Handout 11
Iterated Dominance and the Median Voter Theorem

## Common Knowledge

Some of the more tractable strategic games appeal to the following notion.
A fact F is common knowledge for agents among A just in case everyone in A knows F , knows that everyone knows F, knows that everyone knows that everyone knows F, etc.

It's a common precondition of the applicability of many game-theoretic solution concepts that many facts about the situation be common knowledge, including not only utilities, possible moves, etc., but the rationality of the players in the game.

## Iterated Deletion

Suppose
(1) players in a strategic situation are rational,
(2) being rational involves never choosing a strongly(/weakly) dominated option, and
(3) all this is common knowledge.

Then it seems like we can predict how these players will behave by a process of iterative deletion of (strongly or weakly) dominated strategies. (We delete dominated strategies, which in effect gives us a new strategic situation. Then we delete any new dominated strategies, and so on.)

Consider how iterative deletion of weakly dominated strategies fares in this game.

Column

Row |  |  | C 1 | C 2 | C 3 | C 4 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  | R 1 |  | 0 |  | -1 |  | -7 | O

Incidentally, this is an example of a zero-sum game: a game in which every gain or loss in utility at an outcome for one player is balanced by an equal loss or gain of utility for other plays. (These are games of pure competition.)

## Application: Median Voter Theorem

Two candidates, Barack and Mitt, are choosing their political platforms. They can align themselves on a linear political spectrum from 1 to 10,1 being the most liberal, 10 being the most conservative.

Suppose that for each number $n, 10 \%$ of the voters identify themselves politically as an " $n$-er". They uniformly vote for the candidate whose platform is closest to their political view. If there's a tie, it's $5 \% / 5 \%$ split. Each candidate's utilities are proportionate to the percentage of voters that vote for them.

Some strategies here are dominated. Which?

In general we have the following result:
Median Voter Theorem: If an election...
(1) is a majority election with two candidates, in which...
(2) policy preferences can be ordered linearly, and...
(3) voters vote for the candidate closest to their preferred policy, then...
candidates maximize the number of votes they garner by taking up the policy of the median voter.

How applicable is this to the presidential election? To other kinds of strategic situations?

