Abstracts

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Lusin's Theorem and Mechanism Design:
Lessons from the Vickrey–Mirrlees Model
of Optimal Income Taxation

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ABSTRACT

By Lusin's theorem, a measurable function on the Lebesgue unit interval can be approximated by functions that are continuous except on arbitrarily small subsets. We consider mechanisms where a principal is confronted by a continuum of agents. For these, the Vickrey–Mirrlees model of optimal income taxation when workers have varying skills illustrates why one should allow non-measurable mappings from the unit interval to agents' hidden types. Such mappings emerge naturally when one-way Fubini processes, as considered in joint work with Yeneng Sun, are used to model agents': (i) hidden types; (ii) messages to the principal; (iii) commodity bundles allocated to them by an incentive-compatible mechanism; (iv) hidden multilateral trading processes between finite sets of agents.

Judicial Mechanism Design

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ABSTRACT

This paper proposes a modern mechanism design approach to study welfare-maximizing criminal judicial processes. We provide a framework for reducing a complex judicial process to a single-agent, direct-revelation mechanism focused on the defendant, and identify a commitment assumption that justifies this reduction. We identify properties of a generically unique class of optimal mechanisms for two notions of welfare distinguished by their treatment of deterrence. These mechanisms shed new light on features of the criminal justice system in the United States, from the prevalence of extreme, binary verdicts in conjunction with plea bargains to the use of jury instructions and an adversarial system, all of which emerge as the result of informational, commitment, and incentive arguments.

Self-Evident Events and the Value of Linking

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ABSTRACT

We propose a theory of linking in long-term relationships based on what information becomes self-evident in equilibrium at the end of a stage game. We obtain a tight bound on the average per-period efficiency loss that must be incurred to enforce a stage-game outcome throughout a T-period repeated game when T is large. Our results apply to all monitoring structures and strategy profiles. They encompass the inefficiency result in AMP1991, as well as the approximate-efficiency results in Compte (1998), Obara (2008), and Chan and Zhang (2016).

Dynamic Contracts

Sebastian Di Tella and Yuliy Sannikov

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ABSTRACT

Dynamic incentive problems are crucial in economics. In macroeconomics incentives pose constraints that lead to inequality. In corporate finance, incentives justify financial frictions and impose limits on optimal capital allocation. The lecture will be based a cutting-edge research paper on dynamic contracting using continuous-time methods. In this setting, stochastic calculus provides powerful ways to characterize optimal solutions, and to study dynamics – what incentives imply about the distribution of wealth and future outcomes.

Mechanism Design with Financially Constrained Agents and Costly Verification

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ABSTRACT

A principal wishes to distribute an indivisible good to a population of budget-constrained agents. Both valuation and budget are an agent's private information. The principal can inspect an agent's budget through a costly verification process and punish an agent who makes a false statement. I characterize the direct surplus-maximizing mechanism. This direct mechanism can be implemented by a two-stage mechanism in which agents only report their budgets. Specifically, all agents report their budgets in the first stage. The principal then provides budget-dependent cash subsidies to agents and assigns the goods randomly (with uniform probability) at budget-dependent prices.In the second stage, a resale market opens, but is regulated with budget-dependent sales taxes. Agents who report low budgets receive more subsidies in their initial purchases(the first stage), face higher taxes in the resale market (the second stage) and are inspected randomly. This implementation exhibits some of the features of some welfare programs, such as the affordable housing program in Singapore.

Equivalence of Stochastic and Deterministic Mechanisms

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ABSTRACT

We consider a general social choice environment that has multiple agents, a finite set of alternatives, and independent and dispersed information. We show that for any Bayesian incentive compatible mechanism, there exists an equivalent deterministic mechanism that (1) is Bayesian incentive compatible; (2) delivers the same interim expected allocation probabilities and the same interim expected utilities for all agents; and (3) delivers the same ex ante expected social surplus. This result holds in settings with a rich class of utility functions, multi-dimensional types, interdependent valuations, and in settings without monetary transfers. To prove our result, we develop a novel methodology of mutual purification, and establish its link with the mechanism design literature.

Sequential Screening with Hidden Actions

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ABSTRACT

One common insight in the sequential screening literature (e.g., Courty and Li, 2000, and Eső and Szentes, 2007) is that the allocation (implemented in the second stage) is in general discriminatory over the first stage types. In this paper, we study how introducing a first-stage type-enhancing hidden action of the agent would affect the degree of discrimination at the optimum in a two-stage procurement setting where the agent can make costly unobservable investment to improve his first stage type, which is the distribution of his second-stage realized private cost of delivering the product. The principal's goal is to minimize the expected procurement cost. We find that the introduction of moral hazard unambiguously mitigates the allocative discrimination in the second stage. In particular, the second stage mechanism can even be non-discriminatory when the marginal cost of investment is small enough.

Communication in Repeated Games with Imperfect Private Monitoring

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ABSTRACT

We provide a folk theorem for a communication extension of a game with imperfect private monitoring. The result utilizes results from the theory of games with public monitoring, in combination with certain ideas from mechanism design with incomplete information.

Optimal Discriminatory Disclosure

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ABSTRACT

A seller of an indivisible good designs a selling mechanism for a buyer who knows the distribution of his valuation for the good but not the realization of his valuation. The seller can choose how much additional private information about his valuation that the buyer may access. Under the assumption that the buyer's valuation distributions are ranked by likelihood ratio dominance, we show that the seller's optimal disclosure policy has an interval structure. Moreover, information discrimination has to interact with price discrimination to be effective. When price discrimination is infeasible, non-discriminatory disclosure can attain the maximal revenue achievable under discriminatory disclosure. When price discrimination is feasible, however, the optimal disclosure policy is generally discriminatory, that is, the seller provides differential access to information for different buyer types.

Optimal Delay in Committees

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ABSTRACT

In a committee of two members with ex ante different favorite alternatives, costly delay after a disagreement can induce "efficient concession" by a low-type member who privately knows that his favorite alternative is inferior. We consider dynamic delay mechanisms, where each round of decision-making leads to the next after a disagreement and a delay that is uniformly bounded from above due to limited commitment. Any optimal delay mechanism consists of a finite number of rounds in which the low type concedes with a positive probability, followed by a deadline round for reaching an agreement before a coin flip. It induces in equilibrium both efficient concession at the deadline, and "start-and-stop" in the beginning, in which a round of maximum concession by the low type alternates with no concession. Start-and-stop results from simultaneously maximizing both the static incentives for truth-telling by maximizing the immediate delay penalty, and the dynamic incentives by minimizing the low type's continuation payoffs.

Dynamic Contracts

SEBASTIAN DI TELLA AND YULIY SANNIKOV

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ABSTRACT

Dynamic incentive problems are crucial in economics. In macroeconomics incentives pose constraints that lead to inequality. In corporate finance, incentives justify financial frictions and impose limits on optimal capital allocation. The lecture will be based a cutting-edge research paper on dynamic contracting using continuous-time methods. In this setting, stochastic calculus provides powerful ways to characterize optimal solutions, and to study dynamics – what incentives imply about the distribution of wealth and future outcomes.

Selling Mechanisms for a Financially Constrained Buyer

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ABSTRACT

We study the design of multi-item selling mechanisms where a buyer's type consists of valuation and budget, both of which are private information. Focusing on mechanisms that never generate a deficit for the seller, we provide necessary and sufficient conditions for selling mechanisms to be prior free incentive compatible and ex post budget feasible for the buyer. These conditions inform the construction of incentive compatible prices under financial constraints. For instance, we derive upper bounds on prices for any given allocation function that is implementable without deficits. Our upper bound on prices is tight in the 2-item case. We use a novel f;ow network approach to incentive compatibility that also takes care of budget feasibility, exploiting a subtle difference between unrestricted incremental values —i.e., the minimal value difference between an item assigned to the buyer by the mechanism and any other alternative— and restricted incremental values —i.e., the minimal value difference between the item and the alternative when the buyer can actually afford the alternative.We illustrate the usefulness of our approach in a simple setting, deriving revenue maximizing selling mechanisms when the seller has two identical objects to allocate and the buyer's valuation may exhibit complementarities between the objects.

Maskin Meets Abreu and Matsushima

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ABSTRACT

We study the classical Nash implementation problem due to Maskin (1999), but allow for the use of lottery and monetary transfer as in Abreu and Matsushima (1992, 1994). We therefore unify two well-established but somewhat orthogonal approaches of implementation theory. We first show that Maskin monotonicity is a necessary and sufficient condition for pure-strategy Nash implementation by a *direct* mechanism. Second, taking mixed strategies into consideration, we show that Maskin monotonicity is a necessary and sufficient condition for mixed-strategy Nash implementation by a *finite* (albeit indirect) mechanism. Third, we extend our analysis to implementation in rationalizable strategies. In contrast to previous papers, our approach possesses many appealing features simultaneously, e.g., finite mechanisms (with no integer or modulo game) are used; mixed strategies are handled explicitly; neither transfer nor bad outcomes are used on the equilibrium path; our mechanism is robust to information perturbations; and the size of off-equilibrium transfers can be made arbitrarily small. Finally, our result can be extended to continuous settings and ordinal settings.

Collusion-proof dynamic mechanisms

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ABSTRACT

This paper studies dynamic mechanism design when agents have opportunities to collude. Most of the dynamic mechanism design literature focuses on the truthtelling equilibrium in direct mechanisms, which is justified by the revelation principle. However, agents have plenty of opportunities to coordinate or collude in dynamic settings. This paper proposes a framework to address the possibility of collusion in dynamic mechanisms. We define a notion of collusion-proofness in dynamic settings and construct collusion-proof dynamic mechanisms for the independent private-value environments. We also provide a characterization of collusion-proofness.

Strategically Simple Mechanisms

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ABSTRACT

We define and investigate a property of mechanisms that we call "strategic simplicity," and that is meant to capture the idea that, in strategically simple mechanisms, strategic choices are easy. We define a mechanism to be strategically simple if strategic choices can be based on first-order beliefs about the other agents' preferences alone, and there is no need for agents to form higher-order beliefs, because such beliefs are irrelevant to agents' optimal choices. All dominant strategy mechanisms are strategically simple. But many more mechanisms are strategically simple. In particular, strategically simple mechanisms may be more flexible than dominant strategy mechanisms in the voting problem and the bilateral trade problem.

The Reduced Form in Mechanism Design

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ABSTRACT

A mechanism design problem involves selecting an allocation and transfer rule that satisfies incentive compatibility. The allocation rule is a function of the entire of profile of type reports of agents. This can be a complicated object. Interim allocation rules, that depend upon the allocation rule are simpler objects, because they are lower-dimensional functions. If we can reformulate the problem in terms of interim allocations, one can reduce a design problem involving many agents into one for a single agent. This is called a reduced form representation. It can make a difference in computational and analytical tractability. In this tutorial I will discuss examples of obtaining the reduced from for both static and dynamic mechanism design problems.

Framing Game Theory

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ABSTRACT

A real player sometimes fails to practice hypothetical thinking, which increases the occurrence of anomalies in various situations. This study incorporates psychology into game theory and demonstrates a cognitive method to encourage bounded-rational players to practice correct hypothetical thinking in strategic interactions with imperfect information. We introduce a concept termed "frame" as a description of a synchronized cognitive procedure through which each player decides multiple actions in a step-by-step manner, shaping his (or her) strategy selection. We could regard a frame as the supposedly irrelevant factors from the viewpoint of full rationality. However, this paper theoretically shows that in a multi-unit trading with private values, the ascending proxy auction has a significant advantage over the second-price auction in terms of the bounded-rational players' incentive to practice hypothetical thinking, because of the difference, not in physical rule, but in background frame. By designing a frame appropriately, we generally show that any static game that is solvable in iteratively undominated strategies is also solvable, even if players cannot practice hypothetical thinking without the help of a well-designed frame. We further investigate the possibility that even a detail-free frame design serves to overcome the difficulty of hypothetical thinking. We extend this investigation to the Bayesian environments.

Costly miscalibration

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ABSTRACT

We consider an online platform which provides probabilistic forecasts using some algorithm. We introduce a concept of miscalibration which measures the discrepancy between the forecast and the truth. We apply this concept to sender-receiver games in which miscalibration is costly for the sender (the platform). We show that, when the sender's miscalibration cost is sufficiently high, he can achieve his commitment solution in an equilibrium. Moreover, under some assumption about the miscalibration-cost function, the only rationalizable strategy of the sender is his strategy in the commitment solution.

A Strategic Justification of the Talmud rule based on the Concede-and-Divide Algorithm in Bankruptcy Problems

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ABSTRACT

When a group of creditors has claims on a resource that is not enough to honor all claims, how should the resource be divided? This is the so-called bankruptcy problem. A well-known rule to solve this problem is the Talmud rule. We introduce a game that exploits standard consistency properties, as well as the concede-and-divide algorithm. As we show, the game strategically justifies the rule.

Perfect Conditional epsilon-Equilibria of Multi-Stage Games with Infinite Sets of Signals and Actions

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ABSTRACT

We extend Kreps and Wilson's concept of sequential equilibrium to games where the sets of actions that players can choose from and the sets of signals that players may observe are infinite. A strategy profile is a conditional epsilon-equilibrium if, for any player and for any of his positive probability signal events, the player's conditional expected utility is within epsilon of the best that the player can achieve by deviating. Perfect conditional ε-equilibria are defined by testing conditional epsilon-rationality also under nets of small perturbations of the players' strategies and of nature's probability function that can make any finite collection of signals outside a negligible set have positive probability. Every perfect conditional epsilon-equilibrium strategy profile is a subgame perfect epsilon-equilibrium, and, in finite games, limits of perfect conditional epsilon-equilibria as epsilon tends to zero are sequential equilibrium strategy profiles. Because such limit strategies need not exist even in very "nice" infinite games, we consider instead their limit distributions over outcomes. We call such outcome distributions perfect conditional equilibrium distributions and establish their existence for a large class of regular projective games. Nature's perturbations can produce equilibria that seem unintuitive and so we consider two ways to limit the effects of those perturbations, using topologies on nature's states and on players' actions.

Dinosaur Judges: Conservative Experts in a Changing Society

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ABSTRACT

Modern societies thrive on the advices of experts in a garden variety of areas. How do we identify these experts? In circumstances where an expert's track record cannot be easily assessed by the general public, our society relies on peer reviews from "known" experts to identify new experts. This gives rise to an aristocratic expert class that is inevitably conservative. Young scholars, in order to earn the approval of old "known" experts, have incentives to study old subjects or follow old schools of thought at the expenses of new subjects and new schools of thought that better serve a changing society. Our society tradeoffs conservatism against competence in its endeavor to identify experts, but the optimal tradeoff may not be achieved due to time-inconsistency. We formalize this problem with a model described in terms of legal experts such as lawyers and judges, and use it to shed light on noise voters and anti-intellectualism in the Trumpian era.

Optimal Selling Mechanism with Buyer Price Search

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ABSTRACT

Following a dynamic mechanism design approach, we study the optimal selling mechanism in an environment where buyers are initially endowed with their private values of the object on sale, and they can conduct costless search for outside optional prices. Both the buyers' values and outside prices are their private information, which are continuously distributed. Diverging from the well-received insight obtained from a typical dynamic mechanism design problem, second stage incentive compatibility imposes binding monotonicity conditions on feasible allocation rules, which calls for a modified Myerson convexification procedure to regularize the buyers' virtual values in the dimension of the outside prices. Nevertheless, to the extent these necessary conditions hold, whether the second stage information is private does not affect the mechanism design. The optimal mechanism requires a non-refundable deposit at the first stage and allocates the object to the buyer with the highest nonnegative regularized virtual value. Other buyers take the outside options if and only if outside prices are lower than their values. When there is only one buyer, the optimal mechanism (weakly) deters search of the high types though the search is costless. Specifically, the optimal selling mechanism is implemented by a simple one-stage mechanism of a fixed price, which is only taken by high value types.

Keywords: Dynamic mechanism design; Outside option; Price search; Price Match.

Dynamic Trading: Price Inertia and Front-Running

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ABSTRACT

We build a linear-quadratic model to analyze trading in a market with private information and heterogeneous agents. Agents receive private taste/inventory shocks and trade continuously. Agents differ in their need for trade as well as the cost to hold excessive inventory. In equilibrium, trade is gradual. Trading speed depends on the number and market power of participants, and trade among large market participants is slower than that among small ones. Price has momentum due to the actions of large traders: it drifts down if the sellers have greater market power than buyers, and vice versa. The model can also answer welfare questions, for example about the social costs and benefits of market consolidation. It can also be extended to allow private information about common value.

What Do Mediators Do? Information and Bargaining Design

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ABSTRACT

We propose a mechanism design approach to study the role of a mediator in dispute resolution and bargaining. In our model the mediator provides a buyer and seller with reality checks by controlling the information they have access to and proposing a transaction price. We first consider the class of static decision and information disclosure mechanisms, in which the mediator simultaneously selects the information disclosed to the parties and the price at which they may trade. We characterize the dominant strategy mechanism that maximizes the ex-ante gains from trade. We show that by restricting the agent's information to be binary partitions, the ex-ante gains from trade can be higher than in the Bayesian mechanism that maximizes gains from trade when buyer and seller are fully informed. The gain from restricting the agents' information is to permit completion of some of the most efficient trades that would be lost in the incentive efficient mechanism under full information. We then study the value of the mediator engaging in shuttle diplomacy by considering a class of dynamic decision and information disclosure mechanisms and show that it is possible to design a dynamic mechanism that is ex post effcient; in the ex post perfect equilibrium of the mechanism trade takes place if and only if the buyer's value is above the seller's cost.

Peer Effect and the Structure of Teams

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ABSTRACT

A number of empirical studies have demonstrated positive peer effects in production, and these effects are most significant in teams consisting of members with heterogeneous skill levels. By modelling peer effect as mutual monitoring/pressure between members, we show that the total agency cost is minimized by maximizing skill diversity in each team. Given a pool of agents with different abilities, the optimal job and team design involves assigning agents with extreme abilities into teams in a negative assortative manner, while leaving agents with intermediate abilities to work independently.

Learning and evidence in principal-agent environments

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ABSTRACT

I explore the welfare consequences of costly evidence acquisition in a broad class of contracting environments. An initially uninformed agent contracts with a principal. Before choosing whether to participate in a mechanism, the agent can observe, at a cost, a payoff-relevant signal which can be credibly disclosed to the principal. The principal may commit to a mechanism in which allocations are contingent on disclosure of a signal realization. I find that the principal's expected payoff is either non-increasing or U-shaped in the cost of evidence, and derive a condition that precisely distinguishes the two cases. In contrast, the agent's payoff is maximized at intermediate costs of evidence acquisition. Applications include insurance and labor markets, and public procurement. Further developing the application to insurance markets, I compare the insurer's profit and the agent's welfare between the cases in which evidence can and cannot be contracted upon. I characterize a set of parameter values for which the agent is strictly worse off — and aggregate welfare may be reduced — when evidence can be contracted upon and a set of parameter values for which allowing evidence to be contracted upon induces a Pareto improvement. The results are relevant to the policy debate over the use of genetic testing in health and life insurance markets.

How to Count Citations If You Must

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ABSTRACT

Citation indices are regularly used to inform critical decisions about promotion, tenure, and the allocation of billions of research dollars. Nevertheless, most indices (e.g., the h-index) are motivated by intuition and rules of thumb, resulting in undesirable conclusions. In contrast, five natural properties lead us to a unique new index, the Euclidean index, that avoids several shortcomings of the h-index and its successors. The Euclidean index is simply the Euclidean length of an individual's citation list. Two empirical tests suggest that the Euclidean index outperforms the h-index in practice.