Topics in Microeconomics

Project leaders:
Efthymios Athanasiou, Ozgur Evren, and Sergei Izmalkov

This proposal combines three different research directions that encompass various questions in Public Economics, Game Theory, Decision Theory, Mechanism Design, Auctions, Industrial Organization, Political Economy, and Microeconomics more generally.

The three individual proposals are

1. Topics in Strategy-proof Implementation offered by Prof. Timos Athanasiou
2. Topics in Decision Theory and Political Economy offered by Prof. Ozgur Evren
3. Design of Auctions and Markets offered by Prof. Sergei Izmalkov

Students are welcome to chose theoretical or empirical projects along the suggested lines of research as well as develop own ideas.

Please note that the project will have joint meetings with the project "Topics in tax policy and public economics" lead by Prof. Estelle Dauchy.

We expect great things of you!

Topics in strategy-proof implementation
Prof. Timos Athanasiou

1. Overview

Implementation is the exercise of incorporating incentive issues in the design of policy. It typically marks a departure from first-best solutions and forces the Planner to accommodate informational asymmetries as well as other physical and institutional constraints. Strategy-Proofness constitutes a particular view on implementation. Most notably it requires that the Planner have a minimum amount of information on the characteristics of the population the policy is targeting. A mechanism that complies with Strategy-Proofness induces each participating agent to reveal the information he holds privately voluntarily and truthfully, independently of the actions of the remaining agents in the economy. A strategy-proof mechanism is, thus, "prior-free" in that the implementation exercise does not rely on knowledge of the distribution of types. Characteristic areas where this approach has found fruitful applications are such problems as the provision of public goods, the allotment of indivisible private goods, voting etc.

2. Public Goods

The family of Vickrey-Clarke-Groves (Vickrey, 1961 and Groves, 1973) mechanisms constitutes the most notable family of strategy-proof mechanisms. Prominent among which stands the Pivotal mechanism (Moulin, 1986). In economic domains, the family of Vickrey-Clarke-Groves mechanisms is characterized by Strategy-Proofness and Procurement Efficiency (Holmstrom, 1979). Generically, Vickrey-Clarke-Groves mechanisms fail to balance the budget (Green and Laffont, 1979). As a consequence, adhering to Strategy-Proofness and Procurement Efficiency produces a welfare loss. In particular, the waste takes the form of a budget deficit. Today, this result is accepted as an impossibility and has driven the literature to weaker forms of implementation (see d'Aspremont and Gerard-Varet, 1979). However, a path remains largely unexplored: rather than relaxing Strategy-Proofness, one may drop Procurement Efficiency instead. Thus, we would be confronted with the question: what is the set of Strategy-Proof mechanism that are not Pareto dominated by another Strategy-Proof mechanism? In principle, such a set includes both VCG mechanisms that run deficits, as well as other mechanism that may be budget-balanced while procuring the public good inefficiently.

3. Private Indivisible Goods

A recent strand of the implementation literature (see Moulin, 2009) has been dealing with the problem of assigning a group of homogeneous indivisible goods among a number of agents. This problem is particularly prominent in the computer science literature (Apt et al., 2008, Guo and Conitzer, 2010). While initially the focus was on designing rebates of the pivotal mechanism's deficit that minimize the welfare loss (Cavallo, 2006), recent work revealed that relaxing the obligation to always assign the entirety of the goods to their claimants produces solutions that are Pareto superior (deClippel et al., 2011). More significantly, Sprumont

(forthcoming) identifies a family of mechanisms, generically outside the VCG family, that enjoy many desirable properties such envy-freeness, while abiding by Strategy-Proofness. Although, members of this parametric family violate Assignment Efficiency, they still lie on a Pareto frontier of sorts, as no other strategy-proof, anonymous, envy-free and individually rational mechanism Pareto dominates them. Thus, Sprumont manages to reveal a class of mechanisms that has been overlooked by the literature. Identifying the Pareto frontier of the class of feasible strategy-proof mechanisms, however, remains an open problem. Sprumont relies on additional properties in order to obtain his neat characterization. Crucially, not all envy-free strategy-proof mechanisms are VCG: while the assignment must be conditionally optimal (the object goes to a maximal valuation agent whenever it is allocated (Svensson, 1983)), no-envy does allow us to leave the object unallocated.

References

Apt, K., Conitzer, V., Guo, M., and Markakis, E. (2008), Welfare undominated Groves mechanisms, Proceedings of the 4th Workshop on Internet and Network Economics (WINE-08), Shanghai, China, 426-437.

Cavallo, R. (2006), Optimal decision-making with minimal waste: Strategy-proof redistribution of VCG payments, Proceedings of the 5th International Conference on Autonomous Agents and Multi-agent Systems (AAMAS-05), Hakodate, Japan, 882-889.

D'Aspremont, C. and Gerard-Varet, L.A. 1979. Incentives and incomplete information. Journal of Public Economics 11, 25-45.

de Clippel, G., Naroditskiy, V., Polukarov, M., Greenwald, A., and Jennings, N. (2011), Destroy to save, Proceedings of the 10th ACM Conference on Electronic Commerce, 207-214.

Green, J. and Laffont, J.-J. (1979), Incentives in public decision-making. North Holland, New York. Groves, T. (1973), Incentives in teams, Econometrica 41, 617-631.

Guo, M. and Conitzer,V. (2010), Optimal-in-expectation redistribution mechanisms, Artificial Intelligence 174, 5-6, 363-381.

Holmstrom, B. (1979), Groves schemes on restricted domains, Econometrica 47, 1137-1144.

Moulin, H. (1986), Characterizations of the Pivotal mechanism, Journal of Public Economics 31, 53-78.

Moulin, H. (2009), Efficient strategy-proof and almost budget-balanced assignment, Journal of Economic Theory 144, 96-119.

Sprumont, Y. (forthcoming), Constrained-optimal strategy-proof assignment: beyond the Groves mechanisms, Journal of Economic Theory.

Svensson, L.-G. (1983), Large indivisibles: an analysis with respect to price equilibrium and fairness, Econometrica 51, 939-954.

Vickrey, W. (1961), Counterspeculation, auctions, and competitive sealed tenders, Journal of Finance 16, 8-37.

Topics in Decision Theory and Political Economy
Prof. Ozgur Evren

A major purpose of decision theory literature is to propose alternative decision making models that provide a more accurate description of economic agents' behavior as observed in experiments and empirical studies. For example, recently, scholars proposed plethora of models that accommodate the famous "paradoxes" of Allais and Ellsberg. Alternative models that dispense with the completeness axiom of classical utility theory have also attracted considerable attention. Despite the theoretical and normative appeal of these models, in applied work, potential uses of alternative models proposed by decision theorists have not yet been studied thoroughly. Therefore, thinking about potential applications of alternative models proposed in decision theory literature can lead to many interesting research topics. The first project that I propose below is of this sort.

Interested students can also work on political economy projects under my supervision. Especially, voters' behavior in political elections is a fundamental topic that I am interested in. The second project below is about generalization of my earlier findings on the problem of voter turnout in large, costly elections.

Rational expectations equilibria with non-standard preference relations

In real economic life, trade and related activities take place under imperfect information. (For example, we buy flight tickets without knowing whether the flight in question will be delayed or not.) While people may have private information about the underlying state of the world, prices themselves may also convey relevant information. (For example, a cheaper ticket might indicate a higher likelihood of delay.) The notion of rational expectations equilibrium (henceforth, REE) require agents to take into account not only their private information, but also the information that is revealed by prices. In turn, equilibrium prices depend on agents' information. This cyclic nature of the notion of REE makes it problematic to obtain general conditions that are sufficient for the existence of a REE. Scholars made considerable progress in understanding the problem of equilibrium existence under classical expected utility hypothesis. The best known results in this direction establish the existence of equilibrium prices that fully reveal all information that is available at the outset if (i) the number of commodities is larger than that of potential states of the word; (ii) preference parameters belong to a generic set (i.e., a set of full measure). (See, e.g., Radner, 1979; Allen, 1981.)

On the other hand, the class of expected utility preferences is a very special (i.e., non-generic) class, which undermines these results on "generic" existence. For example, would the generic existence result survive if we were to assume that the agents have "maxmin preferences" of Gilboa and Schmeidler (1989), or more generally, "variational preferences" of Maccheroni et al. (2006)? (Maxmin and variational preferences are best known models that accommodate Ellsberg paradox, and both generalize the expected utility model.)

Perhaps more interestingly, in general, it is well-known that incompleteness of agents'

preference relations simplifies the problem of equilibrium existence. (For example, Roemer (1999) shows that modeling political parties' preferences with an incomplete binary relation leads to the existence of an equilibrium in a political game that typically has no equilibrium when parties' preferences are complete.) However, this issue has not been studied within the context of REE. It seems natural to expect that allowing agents' preferences to be incomplete may help obtaining new existence results. To gain insight, it should first be noted that an agent with an incomplete preference relation can be modeled as a collection of various "selves," each with a complete preference relation. Thus, the set of equilibria of an economy with incomplete preference relations can often be described as the union of equilibria of various economies, each corresponding to a different specification of agents' selves. In turn, this union of sets may well be nonempty, even when almost all member sets are empty.

A general formula on the magnitude of pivot probabilities under aggregate uncertainty

In a large election, the probability of changing the winner with a single vote (pivot probability) is small, but how small it is depends on the statistical distribution of voters' types. In particular, when voter types are independently and identically distributed, then, typically, pivot probabilities decline at an exponential rate with the number of voters. This, in turn, makes it impossible to "rationalize" observed turnout levels with reasonable specification of preference parameters, as voting is a time consuming, costly activity, which practically becomes a waste of time with such small pivot probabilities.

On the other hand, there are some results which show that pivot probabilities are only inversely proportional to the number of voters if there is aggregate uncertainty regarding voters' types. By "aggregate uncertainty," practically, I mean any unknown parameter that uniformly influences the types of a large set of voters. An earlier result in this direction is proved, independently, by Good and Mayer (1975), and Chamberlain and Rothschild (1981). An important shortcoming of Good-Mayer formula is that it does not allow for abstention, i.e., each citizen is assumed to cast a vote. Recently, Evren (2012) proved an alternative version that allows for abstention, but aggregate uncertainty in Evren's analysis has a very special form. Specifically, Evren assumes that a randomly chosen voter who prefers a given candidate i is altruistic with probability qi, and that qi is unknown. One could think of many other forms of aggregate uncertainty. For example, it would be equally sensible to assume that a randomly chosen voter prefers a given candidate with an unknown probability. Moreover, these two types of aggregate uncertainty may also coexist. Therefore, it would certainly be useful to provide an extension of Evren's formula that does not rely on the details of the form of aggregate uncertainty. Thereby, one could also generalize Evren's other findings on turnout levels in large elections.

References

Allen B., 1981. Generic Existence of Completely Revealing Equilibria for Economies with Uncertainty when Prices Convey Information, Econometrica 49, 1173-1199.

Chamberlain G. and Rothschild M., 1981. A Note on the Probability of Casting a Decisive Vote, Journal of Economic Theory 25, 152-162.

Evren O., 2012. Altruism and Voting: A Large Turnout Result That Does not Rely on Civic Duty or Cooperative Behavior, Journal of Economic Theory 147, 2012, 2124-2157.

Gilboa I. and Schmeidler D., 1989. Maxmin Expected Utility with Non-Unique Prior, Journal of Mathematical Economics 18, 141-153.

Good I.J. and Mayer L.S., 1975. Estimating the Efficacy of a Vote, Behavioral Science 20, 25-33.

Maccheroni F., Marinacci M. and Rustichini A., 2006. Ambiguity Aversion, Robustness, and the Variational Representation of Preferences, Econometrica 74, 1447-1498. Radner R., 1979. Rational Expectations Equilibrium: Generic Existence and the Information Revealed by Prices, Econometrica 47, 665-678.

Roemer J.E., 1999. The Democratic Political Economy of Progressive Income Taxation, Econometrica 67, 1-19.

Design of Auctions and Markets
Prof. Sergei Izmalkov

1. Auctions and markets in Russia

Goods and services, licenses, advertising slots are allocated via auctions, as they are simple, fast, and efficient mechanisms to find the prices and determine the allocation. Auctions appear essentially everywhere, from selling antiques to privatization of state enterprises. Auction theory, design and analysis of auctions in practice attract lots of attention from the economists. Possible areas of research are abundant and include design of efficient (and optimal) auctions for specific circumstances of sale and analysis of bidding (in particular, collusive) practices. The following are a few examples of possible auctions and markets to consider.

Russian governments of different levels are obliged to purchase most of what they need via electronic marketplaces, data on which is publicly available. Rosimushestvo is privatizing various firms it controls or has a stake in. Yandex and Google conduct sponsored search auctions every time a user searches for something over the net. These auctions are of particular interests as Yandex and Google serve as market makers, with an opportunity to adjust the rules of the auction as they see fit.

2. New paradigms in Mechanism Design

Enhanced-Privacy Mechanism Design

Privacy of information is clearly a human desideratum, stemming from possible effects of any information revealed by current actions on future interactions. Somewhat surprisingly, it has received virtually no attention in Microeconomic Theory literature. In part this can be explained by the fact that most of mechanisms obtained as solutions (to a variety of problems in auctions, contract theory, bargaining, market design, voting, etc.) are idealistic in relying on assistance of a mediator. Such a mediator collects reports from the players and selects an outcome. In essence, when private information does matter, privacy is substituted by the trust in mediator, often by an explicit assumption on the ability of the mediator to commit to the mechanism. As long as the mediator is trusted with correctly processing collected reports so as to obtain and reveal the outcome and nothing more, the mechanism obtains the perfect privacy: only the minimal unavoidable information is revealed by the outcome. But, can we really trust the mediators? Are trusted mediators readily available?

In a series of papers, Izmalkov, Lepinski & Micali demonstrate that any finite mediated normal-form mechanism can be (perfectly) implemented by an unmediated extensive-form mechanism with a public mediator so that: (1) the two mechanisms are strategy equivalent: their normal forms are isomorphic, and thus solutions of the games generated by these mechanisms are the same; (2) the two mechanisms are privacy equivalent: the players learn exactly the same information during and after the play of each mechanism provided they use equivalent strategies; and (3) the public mediator only performs the public actions, so that everyone can verify that he is acting properly, and never learns any information that should remain private.

Yet, many practical issues related to notions of privacy, trust, and commitment remain unresolved. To what extent do theoretical properties of common auctions suffer from the lack of trust in the auctioneer, or lack of privacy in the auction procedure? What are effects of privacy concerns in dynamic transactions, e.g. online transactions in a large market-place such as amazon.com. How to design practical mechanisms that respect privacy of their participants?

Minimal Knowledge, Belief-Leveraging Mechanism Design In a stock market, one may buy a stock for a high price not because he personally values it very high, but because he believes that others may value it even higher, or because he believes that someone believes that someone else values very high. Beliefs and high-order believes indeed influence our strategic behavior in many settings. However, auctions and other classical economic mechanisms do not leverage such beliefs to —say— generate higher revenue. (Indeed, dominant-strategy mechanisms leverage solely the players' knowledge of their own valuations, not their beliefs about the valuations of their opponents. Bayesian mechanisms with a "common prior" leverage at most the players' first-order beliefs, because their higher-order ones are forced to coincide with their first-order ones.) On the other side, in the design of optimal mechanisms (unlike the classic mechanism design) it is assumed that the seller also has beliefs about knowledge of the others, and acts depending on them. An open research area is how to design mechanisms that leverage higher order beliefs (or anything beyond first order believes), require minimal knowledge by the seller, and are optimal (or at least good in some sense). There is a very recent research on these topics, see in particular, works of Silvio Micali with coauthors.

No Commitment- and Commitment-Providing Mechanism Design

Commitment is the ability to follow a specific plan of action even if it is not rational to do so at any moment a player makes a decision. It can be profit-enhancing as it forces other rational players to adjust their behavior. Ability to commit is particularly crucial for the party that proposes a mechanism to play by others. The famous Coase conjecture states that the monopolist selling a durable good in large supply would have to sell it at a price of zero if he is not able to commit not to lower prices tomorrow. The best mechanism for the monopolist would be to set a price and stick to it even if a customer refuses to buy it. In mechanism design, it is often assumed that the designer can commit to the mechanism it offers. Crucially, the need for commitment often comes at a point when the designer learns some new information about the players it interacts with (such as monopolist learning that a customer refused its offer). Among the open questions are identification of the minimally required commitment for achieving specific (classic) goals of mechanism design and design of mechanism that achieve these goals with the minimally required commitment.

Reduced-Complexity Mechanism Design

Classically, when designing an economic mechanism (e.g., a combinatorial auction) one disregards computational issues. As a result, classical mechanisms often run in time that is exponential in the number of players or other parameters, such as the number of goods in the case of an auction.

In practice, therefore, one cannot live long enough to see the outcomes generated by these mechanisms. This problem becomes particularly acute for internet transactions, such as those involved in tomorrow's secure exchanges, because the number of participants in such games is typically large. They definitely are not 2- or 3-player games. It becomes thus imperative to seek new economic mechanisms that can perform well with bounded computational resources.

Collusion-Resilient Mechanism Design

A large electronic transaction, such as a country-wide or international auction, is a game in which rational players will try to increase their profits. Traditional mechanism design envisages that each player will act individually. If this is the case, then the classical notion of equilibrium is perfectly adequate. Such a notion in fact guarantees that, as long as the other players stick to their "specified" strategies, a player cannot improve his payoff by deviating from his equilibrium strategy.

Players, however, have being colluding from time immemorial, and if two collusive players jointly deviate from their equilibrium strategies, then they are often able to increase their total profits at the expense of the organizer (designer) of the game and possibly of other players. Thus we believe that designing economic mechanisms resilient against collusion is an important research direction.

3. Social networks and Media

If one would be asked a question what is the most visible development in the world in the last 10 years, a definite candidate is the explosion of the online communities and social networks. Think Facebook, netflix, twitter, livejournal, imhonet. This is largely an uncharted territory, and so both exciting and challenging at the same time.

For the papers on the topics described please search via google scholar for appropriate keywords.