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Book of Abstracts

Tight and Effectively Rectangular Game Forms: A Nash Solvable Class

Joseph Abdou*

Abstract

We introduce a new class of game forms called effectively rectangular game forms. An effectively rectangular game form is one that has the same effectivity function as some rectangular game form. Actually we extend this class a little more: we define a superdeterminate game form as one that has an effectivity function which is finer than that of a rectangular game form. We prove that a tightly superdeterminate game form, hence a tight effectively rectangular game form, is Nash solvable.

*Université de Paris-I, France

Quasi-Competitiveness and Profitability in Symmetric Cournot Oligopoly

Rabah Amir*
(joint w/ V.E. Lambson†)

Abstract

In the framework of symmetric Cournot Oligopoly, this paper provides minimal sets of assumptions on the demand and cost functions that imply that, as the number of firms increases, the minimal and maximal equilibria lead to (i) declining per-firm profits in all cases; (ii) decreasing industry price and increasing or decreasing per-firm output; and (iii) increasing industry price and decreasing per-firm output. The analysis relies crucially on a lattice-theoretic approach and yields general, simple and unambiguous conclusions of a global nature. Along the way, some new insight into existence of Cournot equilibrium is developed.

*W.Z.B., Germany
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Full Admissible Rationality in Games of Asymmetric Information

Geir Asheim*
(joint w/ M. Dufwenberg*)

Abstract

We analyze the implications of "common knowledge of full admissible rationality" in games of asymmetric information by generalizing the framework of Asheim and Dufwenberg (1997). We illustrate how such an analysis can give rise to predictions in examples without assuming that players have a common prior or that players coordinate on an equilibrium. The paper is thus motivated by the scrutiny which both the common prior assumption and equilibrium analysis have been subjected to.

A player reasons in accordance with pull admissible rationality if his preferences (1) are consistent with his beliefs over opponents' and nature's sets, and, (2) satisfy that, conditional on any particular vector of sets for his opponents and nature, any director of opponents' strategies and nature's move having the property that all opponents and nature choose in their sets is deemed infinitely more likely than any vector not having this property (where the term "infinitely more likely" is used in the sense of Blume et al. (1991)). A subset of a players strategies is a fully permissible set if it is the set of main elements in a state where it is commonly known that all players reasons in accordance with full admissible rationality.

The concept of fully permissible sets is applied to two examples; the beer-quiche game and Spence's signaling model.

*University of Oslo, Norway

Equilibrium Points in the Ultimatum Game

Robert Aumann*

Abstract

In a famous experiment on the ultimatum game conducted by Guth and associates, the subjects failed to behave in accordance with the subgame perfect equilibrium. Some observers have taken this as evidence "against game theory" or "against rationality". It should be noted, though, that the observations DO accord with Nash equilibrium. If one interprets Nash equilibrium within an evolutionary framework, one would expect that in any given Society, norms of behavior would evolve under which offers underneath a certain threshold – which may vary from Society to Society – would be rejected. It would then follow that most offers within a given Society would be at or near some fixed level, and that offers beneath that level would be rejected. This is a nontrivial prediction made by evolutionary Nash equilibrium theory; it has been experimentally verified in the work of Okuno-Fujiwara, Roth, Yanovskaya, and Zamir, published in the AER several years ago. Thus, far from being evidence "against game theory", the experiments of Guth et al and Okuno-Fujiwara et al become a beautiful verification of game theoretic predictions.

*SUNY at Stony Brook, USA and The Hebrew University of Jerusalem, Israel

Social Planner Equilibrium

James Bergin*

Abstract

This paper considers the relation between equilibrium in a multimarket dynamic model of demand and supply and the social planner problem of social surplus maximization. There is a long and extensive literature applying the social planner formulation to various problems (see for example, Lucas and Prescott (1971), Hopenhayn (1992), Jovanovic (1982), Jovanovic and MacDonald (1994), Sakes and Ericson (1989, 1990) and Bergin and Bernhardt (1996)). The most recent work developing the and the social planner optimum is Hopenhayn (1990). This note provides a quick development of the connection from a game theoretic perspective, and observes that the theory extends to models with interrelated demand across markets, as a multi-planner game. The emphasis is on a differential approach relating social planner optima to the firms first order condition. For models with interrelated demand, the equilibria of the n-planner game coincide with the market equilibria.

*Queen's University, Canada

Stability and Largeness of Core for Symmetric Games

Amit K. Biswas*
(joint w/ G. Ravindran* and T.Parthasarathy*)

Abstract

In a symmetric game the core is the unique stable set if and only if n specified vectors are imputations. We also show for symmetric games that largeness of the core (in the sense of Sharkey) is equivalent to stability of the core and is also equivalent to the convexity of the lower boundary of the set of all acceptable payoff vectors of the game. In this paper we establish the equivalence of a condition given by Shapley to the newly evolved condition, thereby give an alternate proof to Shapley's condition.

*Indian Statistical Institute, India

Hotelling's Model with Capacity Precommitment

Nicolas Boccard*
(joint w/ X. Wauthy*)

Abstract

In an attempt to reconcile quantity and price competition under product differentiation, we use the two-stage game of Kreps & Scheinkman (1983) in the address framework of Hotelling.

Our main results are the following. In almost all subgame perfect equilibrium, capacity precommitment softens price competition drastically: firms behave as if they were an integrated monopoly. In equilibrium, the capacity choices exactly cover the market, so that there is no room for price competition at all. The foundation of this result is that capacity precommitment enables firms to take advantage of the local monopoly structure inherent in the Hotelling model. Note that this result is not driven by the existence of costs for capacity installation ; this cost must be positive but can be arbitrarily small relative to the other parameters of the game.

*Université Catholique de Louvain, Belgium

Catch-22 and King-of-the-Mountain Games: Cycling, Power, and Frustration

Steven J. Brams*

Abstract

In his classic novel, Catch-22 (1961), Joseph Heller postulates the following thoroughly frustrating situation between two people (call them R for row and C for column in a 2×2 matrix game): whichever of two strategies ($r1$ or $r2$) R chooses, the best response of C ($c1$ or $c2$) inflicts on R a worst or next-worst outcome, and possibly vice versa. Modeling this situation as a "generic" 2×2 strict ordinal game, it can be characterized by the following four properties, based on the theory of moves (TOM):

1. **Cyclicity**: There is one direction, either clockwise or counterclockwise, in which neither player, when it has the next move, ever departs from its best outcome as the players alternately move and countermove around the matrix, making cycling in this direction rational

2. **Frustration for** R: When it is C's turn to move during this cycling (by switching from $c1$ to $c2$ or from $c2$ to $c1$), these moves induce R's two worst outcomes. If forced to choose between them, it is rational for R to choose its next-worst outcome (call this outcome O).

3. **Incentive of** C **to frustrate** R: C prefers O to either of the outcomes when it is its turn to move, giving C an incentive always to move.

4. **Power of** C **to frustrate** R: C has moving power. It can continue the move-countermove process when R no longer has the wherewithal or will to continue and must, consequently, stop forcing R to choose O.

Implications of the analysis for identifying focal points, such as the unique pure-strategy Nash equilibrium in a 2×2 game, are discussed.

*New York University

Connections Between the Values of N-Person Games with Crisp and Fuzzy Coalitions

Dan Butnariu*
(joint w/ L. Markowicz*)

Abstract

An n-person cooperative game (with crisp coalitions) is usually represented by a function $v : \mathcal{P}(N) \to \mathbb{R}$ with $v(\phi) = 0$, where $N = \{1, \cdots, n\}$ and $\mathcal{P}(N)$ is the collection of all subsets of N. A n-person game with fuzzy coalitions is a continuous function $w : [0,1]^n \to \mathbb{R}$ with $w(0) = 0$. Each subset S of N can be identified with its membership vector $(s_1, \cdots, s_n) \in [0,1]^n$ defined by $s_i = 1$ if $i \in S$ and $s_i = 0$ otherwise. The elements of $[0,1]^n$ are called fuzzy coalitions. An n-person games with crisp coalitions can be seen as restrictions of the games with fuzzy coalitions to the vertices of $[0,1]^n$.

The question is whether the diagonal value of a game with fuzzy coalitions w is uniquely determined by the Shapley value of the game with crisp coalitions w_* which is the restriction of w to the vertices of $[0,1]^n$. It is shown that the diagonal Aumann-Shapley value for n-person games with fuzzy coalitions is, essentially, insensitive to the degrees of membership of the players in various fuzzy coalitions.

*University of Haifa, Israel

The Multichoice Value: A Strategic Approach

Emilio Calvo*
(joint w/ J.C. Santos*)

Abstract

We show, first, that the value notion of van den Nouweland et al. (1995) is the right candidate for the multichoice value. Second, we will extend the value to the general mixture case in which there are simultaneously two different types of players in the game: ones possessing a finite number of activity levels, and the others one possessing a continuum of possibilities.

*Universidad del Pais Vasco, Spain

Perfect Equilibria of a 2-Person Bargaining Game

Margarida Corominas*

Abstract

The purpose of the paper is to study the set of subgame perfect equilibria payoffs of the Hart and Mas-Colell (1996) game for the case of 2 players.

*Universitat Pompeu Fabra, Spain

Bargaining, Coalitions and Competition

Nir Dagan*
(joint w/ R. Sarrano† and O. Volij†)

Abstract

We study a decentralized matching model in a large exchange economy, in which trade takes place through non-cooperative bargaining in coalitions of finite size. Under essentially the same conditions of core equivalence, we show that the strategic equilibrium outcomes of our model coincide with the Walrasian allocations of the economy. Our method of proof exploits equivalence results between the core and Walrasian equilibria. Our model relaxes differentiability and convexity of preferences thereby covering the case of indivisible goods.

*Universitat Pompeu Fabra, Spain
†Brown University, USA

Estimating Equilibrium Models Using Count Data: Quantity Competition in the Presence of Indivisibilities and Heterogeneous Firms

Peter Davis*

Abstract

In this paper we analyze a model of Cournot competition in which the strategy spaces of agents are discrete. Non uniqueness of equilibria is generic, yet in order to estimate any model we require a one to one mapping between the parameters of that model and it's prediction about the world. Sufficient conditions for uniqueness are restrictive. Rather than require that the equilibrium set be a singleton, we establish sufficient conditions under which predicted market output is uniquely determined within the set of Nash Equilibria. Matching the model's (unique) prediction of total output to the market output we observe provides a mechanism to estimate equilibrium models using count data. The simulated GMM procedure suggested by Berry(1992) implements estimation with a nested fixed point calculation at each iteration.

*Yale University, USA

On Some Myths about Sequenced Common-Value Auctions

Maria A. de Frutos[†]
(joint w/ R. Rosenthal[*]**)**

Abstract

Equilibria are constructed for classes of game models of sequenced second-price auctions of identical common-valued objects. In some of these the equilibrium price falls on average, and in others the seller loses on average by committing to announce publicly all that he knows. Both of these possibilities are surprises.

[†]Universidad Carlos III de Madrid, Spain
[*]Boston University, USA

Network Competition with Reciprocal Proportional Access Charge Rules

Toker Doganoglu[*]
(joint w/ Y. Tauman[†]**)**

Abstract

This paper presents a model of two competing local telecommunications networks, similar in spirit to the model of Laffont, Rey and Tirole (1996). The networks have different attributes which we assume are fixed and the consumers have idiosyncratic tastes for these attributes. The networks are mandated to interconnect and the access charges are determined cooperatively in the first stage. In the second stage, the two network companies are engaged in a price competition to attract consumers. In the third stage, each consumer selects a network and determines the consumption of phone calls. Laffont, Rey and Tirole (1996) have shown that except for restrictive scenarios, the local price competition does not result in a pure strategy equilibrium. In this paper, we assume that the two companies choose access charge rules rather than simply access charges. These rules determine the access charges as a function of the future local prices. We show that the family of reciprocal proportional access charge rules generates a pure strategy equilibrium and we discuss its properties.

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On a Generalized Consistency of a Pair of Values for Cooperative TU Games

Irinel Dragan*

Abstract

By using a new concept of potential for LS-values (least-square values), we prove that the ELS-value (extended least-square value) is characterized by g-consistency relative to the ES-value and weighted standardness.

*University of Texas, USA

Bounded Rationality and Induction: The Email Game Revisited

Uwe Dulleck*

Abstract

In Rubinstein's (1989) e-mail game there exists no Nash equilibrium where players use strategies that condition on the e-mail communication. In this paper I apply a notion of imperfect recall to restrict the utilizable information for one player. I show that in contrast to Rubinstein's result, in a payoff dominant Nash equilibrium, players use strategies that condition on the number of messages sent. Therefore induction under the assumption of bounded rational behavior of at least one player leads to a more intuitive equilibrium it the e-mail game.

*Humboldt University, Germany

Strategy Proof Mechanisms in Joint Ventures

Karl Einolf*
(joint w/ J. Dearden*)

Abstract

In the cost sharing problem, the firms encounter the difficulty that each of their profit functions is private information and the potential gains to agreement are uncertain.

In light of the revelation principle, we consider direct mechanisms. In our model, a mechanism specifies a payment by each firm and an output that each firm can produce as a function of reported profit functions. From the direct mechanisms, we can identify equivalent indirect mechanisms that are simple cost sharing rules and ones that involve more complex licensing arrangements.

First, we consider a preference domain that allows only preferences that satisfy the Spence-Mirlees sorting condition. We characterize the entire set of balanced mechanisms that satisfy strategyproofness, individual rationality, and anonymity.

Second, we consider the domain of all risk neutral profit function. We demonstrate that the only class of balanced, strategyproof, and individually rational mechanisms are fixed cost sharing mechanism.

We then consider mechanisms in which firms make reports at two stages and characterize balanced mechanisms that satisfy individual rationality and our modified strategyproofness requirement. This class of mechanisms specifies fixed cost sharing and licensing.

*Lehigh University, USA

Von Neumann-Morgenstern Stability of the Symmetric Pareto-Optimal Allocations in Pure Exchange Economies

Ezra Einy*
(joint w/ B. Shitovitz†)

Abstract

We apply the notion of von Neumann-Morgenstern stable sets to pure exchange economies with a finite number of traders and also to atomless economies with a finite number of types. We show that in a (finite) neo classical pure exchange economy (with a weaker monotonicity condition than the usual one): if the number of traders of each type is the same and every type has a corner on one of the commodities, then the set of all symmetric Pareto-optimal allocations in the economy (i.e., Pareto-optimal allocations which assign indifferent commodity bundles to traders of the same type) is a von Neumann-Morgenstern stable set. A similar result holds in atomless economies with a finite number of types without the convexity assumption on the preference relations. It is also not necessary to assume (in the atomless case) that the members of the types' partition have the same measure.

*Ben-Gurion University of the Negev, Israel
†University of Haifa, Israel

The Division of Labor is Limited by the Extent of the Market: Stigler's Hypothesis Reconsidered

Walter Elberfeld*

Abstract

According to Stigler [4] vertical disintegration should be the typical development in growing industries, vertical integration in declining industries. This paper reexamines the Stigler's hypothesis within a formal game theoretic model. Introducing activity specific fixed cost, we report a surprising result: Provided that a market for the intermediate product exists, the degree of vertical integration is increasing in market size!

*Universität zu Köln, Germany

King Solomon's Dilemma: An Experimental Study of Implementation

Alexander Elbittar*

Abstract

This paper reports an experiment involving two mechanisms that allocate a single unit of an indivisible private good among two players, at no cost to either of them. Both mechanisms, proposed by Moore (1992) and Perry and Reny (1994), are compared in terms of their relative performance to assign the good to the agent with the highest valuation, and without monetary transfer. Even though Moore's mechanism showed a better performance than Perry-Reny's mechanism allocating the object to the rightful player, both of them had poor performances in terms of their predictions. Some hypotheses about different source of variability affecting the relative performance of each mechanism are also tested.

*University of Pittsburgh, USA

Nash Equilibrium and the Evolution of Preferences

Jeffrey Ely*
(joint w/ E. Dekel-Tabak* and O. Yilankaya*)

Abstract

Addressing concerns that equilibrium play may be too much to expect from imperfectly rational decision-makers, the evolutionary approach does away with the hypothesis of optimization. Instead, the decisions of individuals are exogenously determined and arbitrary. Rationality, a test of the consistency of individual choices with individual preferences, is replaced by a test of aggregate decision profiles against Nature's preferences, i.e. fitness. Of particular interest is the extent to which these tests are equivalent, i.e. whether equilibrium is consistent with this a priori weaker model of play. Provided the survival of firms was linked sufficiently strongly to the standard of fitness, play would "evolve" to be *as if* it were the consequence of optimization, i.e., an equilibrium.

In this paper, we explore a variation on the "as if" argument. Our goal is to determine the conditions under which evolution will ensure that play will be as if their preferences were represented by the given payoff functions.

Our approach is in the spirit of "static" concepts of evolutionary stability in that we propose a stability criterion for preferences which is intended to capture mutation and natural selection while avoiding an explicit model of dynamics. An interesting technical issue arises in adapting this approach to evolution of preferences.

*Northwestern University, USA

Bidding for Unit-Price Contracts–How Craftsmen Should Bid

Karsten Fieseler*

Abstract

Bidding for unit-price contracts is a very common procurement auction. It is the predominant way highways, buildings and many other goods and services are bought by a single buyer. With a unit price contract, not the provision of the good but the employment of several kinds of inputs is priced. The seller charges a unit price for the employed quantity of each input. To model heterogeneous technologies of craftsmen, firms continuously differ in their requirement of input-quantities. A linear selection rule is used to rank submitted lists of unit prices. An equilibrium of this model is found. The composition of submitted lists does not mirror the cost structure and the selection probability is not monotone in the type. Sometimes the "lamer" of two craftsmen is selected, enhancing all but the very lame types to bid very aggressively. Caused by this, unit-price bidding can be cheaper (require a lower expected payment) than standard auctions like the first price auction.

*University of Mannheim, Germany

Maxmin for Stationary and Markov Strategies in Stochastic Games

János Flesch*
(joint w/ F. Thuijsman* and O.J. Vrieze*)

Abstract

We examine the use of stationary and Markov strategies in zero-sum stochastic games with finite state and action spaces. It is natural to evaluate a strategy for the maximizing player, player l, by the highest reward that it guarantees to him against any strategy of the opponent. The respective highest rewards that can be guaranteed by stationary strategies or by Markov strategies are called the stationary utility or the Markov utility. Since all stationary strategies are Markov strategies as well, the Markov utility is always larger or equal to the stationary utility. We present several conditions under which the Markov utility is equal to the stationary utility, and a colorful example will illustrate that, generally the Markov utility may be strictly larger for some initial states. However, we will show that each stochastic game has at least one initial state for which the two utilities are equal. Several examples will clarify these issues.

*Maastricht University, The Netherlands

Learning and Implementation on the Internet

Eric Friedman*

Abstract

We address the problem of learning and implementation in the Internet. When agents play repeated games in distributed environments like the Internet, they have very limited a priori information about the other players and the payoff matrix. Consequently, standard solution concepts like Nash equilibria, or even the serially undominated set, do not apply in such a setting. To construct more appropriate solution concepts, we first describe the essential properties that constitute "reasonable" learning behavior in distributed environments. We then study the convergence behavior of such algorithms; these results lead us to propose rather non traditional solutions concepts for this context. Finally, we discuss implementation of social choice functions with these solution concepts, and find that only strictly coalitionally strategyproof social choice functions are implementable.

*Rutgers University, USA

An Evolutionary Game Theoretic Approach to the Theory of International Regimes

Joao E. Gata*

Abstract

By way of an evolutionary game model we show that mediation in international conflicts might be harmful to the conflicting parties. In fact under anarchy both parties can be better off than under an international regime if mediation reduces the parties' reactive capacities, i.e., their abilities to respond to an aggression. This result is applied to issues currently discussed in the literature on international relations such as the role of the United Nations as a mediator of international conflicts.

*University of York, England

Comparison of Information Structures

Olivier Gossner*

Abstract

We define an information structure $\mathcal{I}$ (defined by Aumann [1974]) to be richer than another one $\mathcal{J}$ whenever, for any game G, all correlated equilibrium distributions of G induced by $\mathcal{J}$, are also correlated equilibrium distributions of G induced by $\mathcal{I}$.

Players who get signals from $\mathcal{I}$ can compute "new" (or interpreted) signals that could have been sent by $\mathcal{J}$. An interpretation ϕ from $\mathcal{I}$ to $\mathcal{J}$ describes how players compute these new signals. We call an interpretation ϕ compatible when the probability distribution of the interpreted signals induced by the probability distribution of the signals in $\mathcal{I}$ and by ϕ is equal to the probability distribution of the signals in $\mathcal{J}$. A compatible interpretation is said to be faithful when every player has the same conditional probability over the interpreted signals of the other players, given his original signal (given by $\mathcal{I}$) or given his interpreted one. In other words, ϕ is faithful if no player loses information by computing his interpreted signal and forgetting his original one.

We prove the equivalence between these two relations. Namely, $\mathcal{I}$ is richer than $\mathcal{J}$ if, and only if, there exists a faithful interpretation from $\mathcal{I}$ to $\mathcal{J}$.

*Université de Paris-IX, France

Multi-Sided Assignment Games: Frequency of Nonempty Cores

Chris G. Graham*

Abstract

The Assignment Game of Shapley and Shubik [1972] can be extended to more than two types of players. In such a multi-sided assignment game, the core may be empty. Necessary and sufficient conditions which characterize when cores are nonempty (Graham [1996]) are used to estimate the frequency of nonempty cores in randomly generated assignment games with two players in each of three, four and five types.

*Mount San Antonio Community College, USA

Trade Between Rational Agents as a Result of Asymmetric Information

Yoram Halevy*

Abstract

"No trade" theorems claim that the mere arrival of new information can not induce trade between rational agents, even in the presence of asymmetric information. If markets are complete and preferences satisfy the Sure Thing Principle, the no-trade result does not depend on the assumption of common prior. Under more general preferences we find dynamic consistency to be necessary but not sufficient for information not to induce trade. We investigate the pattern of trade with and without dynamic consistency of preferences and provide sufficient conditions for a no-trade theorem.

*The Hebrew University of Jerusalem. Israel

Finite Horizon Bargaining and the Consistent Field

Sergiu Hart[*]
(joint w/ A. Gomes[†] **and A. Mas-Colell**[‡]**)**

Abstract

This paper explores the relationships between noncooperative bargaining games and the consistent value for non-transferable utility (NTU) cooperative games. A dynamic approach to the consistent value for NTU games is introduced: the consistent vector field. The main contribution of the paper is to show that the consistent field is intimately related to the concept of subgame perfection for finite horizon noncooperative bargaining games, as the horizon goes to infinity and the cost of delay goes to zero. The solutions of the dynamic system associated to the consistent field characterize the subgame perfect equilibrium payoffs of the noncooperative bargaining games. We show that for transferable utility, hyperplane and pure bargaining games, the dynamics of the consistent field converge globally to the unique consistent value. However, in the general NTU case, the dynamics of the consistent field can be complex. An example is constructed where the consistent field has cyclic solutions; moreover, the finite horizon subgame perfect equilibria do not approach the consistent value.

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[†]Harvard University, USA
[‡]Universitat Pompeu Fabra, Spain

Market Crashes with External Shocks

Sergiu Hart[*]
(joint w/ Y. Tauman[†]**)**

Abstract

Abstract not available.

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Values for Partition Function Form Games

David Housman*

Abstract

Partition function form game values satisfying the proportionality, additivity, symmetry, efficiency, and dummy axioms are characterized via a formula involving parameters and as affine combinations of special values called apex values. Further value characterizations obtained using the strong monotonicity, dummy independence, carrier, and strong marginality axioms. Comparisons are made with values defined previously in the literature. Special attention is given to the classes of games upon which each characterization holds.

*Allegheny College, USA

Cross-Licensing of Substituting Technologies: A Patent Portfolio Approach

Jin-Li Hu*
(joint w/ R. Aoki†)

Abstract

We develop a model of patent portfolio competition in substituting technologies with cross-licensing as a possible outcome. Firms cross-license substituting technologies to avoid defensive and aggressive patenting and litigation costs. For substituting technologies, the society always benefits from cross-licensing. At cross-licensing, a payment is transferred from the firm with less patents to the firm with more patents. The judicial administration is able to encourage cross-licensing by raising the probability of a draw at patent lawsuit. Patent litigation stimulates patent portfolio competition and evokes duplicate R&D efforts. R&D behavior and efficiency with different legal institutions are compared.

*Tamkang University, Taiwan
†SUNY at Stony Brook, USA

Learning to Like What You Have
–Explaining the Endowment Effect–

Steffen Huck*

Abstract

The endowment effect describes the fact that people demand much more to give up an object than they are willing to spend to acquire it. The existence of this effect has been documented in numerous experiments. We attempt to explain this effect by showing that evolution favors individuals whose preferences embody an endowment effect. The reason is that an endowment effect improves one's bargaining position in bilateral trades. We show that for a general class of evolutionary processes almost all individuals will have a strictly positive and finite endowment effect.

*Humboldt University, Germany

Ex Ante and Interim Contracts Singed by the Divisions of Chandler's M-Form Firm

Tatsuro Ichiishi*
(joint w/ R. Radner and M.R. Sertel)

Abstract

The problem of cooperative processing of information is addressed within the framework of profit-center game. The first part studies ex ante contracting: Profit centers in a firm in multidivisional form agree in the ex ante stage upon a plan about their joint production and profit imputation. The plan is executed in the subsequent two periods of the interim stage. In the first interim period, each center has its private information, but a part of its information is revealed to the other centers through its action. Based on the information endogenously pooled this way, the centers take another round of actions in the second interim period. A core plan is defined as a Bayesian incentive-compatible plan of the grand coalition of profit centers, upon which no coalition can improve using its Bayesian incentive-compatible plan. A core plan is called full-information revealing if each center fully reveals its private information in the first period. A core plan is interpreted as an ex ante contract. Three existence theorems for a full-information revealing core plan are established.

The second part studies interim contracting and recontracting: The profit centers, each having its private information, first play a game at the first interim stage, which determines a set of alternative contract-offers with the specific structure of type-contingency. Each division i then chooses from the offered interim contracts the one that is best for i. Division i's choice of a contract and its subsequent action reveal to the others (a part of) i's private information. Having obtained the others' (possibly partial) private information, the divisions play another game in order to rewrite their contract. Simple existence results are established for the neoclassical convex case and for the specific structure of supplier-customer relationship.

The third part presents an example, in order to show that a contract, ex ante or interim, is ex post Pareto inefficient.

*The Ohio State University, USA

Consistency and Egalitarianism: The Egalitarian Set

Elena Inarra*
(joint w/ J. Arin*)

Abstract

The paper extends an egalitarian solution for two-person games to n-person cooperative games. This extension provides a new solution concept, the egalitarian set.

The egalitarian set is defined in terms of complaints among the players. The established standard for two person games is observed for every two agents of the n-person game. In the two-person cases the solution provides the most egalitarian allocation belonging to the core in the case of balanced games or to the anticore in the case of non balanced games.

The egalitarian set is characterized by Davis-Maschler reduced game property, converse reduced game property and constrained egalitarianism. Some examples show that the set could be empty for some games. On the class of balanced games this egalitarian set satisfies non emptiness. In fact, we prove that the intersection between the core and the egalitarian set is non empty.

In the class of balanced games the egalitarian set contains the Lorenz set and the lexicographical maxmin solution. The Lorenz set is derived applying the Lorenz criteria in the core. The elements of the Lorenz set are not Lorenz dominated by any other point of the core. This solution satisfies also Davis-Maschler reduced game property. The lexicographical maxmin solution is derived applying Rawls criteria to the core. This solution consists of a unique element and satisfies Davis-Maschler reduced game property.

We present an algorithm to compute the lexicographical maxmin solution for some balanced games. The paper includes some comments about the application of egalitarianism solutions in TU games.

*Ftad. de Económicas, Spain

False Reputation in a Society of Players

Ehud Kalai*
(joint w/ M.O. Jackson*)

Abstract

Exploiting uncertainties in the minds of opponents, players in a long repeated game can maintain false reputations that lead to a large variety of equilibrium outcomes. Even cooperation in a finitely repeated prisoners' dilemma game can be rationally explained.

Can such false reputation be maintained in an entire society where the same repeated game is played recurringly by many different groups and each group observes the play path of earlier groups? We argue that such false reputation must die out over time. To illustrate this, even in environments that allow for rich (uncountable) sets of types of players, we combine ideas of purification with recent results from the rational learning literature.

*Northwestern University, USA

A Note on the Relationship Between Mutual and Common Knowledge

Vladislav Karguine*

Abstract

In this paper I prove that in the case of 2-player games mutual knowledge of each player's conjectures about other player's actions implies the common knowledge of this conjectures under the condition which I call the condition of weak (or broad-minded) beliefs.

This condition requires that player A never put zero probability on a type of player B (which we always assume to be relevant: that is at least one type of player A puts nonzero probability on it), if she puts nonzero probability on the same type of the player B that plays the same action.

This requirement is quite restrictive: it forbids, for example, that there are two types of a player A, both puts nonzero probability on some action, but one of them assumes that all player who play this action are rational, at the same time that the other one admits the possibility that some type of player B plays this action irrationally, not maximizing his welfare.

In this paper I also give some interpretations of this condition and justification why this condition can be regarded as sensible.

*Boston University, USA

Strategy-Proof Division of a Private Good when Preferences are Single-Dipped

Bettina Klaus*
(joint w/ H. Peters* and T. Storcken*)

Abstract

Pareto-optimal and strategy-proof distributions of a perfectly divisible good among agents with single-dipped preferences are studied. In order to satisfy these two properties and, in addition, either a so called replacement property or a property of consistency, the whole amount should be assigned to one of the agents. Characterizations of the two classes of division rules satisfying the above conditions are provided.

*Maastricht University, The Netherlands

Stochastic Strategy Adjustment in Coordination Games

Michael Kosfeld*

Abstract

I discuss a different approach to the equilibrium selection problem than the ones that are commonly used in the evolutionary game theoretic literature. Instead of considering rational best response behavior with small components of noise I assume that agents stochastically adjust their strategies to changes in their local environment. They depart form current play with some probability that is proportional to the relative success, in terms of expected payoffs, of the strategy that is not currently played. Using results from the theory of interacting particle systems this assumption leads to a continuous time Markov process on the state space of all configurations, the so-called adjustment process. In contrast to other models, this process is no longer ergodic. Results are obtained as the characterization of the set of invariant distributions and the formulation of conditions such that coordination on the risk dominant equilibrium can be observed.

*Institute for Advanced Studies, Austria

Cores of Cooperative Games, Superdifferentials of Functions and the Minkowski Difference of Sets

Gleb A. Koshevoy*
(joint w/ V.I. Danilov†)

Abstract

The core of an n-person cooperative game is the set of all feasible payments that cannot be improved upon by any coalition of players. It is well known (Bondareva, Shapley) that the core is nonempty iff a game is balanced. In this paper it is shown that the core of a game is the Minkowski difference of two sets. These sets, in turn, are cores of two totally monotone games. The core of a totally monotone game has a simple structure, it equals the Minkowski sum of some simplexes. The game is equal to the difference of these games. Our main result is a consequence of two claims. First, we show that the core of a game equals the superdifferential of some its continuation, known as the Choquet integral. Second, we establish a kind of reversion of the Moreau-Rockafellar rule: the superdifferential of the difference of two concave functions equals the Minkowski difference of the corresponding superdifferentials.

In the frame of this approach, we also obtain a new characterization of convex games and a new insight to establish the balancedness as the criterion of nonemptyness of the core.

*Universität zu Köln, Germany
†Central Economics and Mathematics Institute, Russia

Public Networks: Bilateral Division Problems

Maurice Koster*
(joint w/ P. Borm* and S. Tijs*)

Abstract

This paper centers on sharing the cost and benefits of maintaining or creating a certain network structure for a certain group of agents. Costly communication links can be formed between any pair of players. Actual communication is only settled between players if at least the total costs of necessary links have been compensated for. Each pair of players is granted certain benefits when communication is actually realized. It is assumed that these costs and benefits are commonly known.

The players decide for themselves whether they want to enter an engagement with other players. Also, they may cooperate and possibly save communication costs by doing so. Players might gain in case of full cooperation, by constructing a network of minimal cost. It will be shown that those players that agree to cooperate will construct a *minimal cost spanning tree*.

We take the approach from cooperative game theory and focus on the *net benefit game* which relates any coalition of agents to the net benefit related to its optimal structure.

*Tilburg University, The Netherlands

Chores

Chantale LaCasse[*]
(joint w/ V. Barham[†] **and C. Ponsati**[‡]**)**

Abstract

Consider a situation where the provision of a public good must be assumed by one of N private agents. Suppose that, at a given point in time, each agent would rather bear the cost of providing the good rather than doing completely without it. Assume further that each agent would rather for the public good to be provided by someone else. Under these assumptions, the situation in which agents wait for someone to volunteer for the provision of this good has been modeled as a war of attrition. In Bliss and Nalebuff (1984), it is an equilibrium of the incomplete information game for the person with the lowest cost of provision to supply the public good. All agents wait for the good to be provided an amount of time which is just sufficient for the identity of the agent with the lowest cost of provision to be revealed. In Bilodcau and Slivinski (l996), the unique equilibrium of the finite, continuous time game is for the agent with the highest benefit/cost ratio of provision to volunteer immediately. In both cases, it is an equilibrium for the agent who, from a social point of view, should provide the good indeed to do so. Further, the equilibrium outcome either features no delay or a delay which is just sufficient for the assignment of the good.

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[†]University of Ottawa, USA
[‡]Universitat Autònoma de Barcelona, Spain

Some Properties of Solutions for Two-Dimensional Choice Problems Reconsidered

Somdeb Lahiri*

Abstract

In this paper, we take up the outstanding problem of axiomatically characterizing what we have referred to as the additive choice function on the classical domain for choice problems. Apart from an impossibility result for the additive choice function, there is an axiomatic characterization, which as a by-product provides a counter example to a conjecture for the egalitarian choice function. We provide an axiomatic characterization of the egalitarian choice function using a superadditivity axiom. Further we show several nonrationalizability properties of utilitarian consistent solutions.

We also provide axiomatic characterizations of the family of nonsymmetric Nash choice functions and the family of weighted hierarchies of choice functions. Our conclusion is that earlier axiomatizations are essentially preserved on the classical domain for choice problems. Our proofs are significant in being non-trivial and very dissimilar to existing proofs on other domains.

*Indian Institute of Management, India

The EU Decision-Making Procedures: Some Insight from Non Cooperative Game Theory

Annick Laruelle*

Abstract

The European Union decision-making process involves three main actors: the Commission, the Council of Ministers and the Parliament. Depending on the issue which is voted upon, there are three possible procedures to make decision. These include: the proposal procedure, the cooperation procedure and the co-decision procedure. It has often been claimed that the role of the Parliament has increased in the cooperation procedure and in the co-decision procedure. The aim of this paper is to verify this assertion. The procedures are modeled as games in extensive form. The following simplifying assumptions are made. The propositions amendments, final decisions and players' preferences are measured in a one dimensional metric space. The players' payoffs are measured through distances. The cost of time is not taken into account. The information is perfect. The games are solved by backward induction. The results show that the introduction of the cooperation procedure has not increased the Parliament's role. In the co-decision procedure, the Parliament's preference only indirectly influences the final decision via the Conciliation Committee, which has a veto right.

*Université Catholique de Louvain, Belgium

Axiomatization of the Core in Economies with Asymmetric Information

Darin Lee*
(joint w/ O. Volij*)

Abstract

In this paper, we provide a generalized version of the core which is included in the coarse core as defined by Wilson (1978). The definition which we propose can be applied to the family of all economies in which state-contingent contracts can be made (that is, the exact same framework which Wilson (1978) considers). We suggest that agents in a blocking coalition can be subdivided into those which are "active" and those which are "passive". Active agents are those who suggest alternative allocations, and hence, must abide by Wilson's common knowledge criterion. Passive agents are those who merely accept offers which leave them better off in every state. We show that Wilson's coarse core is simply the special case in which all agents in a blocking coalition are "active". Furthermore, we show that this definition of the core can be fully characterized by the axioms of consistency, converse consistency and one-person rationality using a suitably defined reduced economy. We employ a type of reduced economy similar to one used by Serrano & Volij (1996) which is in turn inspired by the work of Davis & Maschler (1965), Peleg (1985) and Peleg (1986). Our work differs from that of Yannelis (1991), Koutsougeras & Yannelis (1993), Allen (1993), Allen (1992), Allen (199la), Allen (199lb) in that we consider interim economies.

*Brown University, USA

Where Bertrand meets Walras: An Equivalence Result

Chun-wah Liu*

Abstract

This paper extends the Bertrand game with capacity constraint to a general equilibrium input-output setting. In contrast to the previous literature, in this generalized Bertrand game small capacity is no longer important for the existence of pure-strategy equilibrium in the case of efficient rationing. Profits earned by firms feedback to consumers as income. Hence the larger the capacity, the higher the aggregate income and the larger the aggregate demand. Given any capacity, it is always small relative to the aggregate demand. Thus the size of capacity is nonrestrictive. Instead, the following condition is sufficient for the existence of equilibrium: as firms raise prices, the drop in consumption demand must be large. Furthermore, in the context of input-output model, a strictly positive productive endowment is necessary and, together with a nonrestrictive condition on consumer utility, jointly sufficient for the uniqueness of equilibrium. Given these conditions, I prove the equivalence result between the general Bertrand (or Nash) equilibrium and the Walrasian equilibrium.

*Chinese University of Hong Kong, Hong Kong

Private Provision of Social Insurance

Brian Lonergan*

Abstract

Government intervention provides insurance against some of the most significant risks that people face. Redistributive taxes and transfers insure us against poverty and publicly subsidized health insurance insures us against injury and disease. Social Security provides insurance against longevity. As with any government-provided service, social insurance may not be produced efficiently, and may not respond well to demand. If consumers were allowed to choose between public and privately provided insurance, insurance might be produced and allocated more efficiently. Without regulation, private insurers might only insure low-risk people, so total risk-pooling would decrease. This paper introduces a mechanism that induces private agents to act as regulators, rewarding private insurers who treat consumers at a lower cost than the government. The regulators monitor the private insurers, but they do not need to place restrictions on premiums or the level of risk coverage. Regulation is accomplished through a non- intrusive set of prices. The mechanism is derived, and is then applied to various models of the economy to study its performance.

*Yale University, USA

The Bargaining Simplex for Multi-Sided Assignment Games

William F. Lucas*
(joint w/ H.A. Hamza*)

Abstract

In l972 L. S. Shapley and M. Shubik introduced the cooperative (coalitional) games known as the assignment games (bipolar markets). These have since been extended to games with more than two types of players. Methods for determining the fair allocations and bargaining ranges for the two-sided and multi-sided games are presented.

*The Claremont Graduate School, USA

Optimal Patent Length and Height in a Sequential Model of Innovation

Israel Luski*
(joint w/ D. Wettstein*)

Abstract

We consider an environment in which a sequence of investments in R&D reduces the cost of production, or alternately improves the quality of the product. The government sets a two-dimensional patent policy which consists of time and height. The time dimension indicates the length of time over which the innovator is awarded monopoly rights. The height dimension indicates the novelty requirement needed to overcome the prevailing patent protection and be awarded new patent protection. The purpose of the paper is to characterize the optimal patent policy by defining the time and height choices that maximize social welfare. The R&D process is sequential; the sequence of innovations can be carried out by one, two or more firms. Each firm solves its profit maximization problem by deciding upon the time and size of the innovation. The government and the firms are viewed as players in a multi-stage game. By employing the sub-game-perfect equilibrium concept we analyze the outcomes and determine an optimal patent policy.

*Ben-Gurion University of the Negev, Israel

English Auctions and Walrasian Equilibria with Multiple Objects: a Dynamic Approach

Jinpeng Ma*

Abstract

This paper studies the English (progressive) auction for an exchange economy with multiple objects. The English auction is a tatonnement process and lasts multiple rounds. It is modeled as a sequence of round games. Each round game is a normal form game in which an agent's strategies are his bids and his payoff is his trading profits of his winning bundle at that round. Among these normal form games, all intermediary round games are in fact the "virtual" games because the payoffs to agents are not finalized unless the auction closes. We show that any ascending price sequence obtained from the English auction converges to a Walrasian equilibrium (if any) within finite rounds when agents submit their bids that consist of a Nash equilibrium in each round game.

We also provide a sufficient condition for the English auction to converge to a Walrasian equilibrium in finite rounds. But this condition is weaker than the Nash equilibrium. This shows that the Nash equilibrium is not necessary (though sufficient) for the English auction to converge to a Walrasian equilibrium.

*Rutgers University, USA

Electoral Evolution

Michael Maschler*
(joint w/ S. Barberà† and J. Shalev‡)

Abstract

Human societies evolve, grow and shrink, as the result of exit and entry. We are interested in the evolution of those societies where entry is regulated by the use of formal voting procedures: new members are only admitted if they receive enough support from inside, according to well specified rules.

Election rules are social constructs: they may come from an agreement among different founders, they may reflect the will of a unique founder or they may be the result of successive amendments, but they must be set purposefully. Once the rules for election to a society are set, participants in the election are bound to engage in strategic considerations that involve non-myopic behavior. In particular, voters cannot overlook the fact that newly elected members will become voters in later elections: this may lead to postponing the election of individually attractive candidates who might vote in unattractive ways, or to accelerate the election of a poor candidate whose vote is needed. We are interested in the evolution of groups which results from letting considerations of this type made by rational agents under well specified voting rules. The features we have emphasized should make it clear that electoral evolution is the result of nonmyopic behavior which is quite exclusive to human societies.

Since this is the first study of the above issues, as far as we are aware of, we allow ourselves many, quite restrictive, simplifying assumptions in the model that we develop. We analyze Nash equilibria, and their refinements: subgame perfect, almost strong and trembling hand perfect equilibria.

Other models should certainly follow. Nevertheless, even in our simplified model, we find the analysis of the various equilibria to be quite rich in itself, and certainly a first good step towards the study of other models. It does capture some interesting dynamic features.

*University of British Columbia, Canada
†Universitat Autònoma de Barcelona, Spain
‡Université Catholique de Louvain, Belgium

Our ultimate goal (for which only first step is taken here) is an ambitious one: to study the evolution of societies who resort to voting as a means to include or to exclude members from both the normative and the positive viewpoint. Just to mention a topic on the descriptive side, we would like to explain why some societies maintain their defining features along their history, while others change so much that their own founders would not recognize them.

Inductive Game Theory: Discrimination and Prejudices I

Akihiko Matsui*
(joint w/ M. Kaneko*)

Abstract

This paper proposes a new theory, which we call inductive game theory. In this theory, the individual player does not have a priori knowledge of the structure of the game which he plays repeatedly. Instead, he accumulates experiences induced by occasional random trials in the repeated play. A stationary state is required to be stable against intentional deviations based on his experiences, and then it turns out to be a Nash equilibrium. The main part of the paper is the consideration of possible individual views on the society based on individual experiences. This view is defined to be a model of the society which the player builds from his experiences. Two coherency conditions with active and passive experiences are required for a model. As concrete objects of the theory, this paper targets the phenomena of discrimination and prejudice. The development of the new theory is undertaken by contrasting observational, behavioral aspects with mental and judgemental aspects of the new theory. The relationship between discrimination and prejudice will emerge in this dichotomous consideration.

*Tsukuba University, Japan

Externalities and Free Trade Agreements

Ana Mauleon*
(joint w/ F. Grafe*)

Abstract

This paper analyzes a general equilibrium model in which there exist two types of countries, differing only in their endowments of capital. In this model, the production of the consumption good in a country affects negatively the welfare of that country. We define the equilibrium in a free trade space formed by both types of countries and we study the existence of a stable system of free trade spaces (a partition of the world economy into free trade spaces, being all of them in equilibrium). we find that (i) since trade equalizes factor prices, countries with higher capital endowments gain from trade (in welfare terms), while countries with lower capital endowments can lose from trade; (ii) there always exists a unique stable system of free trade spaces for the world economy; and (iii) the intervention of a supranational authority by means of a tax policy based on the polluter-pays principle can reach the stability of a system of free trade spaces in which both types of countries cooperate, increasing then the world welfare level, comparing with the situation in which countries of different type do not cooperate.

*Universidad del Pais Vasco, Spain

Outside Options, Maxmin Payoffs and Undominated Equilibria in Repeated Games

Richard P. McLean*
(joint w/ A. Chaudhuri†)

Abstract

In this paper we present a dynamic game, similar to a repeated game but different from the standard supergame by virtue of the presence of an absorbing state which can be induced by a unilateral implementation of the outside option. The associated Folk Theorems suggest that in any subgame perfect equilibrium outcome, the individuals must receive at least their outside option payoff. In some cases, outside option payoffs are smaller than the maxmin payoffs and strategies that employ the outside option are weakly dominated. Hence, we develop Folk Theorems for undominated subgame equilibrium payoffs. Undominatedness is not usually studied in repeated games but turns out to have important implications in this dynamic game with an absorbing state. This analysis also highlights the role played by maxmin payoffs.

*Rutgers University, USA
†University of Pennsylvania, USA

Random-Player Games

Igal Milchtaich*

Abstract

This paper introduces games of incomplete information in which the number, as well as the identity, of the participating players is determined by chance. The participation of certain players may not be independent of the participation of others, and hence the very fact that a particular player was chosen to play may give that player a clue as to the number and the identity of the other players chosen. However, players have to choose their strategies before the identity of the other players is fully revealed to them and thus, effectively, before they know whether or not they will take part in the game. Pure-strategy, mix-strategy, and correlated equilibria of random-player games are defined. These definitions extend the corresponding definitions for finite games, Bayesian games with consistent beliefs, and Poisson games all of which can be seen as special cases of random-player games. Sufficient conditions for the existence of pure and mixed strategy equilibria are given.

*Northwestern University, USA

Distributed (Parallel) Games

Dov Monderer*
(joint w/ M. Tennenholtz)

Abstract

The Internet introduces new challenges in artificial intelligence, economics and game theory. It exhibits both parallel and sequential interactions. While sequential interactions have been extensively discussed in the literature, the study of parallel interactions has been neglected so far.

New models of economies and games are needed in order to effectively deal with parallel interactions. In this paper we present one such new model - distributed games. In such a model each player controls a number of agents which participate in asynchronous parallel multi-agent interactions (games). The agents jointly and strategically control the level of information monitoring by broadcasting messages. As an application, we show that the cooperative outcome of the Prisoner's Dilemma game can be obtained in equilibrium in such a setting.

*Technion, Israel

Sophisticated Play with Payoff Heterogeneity

David Myatt*
(joint w/ C. Wallace*)

Abstract

The payoffs of a symmetric 2×2 strategic form game are disturbed by agent-specific heterogeneity, yielding a static Bayesian game. Agent employ iterative reasoning to select a Bayesian Nash equilibrium, using recent play history to initialize reasoning. The history (or context) of the game evolves, and equilibria are selected for vanishing payoff heterogeneity. When payoff variances are balanced, the risk dominant equilibrium is selected. Unbalanced variances may result in the selection of other equilibria, including the payoff dominant. When players observe potentially different samples from history, the risk dominant equilibrium is selected even for strongly unbalanced variances. The paper thus provides an effective model of the evolution of context for the rational play of coordination games.

*University of Oxford, UK

Effort and Performance in Group Contests

Kofi O. Nti*

Abstract

This paper investigates how population size and prize valuations influence the effort and payoff of individuals in group contests. A generalized fundamental lemma of group contests is established to facilitate the comparative statics analysis. Individual efforts increase with a group's own valuation but decreases with population size. Increasing the valuation of the stronger (weaker) group reduces (increases) the effort supplied by the weaker (stronger) group. Individuals benefit when population size increases but increasing the valuation of one group benefits its members and hurts the opposing group. These results offer an insight into why group endowments matter in various competitive arenas.

*The Pennsylvania State University, USA

Non Zerosum Repeated Games with Finite Automata

Daijiro Okada[*]
(joint w/ A. Neyman[†]**)**

Abstract

This paper studies two-person repeated games in which a player with a restricted set of strategies plays against an unrestricted opponent. An exogenously given bound on the complexity of strategies, which is measured by the size of the smallest automata that implement them, gives rise to a restriction on strategies available to a player.

We examine the asymptotic behavior of the set of equilibrium payoffs as the bound on the strategic complexity of the restricted player tends to infinity, but sufficiently slowly. Results from the study of zerosum case provide the individually rational payoff levels.

[*]SUNY at Stony Brook, USA
[†]SUNY at Stony Brook, USA and The Hebrew University of Jerusalem, Israel

Cost Reducing Strategies

Pau Olivella*

Abstract

The main question that this paper addresses is the following. If a firm F1 has a very efficient supplier S of an intermediate good to production, could it ever be in the interest of F1 to share S with another firm F2 with whom F1 competes in the same market?

First of all, it may be the case that F1 has no power to forbid firm S to supplying F2. Second, F1 may be able to require S to asking F2 for a higher price than the price that F1 itself pays. In this case, not only F1's competitiveness costs may not be too important, but F1 may even capture part of the (social) gains derived from extending the use of a cheaper intermediate good. This is the case if the price paid by F1 to S is smaller, and the price paid by F2 larger, than the true unit costs of S. Finally, perhaps the development and production of a new intermediate good implies very large fixed costs (like R&D costs). Then F1 can share this fixed cost with F2 by sharing S with F2. This is true even if F1 and F2 pay the same price for the intermediate good.

The purpose of our analysis is to show the existence of a (as far as we know, unexplored) fourth explanation. Namely, if S's costs are its private information, F1 can reduce the (informational) rents that F1 has to pay to S so as to induce S to reveal its true costs.

We prove that, even if one eliminates fixed R&D costs and price discrimination, it may still be beneficial for F1 to share its supplier.

*Universitat Autònoma de Barcelona, Spain

On Some Aspects of Noncommutativity in Games

Vesna Pasetta*

Abstract

In this paper a few comments are made on the properties of noncommutativity in games. Generalizations of symmetric concepts in games are proposed where traditional commutative conditions, in describing conflict relations among players, are modified by an extension of a game allowing noncommutativity properties. Methods of economic analysis are discussed for variety of noncommutativities, and their economic interpretations are offered. The focus is on suggested synthesized noncommutativity and an approach in modeling conflict situations, that seem to offer a better insight into flows of economic wealth among agents and can effectively be used for capturing the phenomena within a nonstandard economic environment. The results of noncommutative analysis are applied in several concrete examples in the games within institutional economics and economics of property rights.

*Cornell University, USA

On "Gauge" Excess Function for NTU-Games: Axiomatic Approach

Sergei Pechersky*

Abstract

The scheme based on the idea underlying the definition of von Neumann-Morgenstern utility function is used to axiomatize the "gauge" excess function for NTU-games.

*St. Petersburg Institute for Economics and Mathematics, Russia

Implementation of the Core of a Marriage Problem

Bezalel Peleg*
(joint w/ S.-C. Suh)

Abstract

We consider the prosaic system of matching which is specified by the following two common rules: (i) Each woman (man) proposes to at most one man (woman), (ii) A man and a woman marry each other if they propose to each other. We prove that this system implements the correspondence of stable matchings by strong Nash equilibria. We also find a simple extensive game form which implements the same correspondence by subgame perfect equilibria.

*The Hebrew University of Jerusalem, Israel

Dynamic Cooperative Games

Leon A. Petrosjan*

Abstract

The optimality principles (OP) from classical simultaneous cooperative theory are considered. Suppose $\bar{x}(t)$ is an optimal trajectory maximizing the sum of players payoffs, and $\Gamma(\bar{x}(t), T-t)$ subgames with initial conditions on this trajectory. The most of known (OP) from classical cooperative theory are time inconsistent. Different regularization procedures (differential and integral) are introduced to construct new regularized optimality principles (ROP) based on imputation distribution procedures (JDP) on the time interval $[t_0, T]$ where the original dynamic game develops. The same approach can be used for general games in extensive form, repeated and stochastic games.

*St. Petersburg State University, Russia

Games of Status and One-to-One Ordinal Preference Games

Tom Quint*
(joint w/ M. Shubik†)

Abstract

In this paper we introduce status games. These are n-player ordinal preference cooperative games in which the outcomes are orderings of the players. We define two types of status game. In "Model 1", we assume there is a set of "winning coalitions", much like in the theory of simple games. Each winning coalition S has the power to institute any element of an exogenously given set Π_S of orderings over all n players. "Model 2" is similar, except the elements of Π_S only place S's own members into positions in the hierarchy.

For Model 2 status games, we define a condition of "balance" on the set $\{\Pi_S\}_{S\subset N}$. If Π^* is balanced, the core of the associated status game is nonempty. Conversely, if Π^* is not balanced, and the game is "exchangeable", we can find an instance where the strict core is empty.

Finally, we define a more general class of one-to-one ordinal preference (OOP) games which include both types of status game as well as the class of restricted house-swapping games with ordinal preferences (RHGOPs) (Quint 1997). we again define a condition of "balancedness" for these games, which (a) guarantees core existence, (b) reduces to the above condition for status games, and (c) reduces to "weak balancedness" (Quint 1997) in the case of RHGOPs.

*University of Nevada, USA
†Yale University, USA

Do Backward and Forward Induction Contradict Each Other?

Roald Ramer*

Abstract

The main problem discussed in this paper is the relation between backward and forward induction arguments. The point, which will be stressed over and over again, is, that in general formal mathematical definitions do not by themselves provide for universal valid solution concepts. In order to make sensible use of any such technical refinement, some information about specific circumstances, which customarily is not included in the mathematical specification of the game, will be usually needed. Use of such information as a selection device have been discussed informally by Myerson (1991) under the name of an environment. We shall try to convince the reader that such information is also necessary in order to justify various refinements concepts. By that we mean that whenever a game theoretician proposes some solution concept he needs to know that the players among themselves have sufficient knowledge about each other, not included in the mathematical description of the game, and are aware of its significance for the purpose at hand. This point has been elucidated in the so called epistemic literature but it has not been often mentioned in the literature on refinements which rely exclusively on the (reduced) strategic form. We aim at statements like: we can not be sure that a subgame perfect equilibrium of the game will be played unless we are certain that next to usual conditions the players know that it is not possible for either of them to make an undisclosed move before the game gets started.

*University of Amsterdam, The Netherlands

On Weighted Majority Games

G. Ravindran[†]
(joint w/ K.G. Ramamurthy)

Abstract

In this paper we consider an algorithm for generation of minimal winning and blocking coalitions of weighted majority games. We consider a finite set of players $N = \{1, 2, \cdots, n\}$ indexed such that $w_1 \geq w_2 \geq \cdots \geq w_n$. Using this we impose a total order on the subsets of players. We call this lex ordering as it is closely related to lexicographic ordering of vectors. We give a binary free search procedure to generate lex ordered Minimal Winning coalitions and Blocking coalitions. As an application of the results obtained, we take up the problem of checking whether a simple game is a weighted majority game or not.

[†]Indian Statistical Institute, India

On Repeated Games with Incomplete Information and Signals

Jerome Renault*

Abstract

This work is about undiscounted two-players repeated games with lack of information on one side.

If the observation is perfect (the players observe after each stage the previous moves), the question of the existence of some equilibrium, raised by Aumann, Maschler and Stearns in 1968, has been positively answered by Simon, Spiez and Torunezyk in 1995. This result is extended here to the case of imperfect monitoring where the players observe after each stage some private random signal, depending on the moves chosen but not on the selected state of nature.

*Université de Paris-I, France

Redistributional Concessions Versus Keeping the Status-Quo

Arno Riedl[*]
(joint w/ J. Zweimueller[†]**)**

Abstract

We study a model where redistributional pressure is an integral part of the political process which determines economic efficiency as well as the actual distribution of income. The political process is modeled as a non-cooperative bargaining game where workers and entrepreneurs bargain over a tax-transfer system. Workers may be able to credibly threat with insurrectional actions and capital-owners may invest into "defensive" rather than productive activities in order to prevent that Political power may have a significant impact on economic outcomes. In particular, economic efficiency often goes hand with a most equal distribution of income. These results are in line with the recent empirical literature finding a negative correlation between inequality and investment in cross-country regressions (see e.g. Alesina et al. (1992)).

[*]Institute for Advanced Studies, Austria
[†]University of Zurich, Switzerland

The Cav u Theorem through Dual Games

Dinah Rosenberg*
(joint w/ B. de Meyer)

Abstract

This paper provides an alternative proof of the existence of the limit of the values of n-time repeated games with lack of information on one side. The existence of this value and its equality to the concavification of the value of the game where no player has any information have been proved by Aumann and Maschler 1967. Up to now there are two approaches to this theorem. One studies the best replies of the uninformed player to any strategy of the informed player. The convergence of the martingale of the a posteriori probabilities gives the result. The second one studies the optimal strategies of the uninformed player using the characterization of the approachable sets in a game with vector payoffs, due to Blackwell 1956. This paper provides a third approach, using the dual game introduced by de Meyer 1996. The value of the dual game is always the Fenchel conjugate of the value of the original game. We consider the values of the dual games and prove their convergence to the Fenchel conjugate of the value of the game where no player has any information. This leads to the result. It gives an interpretation of the concavification as the result of two Fenchel conjugations. The proof can be extended to a big match with lack of information on one side, and provides an alternative proof of Sorin's theorem 1985.

*Université de Paris-X, France

Trust and Social Efficiencies

Robert Rosenthal*

Abstract

In a variant of the repeated prisoner's dilemma, if extra costs are associated with the verification built into strategies that could otherwise produce Pareto efficient equilibria, the attainment of efficient play becomes problematic. Evolutionary game version of this dilemma are studied here in an attempt to understand the difficulties societies face in maintaining efficient interactions mediated by trust.

*Boston University, USA

Quantity Selection of a Single Public Good

Tim Russo*

Abstract

We examine the case of a single pure public good. The good is continuous in quantity and all agents receive non-decreasing utility from increasing quantities of the good. Due to the imposition of a cost function, a social planner trying to maximize social welfare cannot simultaneously satisfy all reasonable axioms. An examination of the consequences of relaxing each axiom follows.

*SUNY at Stony Brook, USA

What Priors and Common Priors Are

Dov Samet*

Abstract

Abstract not available.

*Tel Aviv University, Israel

Evolution, Population Growth, and History Dependence

William H. Sandholm*
(joint w/ A. Pauzner†)

Abstract

We extend the model of Kandori, Mailath, and Rob (1993) (henceforth KMR) by introducing stochastic population growth. We provide a complete characterization of the effects of population growth on the evolutionary process. Under slow enough rates of population growth, the equilibrium selection results of KMR are strengthened: the limiting distribution of the evolutionary process puts all weight on the risk dominant equilibrium, even when the rate of mutation is positive. For a small intermediate range of growth rates, this equilibrium selection result is strengthened further: with probability one, the population settles upon the risk dominant equilibrium, playing it exclusively from a certain time forward. In contrast, under faster rates of population growth, the evolutionary process fails to select the risk dominant equilibrium. The population eventually settles upon an equilibrium, and each pure strategy equilibrium is this limit with positive probability. More importantly, as the rate of mutation approaches zero, the probability that the population coordinates in all periods on the equilibrium in whose basin of attraction play began approaches one. We also consider a model of evolution with declining mutation rates.

Finally, we adapt our limiting analysis to study evolution in bounded populations over finite time horizons, and prove a stringent necessary condition for KMR's fixed population equilibrium selection results to be applicable over finite periods of time: unless the time span of interest is more than exponentially greater than the size of population, history dependence should be expected.

*Northwestern University, USA
†Tel Aviv University, Israel

Exchange Agreements Between Competitors with Different Efficiency Levels

Christoph Schenk*

Abstract

Exchange agreements between competitors are a trade-off between efficiency effect due to lower production cost and collusive effect due to a division of market and cost heterogeneity. In order to determine welfare and anti-trust implication the situations with and without exchange agreements will be compared.

The literature on exchange agreements by Holt and Scheffmann (1988) and on subcontracting by Kamien, Li and Samet (1989) and by Spiegel (1993) is related

In a three stage game two firms are able to produce two differentiated products. Each Firm has a cost advantage with one of the products. First they decide which Market to enter. Then, if there is an exchange agreement, they determine the exchanged quantity given an exchange ratio. Finally they compete in quantities.

Firms basically do not always prefer low cost structures. But firms will always prefer exchange to no exchange while consumers are indifferent. The result depends on the fact that firms completely take into account the strategic effect of having to compete against exchange quantities. Generally exchanges are welfare enhancing but do not reach the welfare level achieved by firms with low-cost structures.

*WZB, Germany

The Bargaining Set of an Oligopoly in Markets with a Continuum of Traders

Benyamin Shitovitz*

Abstract

Mixed markets with $r \geq 2$ identical atoms and an uniform ocean of small traders are considered. We show that the Pareto frontier of the symmetric part of the bargaining set that is outside the core consists of the union of $(r-1)$ open nondegenerate intervals. Their end points are strongly related to utility levels of Walrasian outcomes of submarkets obtained by deleting subsets of atoms. In particular, no coincidence of the bargaining set with the core holds, in contrast to atomless markets ($r = 0$), and to monopolistic markets ($r = 1$).

*Haifa University, Israel

A One-Stage Model of Link Formation and Payoff Division

Marco Slikker[*]
(joint w/ A. van den Nouweland[†]**)**

Abstract

In this paper we introduce a strategic form model in which cooperation structures and divisions of the payoffs are determined simultaneously. We analyze the cooperation structures and payoff divisions that result according to several equilibrium concepts. We find that essentially no cycles will result and that a player need not profit from a central position in a cooperation structure.

[*]Tilburg University, The Netherlands
[†]University of Oregon, USA

Rethinking Bargaining Theory

Lones Smith*

Abstract

This paper aims for a new approach to bargaining theory, different from Rubinstein-Stahl bargaining model, with a reprise of the 1960's agenda of bargaining as a timing game. It provides a simple continuous time stationary perfect information bargaining game with offers and counteroffers, and endogenous timing of offers. A simple class of stationary Markovian equilibria are considered with a cost for tendering an offer. I show that delay occurs, as players lock horns in a war of attrition "waiting game" to see who will make the next concession. Two nonstandard but essential characteristics here are that all offers are turned down with positive probability, and that continuation (or "aspiration") values are a Markov martingale stochastic process. This framework provides a meaningful role both for dialogue and the lack of it.

The goal of this paper is not the standard deduction that delay occurs or can occur in bargaining, but rather a serious simultaneous consideration analysis of the timing and content of offers. I conjecture that the choice of what and when to offer are related, with longer bargaining sessions being associated with more disparate ultimate settlements.

*MIT, USA

3-Person Repeated Games with Absorbing States

Eilon Solan*

Abstract

Every 3-person repeated game with absorbing states has an equilibrium payoff.

*The Hebrew University of Jerusalem, Israel

Merging, Reputation and Repeated Games of Incomplete Information

Sylvain Sorin*

Abstract

We relate and unify several results that appeared in apparently different fields: merging of probabilities, perturbed games and reputation phenomena, and repeated games with incomplete information.

*Ecole Polytechnique, France

A Nucleolus for Stochastic Cooperative Games

Jeroen Suijs*

Abstract

This paper extends the definition of the nucleolus to stochastic cooperative games, that is, to cooperative games with random payoffs to the coalitions. It is shown that the nucleolus is nonempty and that it belongs to the core whenever the core is nonempty. Furthermore, it is shown for a particular class of stochastic cooperative games that the nucleolus can be determined by calculating the traditional nucleolus introduced by Schmeidler (1969) of a specific deterministic cooperative game.

*Tilburg University, The Netherlands

An Algorithm for Solving Zero-Sum Two Person Stochastic Games of Perfect Information

Zamir Syed[†]
(joint w/ T.E.S. Raghavan[*]**)**

Abstract

A policy improvement type algorithm is given that solves both discounted and limiting average zero-sum stochastic games with perfect information in an efficient way.

[†]University of Illinois, USA

Almost Stationary ε-Equilibria in Zero-Sum Stochastic Games

Frank Thuijsmen*
(joint w/ J. Flesch* and O.J. Vrieze*)

Abstract

We show the existence of almost stationary ε-equilibria, for all $\varepsilon > 0$, in zero-sum stochastic games with finite state and action spaces. These are ε-equilibria with the property that if neither player deviates then stationary strategies are played forever with probability almost 1. The proof is based on a construction of specific stationary strategy pairs, with corresponding rewards equal to the value, which can be supplemented with history dependent δ-optimal strategies, with small $\delta > 0$, in order to obtain almost stationary ε-equilibria.

*Maastricht University, The Netherlands

Evolution with a Varying Stage Game: An Economic Mutational Model

Xander Tieman[*]
(joint w/ E. Droste[†]**)**

Abstract

We consider a mutational evolutionary model in discrete time with both deterministic and stochastic mutations by specifying a difference equation describing the change in population state from time t to $t+1$. The stochastic mutation process is implemented as a drawing from a normal distribution at each time.

The stage game in the model is a 2×2 symmetric coordination game, in which the payoff of both players playing action 1 is higher than that of them both playing action 2. We introduce a specific economic feature in the model, namely business cycles, by modeling the stage game as a two state system, representing a boom or a recession.

The essential new feature of this model is that there is convergence towards a steady state near the full efficient equilibrium in which all players play action 1 at a much faster rate than the standard mutational models of, e.g., Kandori, Mailath, and Rob (1993). The second feature of our model is that convergence to the efficient steady state need not always occur, especially when the rate of both the deterministic and the stochastic mutations are very small.

We extend our basic model to incorporate endogenous changes in the action space. We show that convergence to a steady state near the full efficient state occurs in this model. Our results show that a population with a lot of variety in the actions that are played during a boom adopts faster when a recession hits it than a population in which all members are playing a unique best reply.

[*]Free University of Amsterdam, The Netherlands
[†]Tilburg University, The Netherlands

Pure Equilibria of Repeated Games with Public Signals

Tristan Tomala*

Abstract

The set of payoffs associated with pure uniform equilibria of a repeated game with public information is characterized in terms of the one-shot game. The key of the result is first, a study of the effect of undetectable deviations, and, second, the definition of new types of punishments using approachability techniques.

*Université de Paris-IX, France

Love Your Neighbor as Yourself

Shyh-Fang Ueng*

Abstract

This infinite-horizon dynamic model studies the collaboration and wars between two neighbors. Each party has his own resources. He may use his resources to produce private goods, to collaborate with his neighbor to produce a mutual beneficial goods, or to maneuver aggression against his neighbor. Allowing asymmetry in resources and depredation efficiency, this paper shows that the only self-enforcing Pareto-efficient subgame perfect equilibrium without eruption of wars is to collaborate at the equal division for the collaboration output.

*Academia Sinica, Taiwan

Coordination through Plain Conversation in Two-Player Games with Incomplete Information

Amparo Urbano*
(joint w/ J.E. Vila*)

Abstract

We show the role of unmediated plain conversation as both an information transmission and a coordination device for the class of two-player incomplete information games. Concretely, we prove that any communication equilibrium payoff of any such a game (with rational parameters) can be reached as a Nash equilibrium payoff of the game expended by a plain conversation protocol.

We finish our work with economic applications of the main result. Firstly, we show the role of plain conversation in double auction problems Afterward, we apply our result to the entry of two firms in a market which is a natural monopoly.

*University of Valencia, Spain

The Forgiving-Trigger Strategy: An Alternative to the Trigger Strategy

Federico Valenciano*
(joint w/ L.M. Ruiz*)

Abstract

We present a strategy profile for supergames with discounting that, under certain conditions, can sustain repeated cooperation as a perfect (or even a renegotiation proof) equilibrium for the same discount factors that the trigger strategy does. This strategy can be briefly described recursively: Start cooperating and do so whenever both players followed the strategy in the previous period. If only one player deviated, then for one period the deviating player must play a certain "autopenalty" while the other plays the one stage equilibrium strategy. We check its nice working in three contexts: Cournot's and Bertrand's duopoly models and the prisoners' dilemma.

*Universidad del Pais Vasco, Spain

Axiomatizations of the Normalized Banzhaf Value and the Shapley Value

Rene van den Brink*
(joint w/ G. van der Laan†)

Abstract

A cooperative game with transferable utilities, or simply a TU-game, describes a situation in which players can obtain certain payoffs by cooperation. A solution concept for these games is a function which assigns to every such a game a distribution of payoffs over the players in the game. Famous solution concepts for TU-games are the Shapley value and the Banzhaf value. Both solution concepts have been axiomatized in various ways.

An important difference between these two solution concepts is the fact that the Shapley value always distributes the payoff that can be obtained by the grand coalition consisting of all players cooperating together while the Banzhaf value does not satisfy this property, i.e., the Banzhaf value is not efficient. In this paper we consider the normalized Banzhaf value which distributes the payoff that can be obtained by the grand coalition proportional to the Banzhaf values of the players. This value does not satisfy certain axioms underlying the Banzhaf value. We introduce some new axioms that characterize the normalized Banzhaf value. We also provide an axiomatization of the Shapley value using similar axioms.

*Tilburg University, The Netherlands
†Free University of Amsterdam, The Netherlands

Vacations and Absenteeism as Signals of Worker Quality

Anne van den Nouweland*
(joint w/ W.T. Harbaugh* and E. Silva*)

Abstract

We model the optimal behavior of workers and employers engaged in team production. We are able to provide new explanations for some aspects of vacation behavior by employees and vacation policies of firms.

Our model differs from the usual signaling model, where the high type has lower signaling costs. In our model vacation time has two direct effects: leisure and lost wages. We assume both types derive the same utility from leisure. Vacation time has three effects on a worker. He derives a benefit from leisure, he loses income due to lost work time, and he gains or loses income as his wage rate changes due to what vacation behavior reveals about productivity.

We will show that there are four possible pure strategy equilibria, two where the workers pool and two where they separate. One pooling equilibrium results when neither worker takes any vacation time. In the other pooling equilibrium both types take vacation time. Unlike the usual pooling result, here the two types of workers expect to receive different wages. In one separating equilibrium, the high type vacations, and the low type does not. The second separating equilibrium produces the rather paradoxical result that it is the low types who signal.

We also examine firm profits under these different equilibria, and address the firm's incentives to try and promote one equilibrium over another.

*University of Oregon, USA

Refinements of Rationalizability for Normal-Form Games

Vincent J. Vannetelbosch[*]
(joint w/ J.J. Herings[†]**)**

Abstract

We introduce the trembling-hand rationalizability concept, where the players' actions have to be best responses also against perturbed conjectures. We also propose another refinement: weakly perfect rationalizability, where players' actions that are not best responses are only played with a very small probability.

We show the relationship between perfect rationalizability and weakly perfect rationalizability as well as the relationship between proper rationalizability and weakly perfect rationalizability: weakly perfect rationalizability is a weaker refinement than both perfect and proper rationalizability. Moreover, in two-player games it holds that weakly perfect rationalizability is a weaker refinement than trembling-hand rationalizability. The other relationships between the various refinements are illustrated by means of examples. For the relationship between any other two refinements we give examples showing that the remaining set of strategies corresponding to the first refinement can be either smaller or larger than the one corresponding to the second refinement.

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[†]Tilburg University, The Netherlands

Equilibrium Payoffs in Two-Player Recursive Games

Nicolas Vieille[†]

Abstract

We prove the existence of equilibrium payoffs in a class of undiscounted, 2-player stochastic games. Games in our class are recursive, in Everett's sense: the players receive a payoff equal to 0, until an absorbing state is reached. We make two additional assumptions. First, one of the players, say player 2, can force the absorption: given a completely mixed stationary strategy of player 2, an absorbing state is reached in finite time, almost surely, whatever be the initial state and the strategy used by player 1. Second, player 2 receives a positive payoff in any absorbing state.

[†]Université de Paris-IX, France

A Value for Graph Restricted Games

Oltion Voshtina*

Abstract

We define a new value for the graph restricted games based on axioms similar to those of the Shapley value.

*The University of Texas at Arlington, USA

Coalition-Proof Nash Allocation in a Barter Game with Multiple Kinds of Indivisible Goods

Jun Wako*

Abstract

The competitive allocations in the Shapley-Scarf market model with indivisible goods are characterized as the Coalition-Proof Nash outcomes in a simple normal form game. In this game the set of Coalition-Proof Nash outcomes is nonempty and coincides with the set of Strong Nash outcomes. The competitive allocations are also regarded as the core defined by a modified weak domination.

*Gakushuin University, Japan and Stanford University, USA

Adaptive Dynamics with Payoff Heterogeneity

Chris Wallace*
(joint w/ D.P. Myatt*)

Abstract

In a model of adaptive best response dynamics among a finite population of agents playing a 2×2 symmetric game, the assumption that players make mistakes is dropped in favor of one where players differ, via payoff heterogeneity. Thus arbitrary mutations are replaced with an economically justified specification. The analysis illustrates that the depth as well as the width of basins of attraction is important when determining long run equilibria. When payoff variances are balanced, the risk dominant equilibrium is selected. Unbalanced variances may result in the selection of other equilibria, including the payoff dominant. For larger populations the overall size of payoff variability is critical to the selection criterion.

*University of Oxford, UK

Communication Can Ease Prisoners' Dilemma

Junichi Watanabe*

Abstract

In order to improve outcomes of one shot prisoners' dilemma games, an extended game with nonbinding communication is proposed. We present an explicit procedure that yields a Pareto efficient solution as its outcome.

The critical assumptions underlying the extended game are as follows; First, we regard the players as social beings who can change the rule of their society if they want to. That is, we assume that they have administrative ability to enlarge the set of strategies of their game. An added strategy must be feasible in the sense that it indicates voluntary transfer from one to the other and/or free disposal of some payoffs. Secondly, we allow the players to make nonbinding communication not only when they discuss the possibility of adding strategies but also when they take action.

*Fukuoka University, Japan

Cooperative Production: A Comparison of Lower and Upper Bounds

Alison Watts*

Abstract

A group of agents share a one-input-one-output convex technology for producing a public or private good. The agents must agree on a level of output to produce and a way to allocate both the output (in the private good case) and the costs of production. The agents would like everyone's utility level to fall between some lower and upper bound. We consider two such bounds: the stand alone bound and the unanimity bound. An agent's stand alone utility level is the utility he would receive if he had free access to the technology by himself. An agent's unanimity utility level is the utility he would receive if everyone else had the same preferences as him and the agents split the output (in the private good case) and the cost of production equally. Normally there is some symmetry in the strength of an upper bound versus the strength of a lower bound; in some situations the upper bound is more relevant to the allocation problem, while in other situations the lower bound is more relevant. However, we show that the unanimity bound is stronger than the stand alone bound; the unanimity bound always has an impact on the production decision, while the stand alone bound does not.

*Vanderbilt University, USA

Tiebout Economies with a Continuum of Traders

Myrna H. Wooders*
(joint w/ J. Conley†)

Abstract

In this paper we introduce a model of an economy with local public goods - public goods subject to crowding and exclusion - and a continuum of agents. Jurisdiction structures are determined endogenously. Following Conley and Wooders (1994), a distinction is made between unobservable taste types of agents and their observable crowding types. The crowding type of an agent determines his effects on other agents and/or on production possibilities. A competitive equilibrium concept, where prices for public goods depend only on observable crowding types of agents, is introduced. Under extraordinarily mild conditions it is shown that the core is non-empty. It is also shown that the set of core outcomes with the equal treatment property coincides with the set of equilibrium outcomes. Conditions are demonstrated under which all outcomes in the core have the equal treatment property; under these conditions the core coincides with the equilibrium outcomes. A Second Welfare Theorem is established. Finally, we show how our model and results extend to economies where agents may belong to multiple jurisdictions or clubs.

*University of Toronto, Canada
†University of Illinois, USA

Foreign Investment and the Asymmetric Information Caused by the Uncertainty of Political Stability

Dachrahn Wu*

Abstract

In order to understand the influence of the asymmetric information caused by a foreign investor's uncertainty to the political stability of the host country, we define a signaling game to analyze the interaction between a foreign investor and the government of the host country. We find that if there is no uncertainty in the game, the equilibrium policy is more intensive than the social welfare optimal policy. If the game is of asymmetric information, we verify the existence of separating equilibrium, and show that whatever the refined separating equilibrium or the refined pooling equilibrium are generated, the social welfare is lower than that of the game of complete information

*National Central University, Taiwan

Selectors of the Core and Consistency Properties

Victor V. Zakharov*

Abstract

In this paper we consider TU-cooperative games from linear programming point of view. Using the linear programming approach to construct the subcore and grand subcore, which are multiple selectors of the core, we represent them in analytical forms. We consider reduced games due to Davis-Maschler, Moulin, and Funaki, and formulate the sufficient conditions for subcore and grand subcore to be $\mathcal{S}$-consistent.

*St. Petersburg State University, Russia

A Stable Solution of Dynamic Auction

Nicklay A. Zenkevich*
(joint w/ S.N. Voznyuk*)

Abstract

We consider a multi-item auction with two asymmetric bidders and one seller. We characterize unique Pareto optimal solution among Nash equilibria (PONE-solution). We also study a multistage process of auctioning with the above auction as a single step and characterize unique time-consistent PONE-solution.

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