Econ 1052 Lecture 23

April 28, 2020

~ Recap ~

X decisions (binary vectors with one element $=1$)

$\theta_i \in \Theta_i \subseteq \mathbb{R}^X$

GLH Theorem: If Θ_i convex, mechanism chooses welfare-maximizing decision $x^*: \Theta \to X$ and strategy-proof, then:

$$p_i(\theta_i, \theta_{-i}) = \underbrace{-\sum_{j \neq i} \theta_j \cdot x^*(\theta_i, \theta_{-i})}_{\text{only this part depends on i's report}} + \underbrace{h_i(\theta_{-i})}_{\text{some function that doesn't depend on i's report}}$$

VCG payments (pivot) $\bar{p}_i(\theta_i, \theta_{-i}) = -\sum_{j \neq i} \theta_j \cdot x^*(\theta_i, \theta_{-i}) + \max_{x \in X} \sum_{j \neq i} \theta_j \cdot x \geq 0$

→ don't break even, generate revenue

Today: Continuation of VCG Payments

What happens if we rebate the VCG payments?

$$p_i(\theta) = \bar{p}_i(\theta) - \underbrace{\frac{\sum_{j \in N} \bar{p}_j(\theta)}{N}}_{\text{depends on your report}}$$

→ profitable to bid higher when you're not high enough to win

GLH: no way to keep efficient allocation rule w/ rebate and keeping it strategy-proof

Auctions vs Lotteries

welfare: $\max_{x \in X}$ maximize $\sum_i x \cdot \theta_i$

VCG disregards utilities in favor of welfare

utility: maximize $\sum_i (x \cdot \theta_i - p_i)$ s.t. strategy proof

$x \in X$
$p \in \mathbb{R}^N$

budget constraint
$\sum_i p_i \geq 0$

under independent private values:

$$\mathbb{E}[\sum_i \text{utility}_i] = \mathbb{E}\left[\underbrace{\sum_i x_i(\theta_i, \theta_{-i})}_{\text{indicator if we give the obj to player } i \text{ at some type}} \times \underbrace{\frac{1-F_i(\theta_i)}{f_i(\theta_i)}}_{\text{inverse hazard rate}}\right]$$

prob(up to θ_i in type space)
if uniform, $= (1-\theta_i)$

$\theta_1, \theta_2 \overset{iid}{\sim} U[0,1]$

$\mathbb{E}[\text{higher}] = 2/3$, $\mathbb{E}[\text{lower}] = 1/3$

$\mathbb{E}[\text{total utility for 2nd price auction}] = 2/3 - 1/3 = 1/3$

But lottery (1/2 for P1, 1/2 for P2): $\mathbb{E}$ is $1/2 > 1/3$.

☆ Of all mechanisms you can run that are incentive compatible subject to a budget constraint, thing that maximizes expected utility of bidders (under iid unit values) is a lottery.

running a lottery, it is at least weakly incentive compatible to tell true type

Tour of Game Theory since 1985

Non-standard preferences

Geanakoplos, John, David Pearce, and Ennio Stacchetti. "Psychological games and sequential rationality." Games and economic Behavior 1, no. 1 (1989): 60-79.

first paper

Rabin, Matthew. "Incorporating fairness into game theory and economics." The American economic review (1993): 1281-1302. ☆

Dufwenberg, Martin, and Georg Kirchsteiger. "A theory of sequential reciprocity." Games and economic behavior 47, no. 2 (2004): 268-298.

formalizing view on fairness / selfishness

Fehr, Ernst, and Klaus M. Schmidt. "A theory of fairness, competition, and cooperation." The quarterly journal of economics 114, no. 3 (1999): 817-868.

social preferences / altruism

Bounded Rationality

Crawford, Vincent P., and Nagore Iriberri. "Level-k auctions: Can a nonequilibrium model of strategic thinking explain the winner's curse and overbidding in private-value auctions?." Econometrica 75, no. 6 (2007): 1721-1770.

level-k thinking

BR to BR to BR to ...

Eyster, Erik, and Matthew Rabin. "Cursed equilibrium." Econometrica 73, no. 5 (2005): 1623-1672.

don't understand how action reflects private information

Esponda, Ignacio, and Demian Pouzo. "Berk–Nash equilibrium: A framework for modeling agents with misspecified models." Econometrica 84, no. 3 (2016): 1093-1130.

assumed common knowledge of the game tree

Berk-NE don't understand how the world works + take self-confirming moves

Market Design - Econ 2099

Kominers, Scott Duke, Alexander Teytelboym, and Vincent P. Crawford. "An invitation to market design." Oxford Review of Economic Policy 33, no. 4 (2017): 541-571.

overview of the field

Roth, Alvin E. Who gets what—and why: The new economics of matchmaking and market design. Houghton Mifflin Harcourt, 2015.

2012 Nobel Prize winner's book

Mechanism Design in a "bigger world"

currently only learning one-shot

Pavan, Alessandro, Ilya Segal, and Juuso Toikka. "Dynamic mechanism design: A myersonian approach." Econometrica 82, no. 2 (2014): 601-653.

Dworczak, Piotr. "Mechanism design with aftermarkets: Cutoff mechanisms." Available at SSRN 2859206 (2020).

in the real world, can't control how players interact in future games

Akbarpour, Mohammad, and Shengwu Li. "Credible Auctions: A Trilemma." Econometrica (2019).

assumed immense commitment (tempted to cheat)

Carroll, Gabriel. "Information games and robust trading mechanisms." Unpublished manuscript, Stanford Univ., Stanford, CA (2018).

formalizing strategy-proofness
no energy spent on spying

Designing 'simple' mechanisms

Li, Shengwu. "Obviously strategy-proof mechanisms." American Economic Review 107, no. 11 (2017): 3257-87.

why ascending auctions are easy and second-price are hard

Börgers, Tilman, and Jiangtao Li. "Strategically simple mechanisms." Econometrica 87, no. 6 (2019): 2003-2035.

how some Bayes Nash mechanisms are harder than others

Pycia, Marek, and Peter Troyan. "A Theory of Simplicity in Games and Mechanism Design." (2019).

complete contingent plan

→ lessons for how to design mechanisms w/o seeing future contingencies

Robustness and Mechanism Design

relaxing strong common knowledge constraints

Bergemann, Dirk, and Stephen Morris. "Robust mechanism design." Econometrica 73, no. 6 (2005): 1771-1813.

Carroll, Gabriel. "Robustness and linear contracts." American Economic Review 105, no. 2 (2015): 536-63.

Carroll, Gabriel. "Robustness in mechanism design and contracting." Annual Review of Economics 11 (2019): 139-166.