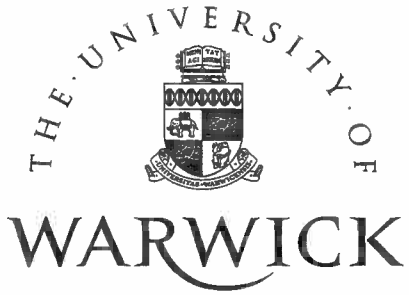
PROGRAMME AND PROCEEDINGS OF 1997 WARWICK SUMMER RESEARCH WORKSHOP ON "DYNAMIC GAMES AND THEIR ECONOMIC APPLICATIONS"

(Special Paper)

No.488

WARWICK ECONOMIC RESEARCH PAPERS



DEPARTMENT OF ECONOMICS

PROGRAMME AND PROCEEDINGS OF 1997 WARWICK SUMMER RESEARCH WORKSHOP ON "DYNAMIC GAMES AND THEIR ECONOMIC APPLICATIONS"

Special Paper
Department of Economics
University of Warwick
Coventry
CV4 7AL

No.488

July 1997

PROGRAMME AND PROCEEDINGS OF
1997 WARWICK SUMMER RESEARCH WORKSHOP ON
"DYNAMIC GAMES AND THEIR ECONOMIC APPLICATIONS"
HELD IN THE DEPARTMENT OF ECONOMICS
14-25 JULY 1997

(Special Paper)

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PROGRAMME PRINCIPAL ACADEMIC ORGANISERS:
Martin Cripps
Jonathan Thomas

SOCIAL, DOMESTIC AND ORGANISATIONAL ARRANGEMENTS:
Gill Pearce
with assistance from
Sanela Brkovic

SPONSORS
We are very grateful to the following for supporting aspects
of the academic programme:
Economic and Social Research Council (UK)
European Community
Royal Economic Society

Annex 1

Academic and Social Programmes

MONDAY 14 JULY

11.15 — Introduction and Welcome

11.30 - 12.30 — Peter Sørensen (joint with L. Smith)
Rational Social Learning with Random Sampling

4.30 - 5.30 — Matthew Jackson
The Optimal Design of a Market

TUESDAY 15 JULY

11.30 - 12.30 — Arthur Robson
Why Would Nature Give Individuals Utility Functions?

4.30 - 5.30 — Luca Anderlini (joint with L. Felli)
Costly Coasian Contracts

WEDNESDAY 16 JULY

11.30 - 12.30 — George Mailath (joint with L. Samuelson)
Your Reputation is Who You're Not, Not Who You Are

4.30 - 5.30 — Bart Lipman
An Additive Representation of Preferences Under Unforeseen Contingencies

THURSDAY 17 JULY

11.30 - 12.30 — Maarten Janssen
Imitation and Evolution of Cooperation in Prisoner's Dilemma Games with Some Local Interaction

12.35 ~ Workshop Photo Session

4.30 - 5.30 — Jeroen Swinkels
Asymptotic Efficiency for Discriminatory Private Value Auctions with Aggregate Uncertainty

FRIDAY 18 JULY

10.00 - 11.00 — Sanjeev Goyal (joint with Venkatesh Bala)
Self-Organization in Communication Networks

11.30 - 12.30 — Rann Smorodinsky
Pivotal Players and the Characterization of Influence

2.00 - 3.00 — Karl Schlag
An Evolutionary Analysis of Bagwell's Example

4.00 - 5.00 — Stephen Morris
The Reputational Cost of Truthful Informational Transmission

MONDAY 21 JULY

10.00 - 11.00 — Antonella Ianni
Learning Correlated Equilibria in Balanced Games

11.30 - 12.30 — Sujoy Mukerji
Equilibrium Departure from Common Knowledge in Games with Non-Additive Expected Utility

3.00 - 4.00 — Theodore To
Dynamic Price Adjustment and Oligopoly

5.00 - 6.00 — Dirk Bergemann & Juuso Valimaki
Learning and Efficient Matching

TUESDAY 22 JULY

11.30 - 12.30 — Michael Peters
A Revelation Principle for Competing Mechanisms

4.30 - 5.30 — Avner Shaked
Altruists, Egoists and Hooligans in a Local Interaction Model

WEDNESDAY 23 JULY

11.30 - 12.30 — Lones Smith
Wald Revisited: A Theory of Optimal R&D

4.30 - 5.30 — Larry Samuelson
Evolutionary Drift and Equilibrium Selection

THURSDAY 24 JULY

11.30 - 12.30 — Dieter Balkenborg (joint with M Jansen & D Vermeulen)
Invariance Properties of Persistent Equilibria

4.30 - 5.30 — David Kelsey
Free Riders Do Not Like Uncertainty

FRIDAY 25 JULY

11.30 - 12.30 — Marco Ottaviani
Competing for an Informed Buyer

4.30 - 5.30 — Sayantan Ghosal
Eductive Stability in a Two Period Economy

~ Additional presentations may be included during the workshop period ~

MONDAY 14 JULY

Welcome Reception for all workshop delegates to be held at 6pm in the Warwick Business School lounge. A finger buffet and drinks of wine and fruit juices will be served.

TUESDAY 15 JULY

An evening for individual social arrangements or team sport event at the on campus. *Your interest is sought - watch the noticeboard for sporting events!*

WEDNESDAY 16 JULY

Chinese Evening at The Chung Ying in Birmingham's China Town. Chopsticks at the ready for 7.30pm, coach will leave Student's Union bus lay-by at 6.30pm. Please let Gill know if you are interested in joining this evening social or sign the 'sign-up sheet' on arrival to the department. We will need to know the exact numbers of places to book by afternoon of Monday 14 July.

THURSDAY 17 JULY

An evening for individual social arrangements or team sport event on campus. *Your interest is sought - watch the noticeboard for sporting events!*

FRIDAY 18 JULY

An evening performance of 'Hamlet' at The Royal Shakespeare Theatre, Stratford. Limited tickets will be for sale by Gill on a first-come-first-serve basis. Transport available to and from campus.

SATURDAY 19 JULY

No outing arranged. Kenilworth Castle has a 'Kings and Queens' day from 12 noon. Warwick Castle has a day of mediaeval entertainments. Transport can be arranged if there are several participants interested in these events, please let Gill know.

SUNDAY 20 JULY

House/Garden party to be held from 2.30pm at the home of Philip Trostel - a pleasant walk from the campus.

MONDAY 21 JULY

An evening for individual social arrangements or team sport event at the Megabowl or on campus. *Your interest is sought!*

TUESDAY 22 JULY

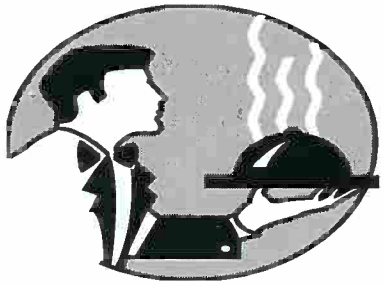
Evening barbeque/house party to be held at the home of Ken Wallis from 7pm. Transport to and from campus will be available.

WEDNESDAY 23 JULY

An evening for individual social arrangements or 'Frisbee' team sport event on campus. *Your interest is sought - watch the noticeboard for sporting events!*

THURSDAY 24 JULY

Workshop Dinner (7.15pm for 7.45pm) at the Charlecote Pheasant, Stratford. Coach will leave the Students' Union bus lay-by at 6.45pm. Smart dress. Please sign the 'sign-up' sheet on arrival to the department or let Gill know that you are interested in attending by afternoon of Monday 21 July for exact number of places to be booked.



FRIDAY 25 JULY

End of workshop get-together for 'drinks and nibbles' in the Economics Department.

Annex 2

Participants' Names and Institutes

WARWICK SUMMER RESEARCH WORKSHOP
"DYNAMIC GAMES AND THEIR ECONOMIC APPLICATIONS"
14 - 25 JULY 1997

LIST OF PARTICIPANTS

ANDERLINI, Luca ..... University of Cambridge, UK
BALKENBORG, Dieter ..... University of Southampton, UK
BERGEMANN, Dirk ..... Yale University, USA
BESTER, Helmut ..... Free University, Berlin
BHASKAR, Venkataraman ..... University of St Andrews, UK
BORGERS, Tilman ..... University College London, UK
CELENTANI, Marco ..... Universidad Carlos III de Madrid, Spain
DIXON, Huw ..... University of York, UK
EVANS, Bob ..... University of Cambridge, UK
GHOSAL, Sayantan ..... Queen Mary & Westfield College, UK
GOYAL, Sanjeev ..... EUR, Netherlands
HERREINER, Dorothea ..... University of Bonn, Germany
HOPKINS, Ed ..... University of Edinburgh, UK
HUMPHREY, Steven ..... University of Nottingham, UK
IANNI, Antonella ..... University of Southampton, UK
JACKSON, Matthew ..... Northwestern University, USA
JANSSEN, Maarten ..... Erasmus University, Netherlands
KELSEY, David ..... University of Birmingham, UK
LEE, In Ho ..... University of Southampton, UK
LEININGER, Wolfgang ..... Universitaet Dortmund, Germany
LIPMAN, Bart ..... University of Western Ontario, Canada
MAILATH, George ..... University of Pennsylvania, USA
MANZINI, Paola ..... University of Exeter, UK
MORRIS, Stephen ..... University of Pennsylvania, USA
MUKERJI, Sujoy ..... University of Southampton, UK
NACHBAR, John ..... Washington University, USA
NÖLDEKE, Georg ..... University of Bonn, Germany
OTTAVIANI, Marco ..... University College London, UK
PETERS, Michael ..... University of Toronto, Canada
PIGNATARO, Giacomo ..... Universita di Catania, Italy
PONTI, Giovanni ..... University College London, UK
RADY, Sven ..... Stanford University, USA
RAY, Indrajit ..... University of York, UK
ROBSON, Arthur ..... University of Western Ontario, Canada
SABOURIAN, Hamid ..... University of Cambridge, UK
SAMUELSON, Larry ..... University of Wisconsin, USA
SCHLAG, Karl ..... University of Bonn, Germany
SEIDMANN, Daniel ..... University of Newcastle, UK
SHAKED, Avner ..... University of Bonn, Germany
SHIN, Hyun Shin ..... Nuffield College, UK
SMITH, Lones ..... MIT, USA

SMORODINSKY, Rann ..... Northwestern University, USA
SØRENSEN, Peter ..... Nuffield College, UK
SWINKELS, Jeroen ..... Northwestern University, USA
TO, Theodore ..... University of St Andrews, UK
VALIMAKI, Juuso ..... Northwestern University, UK
VALENTINYI, Akos ..... University of Southampton, UK
WALTERS, Christopher ..... London Business School, UK
WINTER, Eyal ..... Washington University, USA
WORRALL, Tim..... University of Keele, UK
YALCIN, Erkan..... University of Aberystwyth, UK

plus faculty members and graduate students from the Department of Economics.

Two intended participants, listed above, were unable to attend the workshop for personal reasons.

Annex 3

List of Workshop Papers

List of Workshop Papers

Names of Authors	Titles of Papers
ANDERLINI, Luca	*Costly Coasian Contracts*
BALKENBORG, Dieter (joint with M Jansen & D Vermeulen)	*Invariance Properties of Persistent Equilibria*
BERGEMANN, Dirk and Valimaki, Juuso	*Learning and Efficient Matching*
GHOSAL, Sayantan	*Eductive Stability in a Two-Period Economy*
GOYAL, Sanjeev (joint with Venkatesh Bala)	*Self-Organization in Communication Networks*
IANNI, Antonella	*Herding and Imitation: Some Applications of the Voter Model*
JACKSON, Matthew	*The Optimal Design of a Market*
JANSSEN, Maarten	*Imitation and Evolution of Cooperation in Prisoner's Dilemma Games with Some Local Interaction*
KELSEY, David	*Free Riders Do Not Like Uncertainty*
LIPMAN, Bart	*An Additive Representation of Preferences Under Unforeseen Contingencies*
MAILATH, George (joint with L. Samuelson)	*Your Reputation is Who You're Not, Not Who You Are*
MORRIS, Stephen	*The Reputational Cost of Truthful Informational Transmission*
MUKERJI, Sujoy	*Equilibrium Departure from Common Knowledge in Games with Non-Additive Expected Utility*
OTTAVIANI, Marco	*Competing for an Informed Buyer*
PETERS, Michael	*A Revelation Principle for Competing Mechanisms*
ROBSON, Arthur	*Why Would Nature Give Individuals Utility Functions?*
SAMUELSON, Larry	*Evolutionary Drift and Equilibrium Selection*
SCHLAG, Karl	*An Evolutionary Analysis of Bagwell's Example*
SHAKED, Avner	*Altruists, Egoists and Hooligans in a Local Interaction Model*

SMITH, Lones	*Wald Revisited: A Theory of Optimal R&D*
SMORODINSKY, Rann	*Pivotal Players and the Characterization of Influence*
SØRENSEN, Peter (joint with L. Smith)	*Rational Social Learning with Random Sampling*
SWINKELS, Jeroen	*Asymptotic Efficiency for Discriminatory Private Value Auctions with Aggregate Uncertainty*
TO, Theodore	*Dynamic Price Adjustment and Oligopoly*

Annex 4

Abstracts of Papers

COSTLY COASIAN CONTRACTS*

LUCA ANDERLINI
(St. John's College, Cambridge)

LEONARDO FELLI
(London School of Economics)

January 1997

ABSTRACT. We identify and investigate the basic 'hold-up' problem which arises whenever each party to a contingent contract has to pay some *ex-ante cost* for the contract to become feasible. We then proceed to show that, under plausible circumstances, a 'contractual solution' to this hold-up problem is not available. This is because a contractual solution to the hold-up problem typically entails writing a 'contract over a contract' which generates a fresh set of ex-ante costs, and hence is associated with a new hold-up problem. We conclude the paper investigating two applications of our results to a static and to a dynamic principal-agent model.

JEL CLASSIFICATION: C70, D23, D60, D80.

KEYWORDS: Hold-Up Problem, Ex-Ante Contractual Costs, Contracts Over Contracts, Incomplete Contracts, Principal-Agent Problems.

ADDRESS FOR CORRESPONDENCE: Luca Anderlini, Faculty of Economics and Politics, University of Cambridge, Austin Robinson Building, Sidgwick Avenue, Cambridge CB3 9DD, United Kingdom. E-mail LA13@ECON.CAM.AC.UK.

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*This is a revised version of a working paper entitled 'Costly Contingent Contracts' (Anderlini and Felli 1996a). We are grateful to Sandeep Baliga, Jack Beatson, Patrick Bolton, Jacques Crèmer, Antoine Faure Grimaud, Oliver Hart, François Ortalo-Magné, Tomas Sjöström, Kevin Roberts, Ariel Rubinstein, Yoram Weiss and seminar participants at LSE, Southampton, Bar Ilan and Tel-Aviv Universities for useful suggestions and comments. Financial support from St. John's College and the Suntory and Toyota International Centres for Economics and Related Disciplines at LSE is gratefully acknowledged. We are solely responsible for any remaining errors. A copy of this paper is available at http://www.econ.cam.ac.uk/faculty/la13/la13.htm

INVARIANCE PROPERTIES OF PERSISTENT EQUILIBRIA AND RELATED SOLUTION CONCEPTS

Dieter Balkenborg, Mathijs Jansen and Dries Vermeulen

preliminary and incomplete version, July 23, 1997

1. Introduction

to be written...

Learning and Efficient Matching

Dirk Bergemann
and
Juuso Valimaki

Abstract:

This paper analyzes the set of Markov Perfect equilibria in a market where finitely or infinitely many heterogenous sellers compete in prices for homogenous buyers. The product quality of all sellers is initially uncertain and new information is acquired through purchases.

When there is a single buyer and the products are statistically independent, then all coalition proof equilibria in Markovian strategies are efficient. In any efficient equilibrium, each seller is paid his marginal contribution to the social value. If the product qualities are correlated, then price competition is inefficient in general.

With multiple buyers, the efficiency of equilibria depends on the form of price competition between the firms. In large economies, i.e. in ones with countably many sellers, all coalition proof Markov Perfect equilibria are efficient.

"Eductive stability in a two-period economy"

Author: Sayantan Ghosal
Queen Mary and Westfield College
University of London
Mile End, London E1 4NS
U.K.
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fax. no. 44-(0)181-983 3580
e-mail: S.Ghosal@qmw.ac.uk

Abstract:

This paper examines the (local) strong rationality properties of competitive equilibria in a two period exchange economy with a single asset market linking the two periods. All individuals know the model of the economy. They have heterogenous point expectations about period two prices that aren't common knowledge but that lie in a neighbourhood of the equilibrium price which is common knowledge. The perfect foresight equilibrium is eductively stable if by using the common knowledge of individual optimization and market clearing, all individuals are able to converge to the equilibrium price. From an eductive point of view, there are two main sources of instability: (i) the effect of a change in the distribution of assets on period two commodity prices; (ii) the effect of a change in period two prices on the distribution of assets. When these effects are weak, the competitive equilibrium is eductively stable.

Self-Organization in Communication Networks

Venkatesh Bala[1]
and
Sanjeev Goyal[1]

First Draft: October 1996
This Version: February 1997

ABSTRACT

We develop a dynamic model to study the formation of communication networks. In this model, individuals periodically make decisions concerning the continuation of existing information links and the formation of new information links, with their cohorts. These decisions trade off the costs of forming and maintaining links against the potential rewards from doing so. We analyze the long run behavior of this process of link formation and dissolution.

Our results establish that this process always *self-organizes*, i.e., irrespective of the number of agents, and the initial network, the dynamic process converges to a limit social communication network with probability one. Furthermore, we prove that the limiting network is invariably either a wheel network or the empty network.

We show in the (corresponding) static network formation game that, while a variety of architectures can be sustained in equilibrium, the wheel is the unique efficient architecture for the interesting class of parameters. Thus, our results imply that the dynamics have strong equilibrium selection properties.

Key Words: networks, coordination, learning, path-dependence, self-organization.

JEL Numbers: D82, D83, Q13, Q16.

---

[1] Respectively Dept. of Economics, McGill University, 855 Sherbrooke Street West, Montreal, Canada H3A 1A8 and Econometric Institute, Erasmus University, PO Box 1738, 3000 DR, Rotterdam, The Netherlands. E-mail addresses: inbv@musicb.mcgill.ca and goyal@few.eur.nl respectively. We thank Sandeep Baliga, Maarten Janssen, Eric van Damme, Ganga Krishnamurthy, Yossi Greenberg, Pauline Rutsaert and Rajeev Sarin for helpful suggestions and participants at the 1996 South Asian Econometric Society Meetings in New Delhi and at the 1997 Winter Econometric Society Meetings in New Orleans for their comments. Financial support from SSHRC and Tinbergen Institute, Rotterdam is acknowledged.

Herding and Imitation: Some Applications of the Voter Model.

Valentina Corradi*
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3718 Locust Walk
Philadelphia
PA 19104-6297, U.S.A.

Antonella Ianni†
Department of Economics
University of Southampton
Highfield
Southampton
SO17 1BJ, U.K.

April, 11, 1997

Abstract

We formalize a dynamic model of imitative behaviour, for which we provide a motivation either in terms of a *herding* model, or in terms of a *game dynamics*.

The model involves a countable population of identical individuals, who repeatedly choose among two actions. Information differs among agents, because individuals take choices sequentially (at random exponential time, with unitary mean) and only observe a subset of other individuals in the population. Individuals make choices on the basis of a well defined preference structure, as well as on a probabilistic component that is entirely motivated by imitation.

We address two complementary questions of independent interest.

The first relates to the asymptotics of the process. Though the process is not ergodic, we are able to fully characterize the set of invariant measures, and relate the latter set to the set of stationary states at the level of each single individual. We show that, depending on the model, the system either clusters, in the sense that herds of individuals choosing exactly the same action grow unboundedly, or the system settles down in a state where both actions coexist in a steady state.

The second explicitly focuses on the dynamics itself, by pursuing a multiple space-time scale analysis. It turns out that the system displays the feature that after long time spans, a sequence of states occur, which when viewed locally remains almost stationary over long periods of time, and which is easier to describe as these states are determined by simple macroscopic variables (block averages).

The methodology we utilize borrows heavily from a category of models known as the Voter's model. (e.g. Liggett, T.M., *Interacting Particle Systems*, 1985, Springer and Verlag). In a voter model, each individual adopts the action of an individual chosen at random among her/his neigbors. Neighbors are typically defined in terms of d-dimensional lattice structures.

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The Optimal Design of a Market

Sandro Brusco Matthew O. Jackson*

Draft: March 1997

Abstract

We study the optimal design of the rules of trade in a two-period market given that agents arrive at different times and may only trade with agents present contemporaneously. First period agents face a fixed cost of trading across periods, and their decisions of whether or not to trade in the second period result in externalities relative to the agents arriving in the second period. Given the non-convexities associated with the fixed cost, competitive trading rules can result in inefficiencies in such a market and, in fact, anonymity must be sacrificed to achieve efficiency. Efficient trading rules have a market maker (i.e., an agent who is given some market power and the right to trade across periods) who faces some competition within period trading, but not across periods. The efficient choice of who should be market maker can be made by auctioning rights to this position. If there is uncertainty across periods, then efficient mechanisms may involve multiple market makers, and the optimal number of market makers depends on the discount factor, level of risk aversion, and presence of asymmetric information.

*Brusco is at Departmento de Economía de la Empresa, Universidad Carlos III de Madrid, and Jackson is at MEDS, Kellogg Graduate School of Management, Northwestern University. Financial support under NSF grant SBR 9507912 is gratefully acknowledged. We thank seminar participants at Caltech, Carnegie Mellon University, the University of Michigan, and the University of Minnesota for helpful comments.

IMITATION AND EVOLUTION OF COOPERATION IN PRISONER'S DILEMMA GAMES WITH SOME LOCAL INTERACTION

Maarten JANSSEN

Daisy KERSEMAKERS

This Version: June 1997

ABSTRACT: In this paper we study conditions for the emergence of cooperative behavior in a dynamic model of population interaction. The dynamics are driven either by imitation or by evolution. The model has finitely many individuals located on a circle. The pay-off of each individual is partly based on the (local) interaction with neighbors and partly on (uniform) interaction with the whole population. The dynamics of the population is such that the size of the population remains constant. We show that for a large class of parameters cooperation will emerge if the population is large; if the population is small, noncooperation will prevail in the long run. The result contrasts with conventional wisdom according to which the larger the population, the less likely cooperation will be.

FREE RIDERS DO NOT LIKE UNCERTAINTY

by

Jürgen Eichberger

Wirtschaftstheorie, Fachbereich 2,
Universität des Saarlandes,
Saarbrücken, Germany.

and

David Kelsey

Department of Economics,
The University of Birmingham.

26 February 1997

Abstract We examine the effect of introducing Knightian uncertainty into a simple model of public good provision. We find that uncertainty may reduce the free-rider problem if utility is concave or there are decreasing returns to scale in the production of public goods. Comparative statics analysis shows that increases in uncertainty will increase donations to the public good. These effects may be reversed if there are sufficiently strong increasing returns to scale in production.

Keywords Public goods, Uncertainty-aversion, Knightian Uncertainty, Choquet integral, Free-rider.

JEL Classification D81, H41.

Address for correspondence: David Kelsey, Department of Economics, The University of Birmingham, Birmingham, B15 2TT, England.

* Research supported by the ESRC senior research fellowship scheme, award no. H52427502595 and a grant from the School of Social Science at The University of Birmingham. For comments and discussion we would like to thank Richard Cornes, Max Fry, Simon Gächter, Simon Grant, Stephen King, Frank Milne, Shasikanta Nandeibam, Yew-Kwang Ng, Thomas Renstrom, Martin Sefton, Peter Wakker and participants in seminars at the Universities of Bielefeld, Birmingham, Essex, Humboldt (Berlin), Mannheim, St Andrews, Saarlandes, Birkbeck College, London and the Econometric society meetings in Iowa City 1996.

An additive representation of preferences under unforeseen contingencies[1]

Eddie Dekel[2] Barton L. Lipman[3] Aldo Rustichini[4]

Preliminary Draft
April 1997

Abstract

We axiomatically characterize a representation of preferences over opportunity sets which exhibit a preference for flexibility, interpreted as a concern about unforeseen contingencies. In this representation, the agent acts as if she had a coherent prior over a set of possible future preferences, each of which is an expected-utility preference. We show that the state space is essentially unique given the restriction that all future preferences are expected-utility preferences and is minimal without this restriction.

[1] Dekel and Rustichini thank the NSF and Lipman thanks SSHRCC for financial support for this research.
[2] Economics Dept., Northwestern University. E-mail: dekel@nwu.edu
[3] University of Western Ontario. E-mail: blipman@julian.uwo.ca.
[4] CORE and CentER. E-mail: aldo@kub.nl.

"Your Reputation Is Who You're Not, Not Who You Are"

by
George J. Mailath
and
Larry Samuelson

Abstract:

We study a model in which agents build reputations by choosing separating actions so as to make their identities known, rather than pooling actions to conceal their identities. A long-run player (a firm) plays a repeated game with a sequence of short-run opponents (consumers). The one-shot game has a unique Nash equilibrium. The firm is one of two possible types, a "bad" type and a "rational" type. The bad type finds it profitable to choose the single-stage Nash equilibrium action, even if allowed to commit to an action before the short-run opponents make their choices. The rational type would commit to a "Stackelberg" action if commitments were possible. A motivation for building a reputation arises out of the rational type's desire to not be confused with the bad type. However, such reputation building is not consistent with equilibrium. We study a modification of the original model (in which the long-run player may be replaced) in which such reputation building is consistent with equilibrium. This contrasts with most incomplete-information reputation stories, where the rational firm prefers to not have his type revealed.

*The Reputational Cost of Truthful Informational Transmission**

Stephen Morris
University of Pennsylvania

June 1997

Abstract

An uninformed decision maker repeatedly receives advice from a good informed advisor; that is, the advisor's information is valuable and she only cares about the utility of the decision maker. But the decision maker attaches positive probability to the advisor being stupid or having other objectives. The good advisor has a current incentive to truthfully reveal her information; but she may have a reputational incentive to lie (in order to separate herself from possible "bad" advisors). If the possible bad advisor is informed but biased, and if the current decision problem is relatively unimportant compared to future ones (for the decision maker and thus for the good advisor) this reputational cost of telling the truth ensures that no information is transmitted by either type of advisor in equilibrium. This paper also explores when truth-telling is equilibrium behavior for different kinds of possible bad advisors.

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*This version is prepared for the 1997 Warwick Summer Research Workshop. It is HIGHLY PRELIMINARY (and should not be referred to w/o permission). In particular, I have not converged on the appropriate notation for making comparisons across a number of models: I hope that ambiguity in notation will eventually be cleared up. I have benefited from valuable conversations on this material with Stephen Coate, George Mailath and Andrew Postlewaite. Financial support from the Alfred P. Sloan foundation is gratefully acknowledged.

Equilibrium Departure from Common Knowledge in Games with Non-Additive Expected Utility*

Sujoy Mukerji
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First draft December 1996; revised June 1997

Abstract

In a game where the players have non-additive beliefs, we explore the beliefs implicit in the equilibrium behaviour of the players. Under one interpretation, we can show that there are well-defined departures from common knowledge of the game among the players. Our argument revolves around a representation theorem which relates equilibrium under non-additive beliefs to equilibrium actions of a set of types in a Bayesian game with a common prior. Among these types, the game is common p-belief, where the p depends on the degree of uncertainty aversion. Only when the beliefs are additive is $p = 1$.

Keywords: Ambiguity, capacities, Choquet integral, common belief, common knowledge, Knightian uncertainty, non-additive probabilities, non-cooperative games, uncertainty.

JEL Classification: C72, C79, D80, D81

*We wish to thank J.Eichberger, L.Epstein, D.Kelsey, K.C. Lo, S. Morris, and P.Wakker for their detailed and thoughtful comments on an earlier draft.

COMPETITING FOR AN INFORMED BUYER

by
Marco Ottaviani,
University College London
(joint with Giuseppe Moscarini, Yale)

ABSTRACT: This paper explores a prototypical model of Bertrand price competition with private information on the demand side. Two firms offer different varieties of a good by posting prices to a buyer who has a private signal on the relative quality of the two varieties. The game is parametrized by the prior belief on the relative quality of the goods, common to buyer and sellers, and the precision of the private information of the buyer. The equilibrium prices and value functions of the sellers are fully characterized as functions of these two parameters. The equilibrium payoff of a seller is continuous, monotone and non-convex in the prior belief, and non-monotone in the precision of the signal of the buyer.

A REVELATION PRINCIPLE FOR COMPETING MECHANISMS

Larry G. Epstein Mike Peters*

December 3, 1996

Abstract

In modelling competition among mechanism designers, it is necessary to specify the set of feasible mechanisms. These specifications are often borrowed from the optimal mechanism design literature and exclude mechanisms that are natural in a competitive environment; for example, mechanisms that depend on the mechanisms chosen by competitors. This paper constructs a set of mechanisms that is *universal* in that any specific model of the feasible set can be embedded in it. An equilibrium for a specific model is robust if and only if it is an equilibrium also for the universal set of mechanisms. A key to the construction is a language for describing mechanisms that is not tied to any preconceived notions of the nature of competition.

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WHY WOULD NATURE GIVE INDIVIDUALS UTILITY FUNCTIONS?*

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ABSTRACT

This paper considers the biological derivation of von Neumann Morgenstern utility functions. On the one hand, if individuals possess an explicit utility function stemming from the rate of production of expected offspring, they can readily adapt to novelty in a two-armed bandit problem. Embedding such a function in a simple rule of thumb involving no beliefs about prior or posterior probabilities leads to maximization of expected offspring, in a certain limit as the number of repetitions tends to infinity. In general, on the other hand, if any rule yields such evolutionary optimality of behaviour, this biological utility function is implicit at least.

*This is a much revised version of "Expected Utility Maximization in the Long Run: Rules of Thumb Versus Bandits". I thank the Department of Economics at Boston University for its hospitality and seminar participants at the University of California at Santa Barbara for their comments. The Social Sciences and Humanities Research Council of Canada provided research support.

EVOLUTIONARY DRIFT AND EQUILIBRIUM SELECTION[1]

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March 5, 1997

Abstract

This paper develops an approach to equilibrium selection in game theory based on studying the learning process through which equilibrium is achieved. The differential equations derived from models of interactive learning typically have stationary states that are not isolated. Instead, Nash equilibria that specify differnt out-of-equilibrium behavior appear in connected components of stationary states. The stability properties of these components can depend critically on the perturbations to which the system is subjected. We argue that it is then important to incorporate such *drift* into the model. A sufficient condition is provided for drift to create stationary states, with strong stability properties, near a component of equilibria. Applications to questions of forward and backward induction are developed.

Journal of Economic Literature Classification Numbers C70, C72.

Keywords: Evolutionary Games, Cheap Talk, Stability, Drift.

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AN EVOLUTIONARY ANALYSIS OF BAGWELL'S EXAMPLE

by
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ABSTRACT:

In a recent paper Bagwell (1995) pointed out that only the Cournot outcome, but not the Stackelberg outcome, can be supported by a pure Nash equilibrium when actions of the Stackelberg leader are observed with the slightest error. The Stackelberg outcome, however, remains close to the outcome of a mixed equilibrium.

We compare the predictions in various classes of evolutionary and learning processes in this game. Only the continuous best response dynamic uniquely selects the Stackelberg outcome under noise. All other dynamics analyzed allow for the Cournot equilibrium to be selected. In typical cases Cournot is the unique long run outcome even for vanishing noise in the signal.

Altruists, Egoists and Hooligans in a Local Interaction Model

by

Ilan Eshel,Tel Aviv University,
Larry Samuelson, University of Wisconsin,
Avner Shaked, Bonn University

Abstract:

We study a population of agents, each of whom can be an Altruist or an Egoist. Altruism is a strictly dominated strategy. Agents choose their actions by imitating others who earn high payoffs. Interactions between agents are local, so that each agent affects (and is affected by) only his neighbors. Altruists can survive in such a world if they are grouped together, so that the benefits of altruism are enjoyed primarily by other Altruists, who then earn relatively high payoffs and are imitated. Altruists continue to survive in the presence of mutations that continually introduce Egoists into the population.

*Wald Revisited: A Theory of Optimal R&D**

Giuseppe Moscarini[†] Yale University

Lones Smith[‡] M.I.T.

July 17, 1997

Abstract

The paper revisits Wald's famous (1947) *sequential probability ratio test,* enriching it with *costly variable-size experiments* each period, where additional signals can be purchased at an arbitrary increasing marginal cost. By letting the time interval between experiments vanish, we show how to translate this natural discrete time story of experimentation into an analytically tractable control of variance for a continuous time diffusion. Here we find two robust results on the optimal level of experimentation: (*i*) It is increasing as confidence about the project outcome rises. (*ii*) For a wide class of convex cost functions, the stochastic process of experimentation levels has a positive secular drift.

*We thank Dirk Bergemann, Bill Nordhaus, John Rust, and Chris Sims for helpful feedback on earlier versions of this project. Smith gratefully acknowledges support of the National Science Foundation for this research.

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PIVOTAL PLAYERS AND THE CHARACTERIZATION OF INFLUENCE†

by

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November 1996
Revised: April 1997

Abstract:

A player *influences* a collective outcome if his actions can change the probability of that outcome. He is α-*pivotal* if this change exceeds some threshold α. We study influence in general environments with N players and arbitrary sets of signals. It is shown that influence is maximised when players' signals are identically distributed and the outcome is determined according to simple majority rule. This leads to the surprising conclusion that majority rules already contrain the maximal number of pivotal players. From this we derive a tight bound on average influence, as well as tight bound on the number of α-pivotal players, which is independent of N.

This analysis is relevant to problems where players' influence is a key consideration in determining their strategic behavior. The applications we consider include the problem of designing a mechanism for the provision of public goods in the spirit of Mailath and Postlewaite (1990), partnership games, games with production complementarities, and cooperation in a noisy prisoner's dilemma.

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*Rational Social Learning with Random Sampling**

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(Incomplete)

February 10, 1997

Abstract

This paper aims for a general theory of rational social learning where individuals do not observe the entire action history but only unordered samples from it. Our approach to such rational social learning can be viewed as a finite agent counterpart of BF: Banerjee and Fudenberg (1995). We show by example that the continuum of agents assumption they employ confuses some important aspects of social learning.

Just as in BF, the (expected) *welfare improvement principle* holds: With identical vNM preferences, everyone expects to do as well as his sample. We apply this insight to sampling regimes where welfare is not necessarily monotonic over time. With unboundedly strong private signals, there is complete learning. But with only boundedly strong private signals, we must delve rather deeply into the recent theory of urns to understand the dynamics.

Yet the expected welfare approach is doomed to failure for models with slightly heterogeneous preferences. Thus motivated, we attempt to construct a theory based on the *information improvement principle*. This aims for a foundation of rational social learning based on Blackwell's (1953) value of information theorem. While this ambitious approach is shown generally to fail for finite action models, it applies to a special symmetric two action case for which we are able to make strong conclusions. We believe that a Blackwellian foundation could be valid for more general models of social learning with continuous transmission of social information.

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*This paper partially *supersedes* "Error Persistence, and Experiential versus Observational Learning," which was presented on the *Review of Economic Studies Tour* of London, Brussels, and Tel Aviv in 1991. The authors wish to thank participants at the MIT, Nuffield and Stockholm School of Economics theory lunches and at the MIT-Harvard and Oxford theory seminars for their comments. Thanks also go to Bruno Jullien, Jozsef Sakovics and Xavier Vives for useful suggestions. All errors remain our responsibility. Sørensen gratefully acknowledges financial support from the Danish Social Sciences Research Council.

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Asymptotic Efficiency for Discriminatory Private Value Auctions With Aggregate Uncertainty

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First draft: September 1994
This draft: February 1997

Abstract

We consider discriminatory auctions for multiple identical units of some good. Players have private values, possibly for multiple units. These values may be asymmetrically distributed across players. In this setting, equilibria will be inefficient. We consider a sequence of auctions with growing numbers of bidders and objects. As the auction grows, uncertainty persists about the aggregate level of demand and/or supply. We show that, nonetheless, such auctions become arbitrarily close to efficient as they become large, and use this to derive an asymptotic characterization of bidding behavior and revenue.

Keywords: Auctions, Discriminatory Auctions, First Price Auctions, Aggregate Uncertainty, Asymmetry, Efficiency, Asymptotic Efficiency, Large Auctions.

JEL Classification Codes: C72, D44, D82

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Dynamic Price Adjustment and Oligopoly

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Abstract

A number of authors have studied the process by which prices change over time in imperfectly competitive environments. Rather than introducing additional market imperfections (e.g., adjustment costs, consumer switching costs, customer markets or price staggering), we consider a 'plain vanilla' model of oligopoly. In our model an intertemporal link arises because current consumption decisions affect the utility of future consumption. Thus future demand depends on the current price and firms must take this into account when making their production decision. The main result is that equilibrium prices follow a dynamic stochastic process in which the current price depends on past prices and on random disturbances. The convergence of prices to the 'long run expected price' is monotonic if current and future consumption are substitutes and oscillatory if they are complements.

JEL classification: C73, D21, D43
Keywords: dynamic pricing, oligopoly, overlapping generations.