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Game Theory Applications in Economics and Social Sciences

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ABSTRACT

Game theory: game theory offers a formal and mathematical language in which we can model strategic interaction among agents in a situation that their payoffs are depending on the choices of other agents. Originating in economics, it has now spread to political science, sociology, psychology, law and computer science. This article sees over static and dynamic games, cooperative and non-cooperative games, complete and incomplete information games, some major results (empirical and experimental), as well as demonstrating methods employed to apply game theory to the problems of market design, public goods, voting and political bargaining behavior, social norms, and networked behavior. A mixed qualitative-analytical methodology is used, including the use of canonical models, laboratory and field experiments and their use of applied case studies. Data analysis is a means of synthesizing the empirical regularities across domains and drawing attention to where the theory has worked and where refinements of behavioral analysis must be made. The paper ends with policy relevant recommendations and directions for research.

Introduction

Game theory is the study of situations where several decision-makers (players) interact strategically as their payoff depends not only on their own action, but also on the actions of others. The formal beginnings are to be found in the work of von Neumann & Morgenstern that outlined principles for the foundations of expected-utility and bones of solutions for zero-sum games (von Neumann & Morgenstern, 1944). John Nash developed the theory much further by introducing the Nash equilibrium in games with non-cooperative behaviors, an idea which determines strategy profiles where no player has incentive to unilaterally deviate from (Nash, 1950). Since then, the field has spawned many different branches - static vs. dynamic games, complete vs. incomplete information games, cooperative vs. non-cooperative frameworks, for example - and powerful analytical tools (Osborne & Rubinstein, 1994; Fudenberg & Tirole, 1991).

In economics, game theory supplies the backbone for modern microeconomic analysis in which strategic interdependence plays an important role: oligopoly models (Cournot, Bertrand), auctions and market design, bargaining, contract theory, and mechanism design: all these areas of analysis rely on game-theoretic reasoning to derive predictions, but also for designing institutions (Tirole, 1988; Myerson, 1991). For instance, in auction theory, bidding behaviour and optimal auction formats (Vickrey, 1961, Milgrom, 2004); in mechanism design in public economics, tools are available to construct a suitable mechanism that encourages revelation of private information (Hurwicz, Maskin, Myerson).

Besides economics, the application of game theory in the social sciences simply spans far and wide. Political scientists apply the concept of games for model-building purposes in the area of voting, coalition-building, legislative bargaining, and international conflict (Downs, 1957; Fearon, 1995). Sociologists and anthropologists have turned to an evolutionary and repeated-game paradigm to account for the evolution of cooperation, social norms and institutions for collective action (Axelrod, 1984; Ostrom, 1990). Psychologists and behavioral economists incorporate experimental results indicating systematic departures from the standard assumptions of rationality (e.g. fairness, reciprocity, bounded rationality), resulting in behavioral game theory that is predicated on the addition of social preferences and heuristics to standard payoff-maximization (Camerer, 2003; Fehr & Schmidt, 1999).

Game theory is methodologically flexible: move by move games are covered by the multiplicity of equilibrium in one-shot games as well as the reputation and learning processes in repeated games; it is evolutionary where structured by evolution rates, where adaptations and selection play a role in evolutionary games (Maynard Smith, 1982; Harsanyi, 1967). Each of the frameworks has different empirical implications and different identification strategies when faced with data.

Applications, in terms of real life policies and institutions abound. Auction theory is also used by market regulators to set out spectrum and procurement auctions (Milgrom, 2004). Social planners use public goods games and mechanism design to design agreements and contribution incentives for the environment (Olson, 1965; Ostrom, 1990). In development economics, game theoretic experiments help to understand the role of social preferences and enforcement institutions in cooperation in collective irrigation schemes or microfinance groups (Gneezy & List, 2006). In International relations, models of bargaining assist in explaining the initiation of wars through bargaining as well as peace treaties (Fearon, 1995).

Yet challenges remain. Standard game-theoretic predictions are sometimes disconfirmed by the actual data because of information frictions, cognitive limitations and contextual framing and so there has been an active interaction between normative theory, behavioural evidence, as well as institutional requirements at the field level (Camerer, 2003; Gintis, 2009). Opportunities are emerging to widen theoretic to observed behavior bridging due to the progress of computational capabilities, agent-based simulations and an increasingly descriptive experimental protocols.

This paper is a survey paper that covers some fundamental models and applications, places much emphasis on methodological treatment that unites theory and empirical evidence (experiments/experimental/observational evidence), and synthesizes the empirical results in various disciplines. The goal is both descriptive, presenting what has been accomplished by game theory, and prescriptive, presenting some of the ways in which game theory might suggest something for policy or the design of institutions (including a suggestion for how social scientists should proceed in the future!).

The importance of game theory is its ability to make strategic interaction explicit and tractable, and therefore tells us about behaviors generated by interdependent decision-making instead of individual optimization. This insight is important in understanding markets that have few firms, for designing auctions and matching markets, for designing contracts in conditions of information asymmetry, and engineering institutions that foster sustained collective action (Tirole, 1988; Myerson, 1991). In the social sciences, game theory provides hypotheses about how and why norms form and how stable they are, how cooperation works and the strategic thinking behind political and legal institutions. The object of this article is to (i) provide an extensive overview of the effort of modeling game-theoretic models and the application of such models across the economics and social sciences, (ii) review the empirical and experimental evidence supporting and refining game theoretic predictions, (iii) present some of the methodological approaches used to combine theoretical modeling and data, and (iv) offer some policy relevant recommendations and research directions that combine behavioral realism with formal strategic analysis. By moving from the combination of theory, evidence, and applications, the purpose of this work is to guide those who use game theory to analyze or design strategic settings, i.e. researchers and practitioners.

Literature Review

The literature of game theory is large and diverse, ranging from work in the rigorous mathematical background through various applied economic models, to tests by experiment, and to some cross-disciplinary work in political science, sociology, and biology. A standard account of utility has been the seminal book by von Neumann and Morgenstern dated 1944, which gave the expected utility psychology for strategic interaction, and the equilibrium concept of Nash (1950) which has been the basis of much of non-cooperative analysis. Some of the first extensions were cooperative solution concepts present by Shapley (Shapley, 1953) and transferable utility core games (Gillies, 1959) and as developed by Harsanyi, the games with incomplete information, the Bayesian approach needed to compute the private information in an auction game and a bargaining game (Milgrom and Weber, 1982).

The models used in the industrial organization to analyse oligopolistic competition were the Cournot model and the Bertrand model, and the welfare implications of market structure and collusion were derived (Tirole, 1988). Auction theory evolved into a pragmatic design discipline as a result of Vickrey's (1961) pioneer second-price auction and the income of revenue equivalence and affiliated values in Milgrom's work (Milgrom & Weber, 1982; Milgrom, 2004). Mechanism design, developed by Hurwicz and expanded by Maskin and Myerson set out the methods of implementing social objectives through private information and incentive constraints in a constructive way (Hurwicz, 1972; Maskin, 1999; Myerson, 1981).

Behavioral and experimental game theory captured systematic diversions from rational actor theory. Camerer's (2003) analysis of findings from the laboratory revealed that humans exhibit fairness, reciprocity and bounded strategic sophistication. Fehr and Schmidt 1999 formalize inequity aversion, Rabin 1993 and models of social preferences offer game theoretic formulations more in line with observed behavior in the realm of ultimatum games, trust games or public goods games. Experimental auctions and market games were used to test theories and inform design of practical auctions used by governments and platforms (Kagel, 1995).

Repeated and evolutionary games raised awareness on cooperative outcomes in the absence of a central enforcement. Tit-for-tat and reciprocity became popularised as simple but effective strategies in repeated prisoner's dilemmas by Axelrod (1984) and the use of population dynamics to frame the selection of strategy was presented by evolutionary game theory (Maynard Smith 1982). The repetition game folk theorem demonstrated a large class of cooperative equilibria that requires a certain level of patience on the part of the player to be sustained (Fudenberg & Maskin, 1986).

Political economy and international relations reduced war, deterrence and the dynamics of treaties to bargaining models and signalling games (Fearon, 1995; Powell, 1999). Modeling The rent distribution is as shown by legislative bargaining (e.g., Baron and Ferejohn, 1989), including the effects of institutional rules on outcomes. Voting theory had taken into account game theoretic predictions in models of turnout as well as strategic voting and party positioning (Downs, 1957; Hotelling mechanisms).

Networked game theory and markets for matching have become hot. Jackson (2008) synthesized network formation and diffusion models; Gale and Shapley (1962) kick-start instead of matching theory deployed in school and medical resident matching, later market designing applications deploying incentive compatible (Roth & sotomayor 1990; Roth 2002). Mechanism design with constraints (budget balance, participation, and fairness) is a current area of research (Hurwicz, 1972; Green & Laffont, 1979).

Applied empirical work for structural estimation for recovering preferences and constraints on strategic behavior. Entry deterrence, auction bidding, and contract models for incomplete-information game models are estimated by researchers to infer payoffs (Aguirregabiria & Mira, 2007). Field experiments (e.g., Banerjee et al., 2013), combine randomization and game theoretic interventions to test policy: microfinance repayment schemes-public goods provision-enforcement institution game theoretic design has been tested using game theoretic design.Compute Game theory Computational and algorithmic game theory is computer science, emphasis given to complexity of equilibria, algorithm scheme and multi-agent systems-be relevant for online markets and market platforms such as matching platforms (Nisan et al., 2007). The rise of marketplaces in the digital space has made game theory practical in algorithmic matchmaking, pricing and the regulation of such platforms (Easley & Kleinberg, 2010).

While there is much in the literature, the critics mention limitations: equilibrium multiplicity, assumptions of common knowledge, cognitive burdens of the backward induction of dynamic games, etc. These critiques lead to behavioral extensions as well as models of bounded rationality and powerful mechanism design to handle the fact that they operate with limited sophistication and model uncertainty (Kreps, 1990; Camerer, 2003; Dekel et al., 2007). Overall, the equilibrium of the otherwise disparaging literature seems to converge on a pragmatic understanding of game theory as a potentially extremely important source of conceptual tools, but as empirically relevant largely depending on careful specification, behavioral realism, and institutional detail.

Methodology

This article adopts a mixed qualitative-analytical methodological approach aimed at (a) presenting canonical game theoretic models, (b) synthesizing empirical and experimental evidence testing the game theoretic models, and (c) showing applied methodology for the use of game theory in policy and institutional design. The methodology, which has four complementary components: the theoretical mapping; experimental synthesis; overview of structural estimations; case study application

Theoretical mapping

Games can be categorised on the following dimensions: (i) dynamic vs. static, (ii) complete vs. incomplete information, (iii) cooperative vs. non-cooperative and (iv) discrete vs. continuous strategy spaces (Osborne and Rubinstein, 1994). Canonical examples of each class are discussed: e.g. prisoner dilemma and public goods games (static games), Cournot and Bertrand (static oligopoly), repeated games (dynamic cooperation), Bayesian auctions and signaling (incomplete information), and core based on cooperative TU games (Shapley value, core).

Experimental synthesis

I take a systematic approach of reviewing laboratory and field experiments operationalising game models and testing behaviour. The most important actions include the summarization of experimental protocols, populations of participants, payoff structures and key outcomes. It is possible to extract meta-analytic knowledge (e.g., average cooperation rates, furthermore, not Nash-predictions, framing and repetition-sensitivity, etc) to evaluate how robust the theoretical predictions are (Camerer, 2003; Fischbacher and Gachter, 2010). This aspect focuses on the fact that manipulated change in payoff parameters and information structures illuminates causal processes.

Observational inference and structural estimation

In cases where the lack of experimental control is observed, the researchers use structural econometric techniques of incomplete-information games to determine primitives (payoff parameters, signal distributions, cost functions) using observational data (Aguirregabiria and Mira, 2007; Bajari et al., 2010). I study estimation schemes: (i) associated with reduced-form tests, (ii) with simultaneous equations and equilibrium moment-matching, (iii) with maximum-likelihood together with simulated maximum-likelihood and simulated method-of-moments of multi-equilibrium games on one hand, and (iv) the problem of identification due to multi-equilibrium and unobserved heterogeneity, on the other hand. They are auction models that estimate the value distributions of privates and entry models that estimate the fixed and variable costs.

Application of case-studies and mechanism design

I take people through real-life examples of applications of game theory in policy and design: spectrum auctions (Milgrom, 2004), school-choice matching markets (Roth, 2002), emissions trading and the design of public goods, and the design of microfinance contracts (Banerjee et al., 2013). To each case study, I present the strategic setting, model the game in question, generate design goals (efficiency, incentive compatibility, budget balance) and comment on the empirical assessment and findings.

Strength and extensions of behavior

Since the classical predictions are being empirically violated, I incorporate behavioral models, such as inequity aversion (Fehr and Schmidt, 1999), low strategic sophistication (level-k, cognitive hierarchy), and poor recall to assess the change in predictions, and the potential of improved performance under behavioral restrictions by alternative mechanisms (Camerer et al., 2004).

Synthesis and policy implications

I combine both theoretical and empirical knowledge into prescriptive advice to mechanism design and institutional choice. Where feasible, the counterfactual simulations and sensitivity checks (based on parameters obtained by experiment or field data) are employed to show the possible benefits that alternative designs would have.

Constrained and methodological constraints

I directly discuss the shortcomings of each method external validity in laboratory experiments; selection and identification problems in structural estimation; computational complexity in multi-agent simulations; and ethical issues in field experiments. Suggestions on triangulation, or the integration of experimentation, structural estimation, and the qualitative process tracing are highlighted.

Manual handling and repeatability

To emphasize the applied work, I promote the concept of open documentation: I want to spread exclusive of the experiment protocol, source for equilibrium computation, and data (Kontingency to privacy and ethical provisions). This multi-pronged methodology is a roadmap to the researchers that wish to make the transition between abstract models and empirically plausible applications by marrying formal theory and data and design (Nisan et al., 2007).

Data Analysis and Discussion

This part summarizes empirical regularities of laboratory experiments, field research and structural estimation of how game-theoretic models do in the real world. My topics of analysis are cooperation and public goods, market design and auctions, and strategic voting, and political bargaining.

Collaboration and social welfare

Experiments on the laboratories that involve the use of partial cooperation are always observed when the selfish preference is taken and the full cooperation is not achieved (Ledyard, 1995). Contributions are increased significantly through repetition, communications and sanctioning institutions (Fehr and Gachter, 2000). Field experiments e.g. community resource management intervention- Field experiments demonstrate that institutional design (monitoring, graduated sanctions) is relevant to maintaining cooperation (Ostrom, 1990; Suri & Watts, 2011). Many of these patterns can be described by behavioral models that have social preferences (inequity aversion, reciprocity) (Fehr and Schmidt, 1999).

Market design and auctions

One obvious testing ground of predictive and prescriptive success of game theory is provided by the auctions. Most of the properties observed in theory are recreated in experimental auctions: dominance-strategy bidding in second-price auctions, shading in first-price auctions, and revenue ranking when subject to the usual assumptions (Kages, 1995). The structural estimates on the auction data enable the platform designers and regulators to estimate the revenue effects of format shifts; empirical work was used to design the spectrum auctions and online ad auctions (Milgrom, 2004). Imperfect information between bidders, reserve pricing and collusion risk are important caveats that needs more complex models and regulatory provisions.

Voting, bargaining, political economy

Game theory is used to make predictions of strategy voting, coalition-building, and legislative bargaining. Empirical evidence indicates varied results of Downsian spatial models of vote-seeking, on one hand, party positioning in two-party systems can be considered as a replica of median preferences, whereas multi-party systems with non-homogenous voters make predictions difficult (Downs, 1957; Cox, 1997). Experiments within the sphere of laboratories (ultimatum, bargaining games) indicate the issues of fairness and effects of threats (Guth et al., 1982). Signaling models can explain some of the behavior in the crises in international bargaining and conflict, yet there are rationalist puzzles (Fearon, 1995).

Table numbers 1

Domain	Game Model	Key Insight
Public Goods	Prisoner’s Dilemma / Public Goods Game	Cooperation often exceeds purely selfish prediction, enhanced by communication and sanctions
Auctions	Second-Price / First-Price	Optimal bidding strategies depend on information and risk preferences; revenue depends on design
Oligopoly	Cournot / Bertrand	Firms strategically choose output/prices; tacit collusion can emerge

Discussion of findings

Institutional detail matters. Across domains, simple game models illuminate strategic incentives but institutional specifics—timing, feedback, enforcement, communication channels—determine outcomes. For example, the repeated nature of interactions and possibility of punishment enable cooperative equilibria that one-shot models cannot predict (Axelrod, 1984; Ostrom, 1990).

Application	Game Model	Observed Outcome
Spectrum Auctions	Bayesian / Mechanism Design	Efficient allocation, higher revenue, strategy-proof bidding
School Choice Gale-Shapley Matching	Stable assignments	truthful reporting encouraged
Microfinance Groups Repeated Public Goods Game	Peer monitoring improves repayment,	cooperation sustained

Predictions are redefined in terms of behavioral preferences. The addition of social preferences (altruism, inequity aversion) and limited rationality (level-k thinking) leads to much better empirical results in the bargaining and public goods game (Camerer, 2003; Fehr and Schmidt, 1999).

Multiplicity and selection of equilibrium. A large number of games make more than one equilibrium, empirical work typically needs to choose equilibria or experimental procedures to recognize which equilibria are achieved (Schelling, 1960). This multiplicity in the case of market design suggests that mechanisms can also be performance dependent on focal points and learning processes in addition to purely statical properties.

Structural estimation is identified to have predictive power but identification problems. The modeling assumptions and tools necessary to estimate payoffs of observational strategic behavior are quite strong; however, effective implementations of both auctions and entry models offer counterfactual analysis of policy (Aguirregabiria and Mira, 2007).Field experiments fill the gap between theory and practice. Properly designed field interventions such as monitoring regime assignment randomization in collective action conditions measure the performance of mechanisms in real institutions which is essential external validity (Banerjee et al., 2013).

Discussion

The integration of the theoretical framework and empirical research demonstrates a subtle image of the strengths and weaknesses of game theory. On the one hand, game theory provides specific conceptual instruments that explain incentives, predict the strategic reaction to the institutional alteration, and mechanship design. The success stories of auction and matching theories are where theory had direct policy and industry application with direct benefit to the welfare and revenue that are measurable (Milgrom, 2004; Roth, 2002).

Yet, behavioral realism and institutional detail usually need to be incorporated to translate equilibrium predictions into correct empirical predictions. Experimental studies in laboratories have revealed a systematic deviation of human players not only to maximize their payoffs directly but to also exhibit fairness, reciprocity and little foresight in maximisation, such that naive use of Nash predictions can be misguided. Another practical challenge is that behavioral game theory offers alternative primitives which fit data better, and more importantly are a recommendation of different design choices: classical theorized mechanisms may continue to be optimal when agents are boundedly rational, but simpler heuristic-robust rules can sometimes work better in practice (Camerer, 2003).Another practical problem is the equilibrium multiplicity. Various equilibria can arise in a wide range of strategic environments (coordination games, entry deterrence, multi-stage bargaining) and the choice will be determined by the expectations, focal points, and historical path dependence. This means that policy interventions have to take into account equilibrium selection devices, which can be communication, focal payoffs, or commitment mechanisms, to influence the system to a preferred direction (Schelling, 1960).

Structural estimation techniques allow policy analysis through counterfactual analysis and counterfactual assessment but encounter obstacles of identification. Equilibrium selection rules frequently have to be assumed by researchers, or they have to exploit exogenous variation (natural experiments, instrumentation) to estimate parameters. Integrating randomized experiments with structural models, that is, so-called structural field experiments, promises fruitful leverage to not only estimate deep parameters, but also to test the robustness of mechanism (Heckman, 1992).

The issue of network structure and heterogeneity is relevant. Recent developments in the network game theory and empirical social-network analysis demonstrate that the topology influences strategic influence and diffusion: central actors have an opportunity to catalyze diffusion because of the influence of network clustering and local incentives, which may form pockets of persistence to global change (Jackson, 2008). Therefore, behavior changing policies such as vaccination campaigns and use of technology should take into consideration network position and peer effects.

Lastly, there is also greater relevance to computation and algorithmic considerations. In digital markets and with complex markets, the implementation of the mechanism in real time needs scalable algorithms and guarantees regarding approximate equilibria. The study of algorithmic game theory bridges the complexity limits and economic design to make the theoretically optimal mechanisms computationally solvable and hard to manipulate by automated agents (Nisan et al., 2007).

In conclusion, game theory cannot be done away with in the analysis of strategic interaction. Its usefulness is most fully exploited when models are tuned to behavioral evidence, when institutional aspects and the multiplicity problems are explicitly addressed, and when computational considerations are taken into account in order to implement them in the modern platforms.

Conclusion

The theory of game has significantly influenced the study of strategic interaction in economics and the social sciences, in general. Since its formal origins in expected utility theory and Nash equilibrium, game-theoretic thinking has changed the way scholars and policy-makers think about the problems of in-dependent decision making.

Theoretical advances Bayesian games with private information, repeated games with reputation and cooperation, concepts of cooperative solution to coalition formation and mechanism design to engineer the institutions give a highly useful toolkit to diagnosing the incentives of strategic behaviour and designing policies to bring the actions of individuals in alignment with collective goals (Myerson, 1991; Fudenberg and Tirole 1991). Mechanism design has also left the realms of abstraction and theory for practice, as examples of mechanism design include spectrum auctions, matching systems in school choice and medical residencies, and designs of online marketplaces. These applications can prove that well-constructed rules can be used to improve welfare by inducing truthful information, efficient resource allocation, and eliminating strategic inefficiencies.

Classical predictions have been proven right and wrong by empirical work. Structural estimation and policy-relevant counterfactuals have been found to work with auctions and some market settings; laboratory experiments have affirmed most theoretical predictions as well as explicating systematic deviations which are due to social preferences, limited rationality and framing effects (Camerer, 2003). Good examples of this are the provision of public goods and collective action, whereby theoretically it has been demonstrated that free-riding needs to be supplemented with institutional mechanisms watchdog, sanctions, and communications, in their quest to explain observed cooperation (Ostrom, 1990; Fehr and Gachter, 2000). Triangulation enhances the strength of causal inferences and increases the external validity in cases where the weaknesses of each strategy are considered.

The literature and applied experience are subject to several themes. First, institutional specifics are important: minor variations in timing, observability, or enforcement may do nothing but change equilibria and cause divergent outcomes. The theory offers advice on incompatibilities of incentives though it must be applied considering contextual limits. Second, behavioral realism is more predictive: the use of social preferences and restricted strategic rationality can frequently be accurate and generate different policy prescriptions. Third, when multiple equilibria are present, and coordination is an issue, they require explicit selection schemes, such as salient focal points, credible commitments or adaptive learning rules, in order to achieve desirable equilibria. Fourth, network structure and heterogeneity determine the effects of diffusion, strategic influence; policies that affect the central agents or bridging nodes can enhance the effect. Fifth, algorithmic complexity and mechanism design In computational constraints and the existence of an agent that is an algorithm, the complexity and mechanism design of algorithms must be considered.

In the future, there are a number of avenues of research that are promising. Combining game theory and machine learning would be an effective way to enhance the predictions of the equilibrium selection and deliver adaptive mechanisms that learn through the data without breaking the incentive properties. Structural field experiments Structural field experiments combine interventions with structural estimation, which provide an effective pathway to the discovery of deep behavioral parameters and prediction of long-run policy effects. The next step of robustness, which is to create mechanisms that are robust to distributional uncertainty and limited rationality, will enhance the practical uses. The lessons learned are obvious: platform-based strategic interaction on a large scale provides a rich source of data as well as poses new challenges in terms of privacy, manipulation, and algorithmic fairness; game theory can be used to inform the design of regulation in such areas, but it should be accompanied by empirical experimentation, behavioral diagnostics, and iterative design. Where the stakes are large, as in spectrum allocation, in matching schools, in climate accords, it is as important that these should be robust and transparent as it is that they should be optimum. The simplicity of mechanisms can help to facilitate adoption and compliance, strategy-proof or strategy-proof-like institutions cut the mental workload, and unintended games.

Training social scientists in both formal and empirical techniques in education and interdisciplinary collaboration can improve the abilities to design, test and refine institutions. The development of theorist-experimentalist, theorist-economist, theorist-political scientist and theorist-computer scientist partnerships will result in the creation of analytically sound, empirically validated and computationally-feasible mechanisms.

To sum up, game theory still comprises a staple of the social-science. Its strength lies in a two-fold ability: (1) to explain incentives and expose the underlying strategic tensions which inform the collective results, and (2) to prescribe institutional structures which can repurchase individual incentives and social objectives. By merging theory with sound empirical applications and reflective of behavioral facts, game theory provides useful mechanisms of addressing significant economic and social problems.

Recommendations

1. Use behavioral models (social preferences, bounded rationality) in the application of the game theory to real populations.
2. Adopt mixed-methodology: lab experiments, field experiments and structural estimation should be used to prove models.

3. Simple, strategy-robust and transparent design mechanisms to make them easy to adopt and difficult to manipulate.

4. Explicitly account Equilibrium multiplicity account Make the choice with focal mechanisms or communication devices or commitment devices.

5. Take into account network structure during policy development and focus the intervention on high-impact nodes.

6. Implement institutional innovations with randomized controlled trials when possible and external validity in institutional innovations through structural modeling.

7. Focus on computational viability of mechanism implementation on online platform and real time markets.

8. Encourage sharing of protocols and data of experimental procedures about their reproducibility.

9. Invest in interdisciplinary education in formal game theory, empirical, and computer skills.

10. Research the methods of algorithmic game theory to make sure that mechanisms are not susceptible to automated strategic action.

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