Abstracts

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A Two-Stage Model of Assignment and Market

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ABSTRACT

This paper studies a two-stage economy where the non-monetary assignments of indivisible objects are followed by market transactions. In this economy, there are finitely many players and finitely many types of indivisible objects and possibly one divisible good called money. Every player demands at most one object besides money. The first stage is governed by a non-monetary assignment mechanism, while the second stage is governed by the market. As a mechanism in the first stage, this paper considers the Boston mechanism and the deferred acceptance algorithm. This paper defines perfect market equilibrium (PME) where the second stage outcome is a market equilibrium both on and off the equilibrium paths, and the first stage strategy profile is a Nash equilibrium of the mechanism, taking the second stage outcomes as given. This paper then analyzes two situations, the economies with and without money. This paper provides some necessary and sufficient conditions under which efficiency and stability are guaranteed.

Prestige Concerns in College Admissions

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ABSTRACT

We study the effect of prestige concern on the students' major choice in decentralized college admission. Students are admitted based on their exam scores which are imperfectly correlated with their unobservable ability. Prestige concern makes students try to signal their ability via the choice of more prestigious program, i.e., program attended by students with higher scores. As a consequence, students sacrifice their intrinsic preferences about majors, leading to welfare loss. The extent of welfare loss is affected by various factors such as: magnitude of prestige concern; information precision of exam scores; evaluation criteria; presence of groups with unequal accessibilities to exam preparation technology; and college admission system.

Chain Stability in Trading Networks

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ABSTRACT

We show that in general trading networks with bilateral contracts, a suitably adapted chain stability concept (Ostrovsky, 2008) is equivalent to stability (Hatfield and Kominers, 2012; Hatfield et al., 2013) if all agents' preferences are jointly fully substitutable and satisfy the Laws of Aggregate Supply and Demand. We also show that in the special case of trading networks with transferable utility, an outcome is consistent with competitive equilibrium if and only if it is not blocked by any chain of contracts. Moreover, from a computational perspective, checking whether an outcome is chain stable is substantially easier than directly checking whether an outcome is stable.

Consumer Search and Optimal Pricing under Limited Commitment

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ABSTRACT

This paper studies the effects of limited price commitment on consumer search and optimal pricing. I consider an environment in which consumers are uncertain about a seller's commitment to the advertised price. I characterize the set of pure-strategy equilibria and find that a higher degree of commitment leads to lower prices. I show that the impact of search costs on prices is non-monotone and depends on the level of commitment as well as the magnitude of the search cost. I also evaluate the effects of regulation that limits the extent of a seller's deviation from the advertised price and demonstrate that stricter regulation may not be welfare improving. Finally, I consider the case where sellers have heterogeneous levels of commitment power and investigate how the difference in commitment power influences market outcomes. I find that full commitment allows a seller to dictate the order in which consumers visit sellers when rival sellers have limited commitment, while a higher degree of limited commitment does not permit the seller to determine the order.

Continuous Time Random Matching

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ABSTRACT

We show the existence of independent random matching of a large population in a continuous-time dynamical system, where the matching intensities could be general nonnegative jointly continuous functions on the space of type distributions and the time line. In particular, we construct a continuum of independent continuous-time Markov processes that is derived from random mutation, random matching, random type changing and random break up. It follows from the exact law of large numbers that the deterministic evolution of the agents' realized type distribution for such a continuous-time dynamical system can be determined by a system of differential equations. The results provide the first mathematical foundation for a large literature on continuous-time search-based models of labor markets, money, and over-thecounter markets for financial products.

Redesigning Over-the-Counter Financial Markets

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ABSTRACT

This series of lectures focuses on the theory and practice of dealer-intermediated over-the-counter markets, and is relevant to recent issues in the design and regulation of financial markets. Significant increases in the regulatory capital and liquidity requirements of bank-affiliated dealers, combined with increased debt funding costs for their shareholders, have dampened the liquidity of over-the-counter markets. This is especially the case for products that occupy a lot of space on dealer balance sheets, such as bonds, swaps, repos, and foreign exchange contracts. Dealers have reduced their market-making inventories and are offering less liquid two-way markets for asset classes whose capital or funding requirements are large relative to their riskiness and intermediation profits.

Matching theory and market design: Theory and applications

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ABSTRACT

How to match people to other people or goods is an important problem in society. The economics of "matching and market design" has analyzed these problems and improved real-life institutions in recent years. In this lecture series, I will briefly cover the basics of matching theory and then talk about some of the recent advances in matching theory and applications, partly based on my own research.

On stable and efficient mechanisms for priority-based allocation problems

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ABSTRACT

For school choice (priority-based allocation) problems, when the priority structure is acyclic, the associated (student-proposing) deferred acceptance algorithm is Pareto efficient and group strategy-proof (Ergin, 2002). We reveal a hidden iterative removal structure behind such deferred acceptance algorithms. A nonempty set of students is called a top fair set (TFS) if when all students apply to their most preferred schools and all schools accept the best applicants up to their quotas, students in the set are always accepted, independent of other students' preferences. We provide an elimination process to find the maximal TFS, if any TFS exists. We show that for any priority structure, iterative removal of TFS always produces a complete assignment if and only if the associated deferred acceptance algorithm is Pareto efficient, or equivalently, if and only if the priority structure is acyclic. Furthermore, for any such priority structure, the assignment made by iteratively removing TFS coincides with that of the deferred acceptance algorithm.

Learning by Matching

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ABSTRACT

This paper studies stability notions and matching processes in the job market with incomplete information on the workers' side. Each agent is associated with a type, which determines their payoffs from a match. Moreover, firms' information structure is described by partitions over possible worker type profiles. With this firm-specific information, we propose stability notions which, in addition to requiring individual rationality and no blocking pair, captures the idea that the absence of rematching conveys no further information. When an allocation is not stable under the status quo information structure, a new pair of an allocation and an information structure will be derived. We show that starting from an arbitrary allocation and an arbitrary information structure, the process of allowing randomly chosen blocking pairs to rematch, accompanied by information updating, will converge with probability one to an allocation that is stable under the updated information structure. Our results are robust with respect to various alternative learning patterns.

Weak Stability and Pareto Efficiency in School Choice

Yongchao Zhang and Qianfeng Tang

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ABSTRACT

We propose a new notion of weak stability for two-sided matching problems. A matching is said to be weakly stable if none of its blocking pairs can be matched in a more stable matching–one with a weakly smaller set of blocking pairs. We then apply this concept to school choice problems and study its compatibility with the Pareto efficiency of students' assignments. A matching is said to be self-constrained efficient if for students it is not Pareto dominated by any matching more stable than it. We prove that the following statements are equivalent for a matching: (i) it is weakly stable and self-constrained efficient; (ii) it is exactly the outcome of the generalized Kesten's efficiency-adjusted deferred acceptance mechanism which uses its own set of blocking pairs as the consenting constraint; and (iii) it weakly Pareto dominates every matching which is more stable than it.

Strategic 'Mistakes': Implications for Market Design Research

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ABSTRACT

Using a rich data set on Australian college admissions, we show that even in strategically straightforward situations, a non-negligible fraction of applicants adopt strategies that are unambiguously dominated; however, the majority of these 'mistakes' are payoff irrelevant. We then propose a new equilibrium solution concept that allows for mistakes. Applying it to a strategy-proof mechanism in which colleges strictly rank applicants, we show that equilibrium strategies need not be truth-telling, but that every equilibrium outcome is asymptotically stable. Our Monte Carlo simulations illustrate the differences between the empirical methods based on truth-telling or outcome stability, revealing that the latter is more robust to potential mistakes. Taken together, our results suggest that strategy-proof mechanisms perform reasonably well in real life, although applicants' mistakes should be carefully taken into account in empirical analysis.

Kidney Exchange with Immunosuppressants

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ABSTRACT

Recent developments in immunosuppressive protocols have enabled patients to receive kidney transplants from biologically incompatible donors. We propose to use immunosuppressants as a part of kidney exchange program to increase compatible transplants. For each compatibility profile, the "pairwise cycles and chains (PCC)" solution tells us how to use immunosuppressants and how to match patients and donors. We show that this solution is Pareto efficient, responsive, and maximizes the number of compatible transplants among all Pareto efficient and responsive solutions.

Minimizing Justified Envy in School Choice and Top Trading Cycle

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Minimizing Justified Envy in School Choice: The Design of New Orleans' One App

Joint work with A. Abdulkadiroĝlu, Y-K. Che, P. Pathak, A. Roth

Abstract. In 2012, New Orleans became the first school district to use a mechanism based on Top Trading Cycles (TTC) in real-life allocation problem. TTC is Pareto efficient and strategy-proof, but so are other mechanisms including serial dictatorship. We show that TTC minimizes justified envy among all Pareto efficient and strategy-proof mechanisms when each school has one seat. When schools have more than one seat, TTC admits less justified envy than serial dictatorship in an average sense. Using data from New Orleans and Boston, we show that TTC has significantly less justified envy compared to serial dictatorship.

Top Trading Cycles in Prioritized Matching: An Irrelevance of Priorities in Large Markets

Joint work with Y-K. Che

Abstract. We study top trading cycles (TTC) algorithm in a prioritized matching environment under the assumption that individuals' preferences and objects' priorities are uniform iid. Although TTC favors agents with high priorities in the assignment, we show that as the market grows large, the effect of priorities in TTC disappears, leading in the limit to an assignment that entails virtually the same amount of justified envy as does Random Serial Dictatorship, which completely ignores priorities.

Robust Persuasion of a Privately Informed Receiver

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ABSTRACT

This paper studies robust Bayesian persuasion of a privately informed receiver in which the sender has limited knowledge about the receiver's private information. The ambiguity-averse sender has a maxmin expected utility function. We show that when the sender has no knowledge about the receiver's private information, full information disclosure is optimal; when the sender's uncertainty about the receiver's private information vanishes, the sender can do almost as well as when the receiver does not have private information. We fully characterize the sender's robust information disclosure rule for various kinds of ambiguity in an example with two sates and two actions.

Multi-period matching with commitment

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ABSTRACT

Many multi-period matching markets exhibit some level of commitment. That is, agents' ability to terminate an existing relationship may be restricted by cost of breakups, binding contracts or social norms. This paper models matching markets with three types of commitment, defines corresponding notions of stability and examines the existence of stable mechanisms, as well as specifies sufficient conditions for efficiency, strategy-proofness and other properties. Firstly, the market with full commitment most closely resembles the static matching market, where most of the results, such as existence of stability, hold in the most general class of preferences. However, there is no dynamically stable spot rule, which only depends on spot markets, unless agents are extremely impatient. Secondly, for the models with two-sided commitment or one-sided commitment, desirable properties that are valid under the setup with a fixed set of individuals may not hold when arrivals and departures are introduced, and three approaches are proposed to deal with this issue. Whenever a dynamically stable matching exists, we construct an algorithm building upon the Deferred Acceptance algorithm of Gale and Shapley (1962) to characterize such a matching outcome. Moreover, as extensions, we discuss the case with no commitment and conduct welfare comparisons among cases with different types of commitment.

A Theory of Stability in Matching with Incomplete Information

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ABSTRACT

This paper provides a framework to study two-sided matching markets with incomplete information. In those markets, when two agents from opposite sides evaluate each other, they take their opponent's evaluation into account, which initiates agents' higher order reasoning. We propose a blocking notion that captures this higher order reasoning and then a stability notion that captures, in addition to individual rationality and no blocking, the idea that absence of blocking conveys no further information. We show that starting from an arbitrary allocation and an arbitrary information structure, the process of allowing randomly chosen blocking pairs to rematch, accompanied with information updating, will converge to an allocation that is stable under the updated information structure with probability one. Our framework also facilitates the study of alternative stability notions such as ex ante stability and Bayesian stability.

Dynamic Liquidity-Based Security Design

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ABSTRACT

We study a dynamic problem of the design and sale of a security backed by a long-lived asset. The dividend payment on the asset may be high or low. Issuers are privately informed about the quality of the asset, and raise capital by securitizing part of it. Issuers can pledge not only the current period payoff from the assets, but also the future resale price which depends on inter-temporal coordination. Both adverse selection and inter-temporal coordination determine the liquidity of the security. Multiple dynamic - liquid and illiquid - equilibria might arise when only equity contracts can be issued. We characterize the optimal security design and demonstrate short-term liquid collateralized debt, or short-term repo, is optimal and eliminates the multiple equilibria fragility. The unique equilibrium under debt contract improves social welfare relative to the illiquid equity equilibrium.

Procurement Design with Optimal Sequential R&D

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ABSTRACT

We explore optimal procurement mechanisms in an environment where potential suppliers are en- dowed with private R&D costs, and after incurring his R&D cost, each supplier will learn his true provision cost to perform the job. We show that the optimal procurement takes the form of sequential shortlistings and that the final procurement allocation rule is efficient. At each round (at most) one supplier is shortlisted, who then incurs the R&D cost to discover his provision cost. Depending on the reported R&D cost and provision cost profile, a new supplier will be shortlisted or the shortlisting simply stops. We show that a new supplier will be shortlisted only when his marginal contribution to the expected provision cost reduction outweights his virtual R&D cost, contingent on all the previous reports. We also demonstrate that the optimal shortlisting and final procurement allocation rules are truthfully implementable.

Matching and Rematching with Commitment

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ABSTRACT

We study a new two-sided matching model with commitment, consisting of free or committed heterogeneous workers and firms. A committed agent is an agent (firm or worker) who has initially had a partner (worker or firm) and is bound by her commitment. A free agent is an agent who has initially had no partner or whose relation with by her initial partner is not binding. Every agent tries to find her best possible partner but a committed agent can dissolve her partnership only if it is also in the interest of her partner to do so. We examine the problem of how to match workers and firms as well as possible and at the same time to set committed agents free as many as possible without violating their commitments to their partners. We show the existence of stable and core matchings through a constructive algorithm.

Random Mechanism Design on Multidimensional Domains

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ABSTRACT

We study random mechanism design in an environment where the set of alternatives has a Cartesian product structure. We restrict attention to top-separable preferences and generalize the notion of connectedness (Monjardet 2009) to a broad class of multidimensional domains: connected + domains. We show that in the class of minimally rich and connected+ domains, multidimensional single-peakedness is necessary and sufficient for the design of a flexible random social choice function that is unanimous and strategy-proof.

Premarital Investment with Imperfect Commitment

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ABSTRACT

We propose a model of imperfect commitment within marriage, and show how this affects premarital investments in children. A male-biased sex ratio induces families with a son to increase total investments, and to shift the composition towards physical capital and away from human capital. Empirical evidence from the China Family Panel Studies survey is consistent with the predictions. When the sex ratio is biased towards males, parents of boys, relative to those of girls, are more likely to migrate, and to increase housing investment at the expense of lower child educational investment. These patterns result in underdevelopment in human capital of boys. Our results highlight the different roles of different forms of capital in multidimensional marriage matching.