, 0), (5, 0, 5), (0, 5, 5) \tag{10}$$

Game Theory - Logrolling

- Logrolling is then developed as an imperfect form of side payments.
- We assume that side payments are ruled out by law – the senator from Indiana cannot pay the senator from New York to vote on the farm bill.
- However, the senator from Indiana can promise the senator from New York to vote for another piece of legislation if he supports the farm bill.

Rent-Seeking Behaviour

- Rent-seeking behaviour is the activity of influencing the political process to obtain favourable outcomes or to avoid unfavourable ones (Krueger 1974).
  - First, bureaucrats are involved in the policy process and they may or may not facilitate policy change (Furtan 2001).
  - Second, employees may exhibit rent-seeking behaviour for the maintenance of well-paying jobs once a policy is in place.
  - Third, there is the notion that bureaucrats employ rent-seeking behaviour for a particular policy outcome.