Svetlana Pevnitskaya

Research Statement

The research methodology applied in most of my studies can be described as theory-driven experiments, which involves developing or adapting a theoretical model (often game theory- or decision theory-based) to reflect the setting of interest, designing an experiment, collecting data, and testing the consistency of theoretical predictions with observed human behavior. In the presence of systematic deviations, I aim to identify the behavioral phenomena driving them and adjust theory. I used this methodology to investigate a range of settings including public and environmental economics, dynamic social dilemmas, decisions under risk and uncertainty, auctions, bargaining, and networks. I also raise the question of how welfare can be improved, be it of individual decision makers or the system/society overall. The latter objective is particularly prominent in the line of research on dynamic social dilemmas with applications to environmental decisions, described below. These studies highlight the tradeoffs that may exist between individual and social considerations, identify the impact of heterogeneity in pro-social preferences on the outcome, and propose innovative mechanisms that improve social welfare.

I have a long-standing interest in environmental economics and climate change and have experience in interdisciplinary work in this area. I became a research partner of the Institute for Energy Systems, Economics and Sustainability (IESES) which included faculty from various fields. Through the institute I obtained two grants (was a PI on one of them) that resulted in multiple refereed publications, and also collaborated and published with interdisciplinary scholars. One of my funded projects (PI) generated a series of papers investigating dynamic games with a public bad that is a byproduct of private production, with applications to environmental decisions and the long-term effect of pollution and climate change. Paper "The Effect of Access to Clean Technology on Pollution Reduction: an Experiment" (with Dmitry Ryvkin, *Games and Economic Behavior* 2022) extends the literature by introducing a more realistic setting to the study of environmental decisions: an option to invest in clean technology. In addition, the paper proposes two institutions for sharing the benefits of investment in clean technology: one where an agent can clean only *own* technology (private access), and another where each agent's investment reduces *everyone's* propensity to pollute (common access). We also investigate the impact of the availability of communication among group members. We find that subjects choose to invest in clean technology, leading to lower pollution and higher payoffs compared to settings without such option. Common access institution leads to greater efficiency and lower pollution, despite the possibility to free-ride on others' investments. This is driven by heterogeneity in pro-environmental/pro-social preferences and the willingness of some subjects to overinvest (compared to their fair share) to compensate for those who do not invest enough. Better performance of common access mechanism is preserved in treatments with communication.

This setting provides a rich environment for extensions. One of the extensions that allows modeling a variation of environmental and climate change impacts is introducing uncertainty to the cost of the public bad. The setting we considered was more reflective of pollution in a sense that if the public bad exists, it imposes a certain fixed cost proportional to its size. Introducing uncertainty to the magnitude of the cost of the public bad (climate change) or introducing a new variable that measures the likelihood of incurring the cost, would allow using this setting to develop policies pertaining to economic impact of a larger variety of environmental phenomena, for example hurricanes or droughts. In addition, the setting

studied in my previous work assumed that only part of the public bad carries over to the next period, for example that some of the pollution is naturally cleaned away. Relaxing this assumption would allow modeling progressive environmental phenomena, for example salinization, which require greater mitigation efforts.

One of my areas of expertise is the analysis of auctions. In the studies of auctions and markets I have been interested in the overall performance and efficiency as well as in individual behavior. My first publication on auctions "Endogenous Entry Equilibrium in First Price Private Value Auctions: An Experimental Study", with Thomas Palfrey, confirms that individual characteristics and their heterogeneity affect entry to and behavior in markets, leading to a different selling price than if we were to ignore such characteristics. I have also investigated theoretical and behavioral impact of uncertainly about the market environment (for example the number of bidders in the auction) and the effect of charity preferences. My work on auctions included examining innovative mechanisms, for example survival auctions, which provide (nearly) full efficiency, similarly to clock auctions, but are more practically attractive due to the limited and known number of stages. Another example is the study of the indicative bidding mechanism that has been used in the sale of high valued assets (for example companies) when the seller prefers to preserve the privacy of some information about the object, not reveal everything about the company to all potential bidders, and rather to provide the additional and full information only to select final bidders.

My interest in decision-making under uncertainty extends to my recent interest in networks. Working paper "Information aggregation in directed networks," with Chris Brown, investigates decisions when in addition to own private information a person observes select previous choices by others. We investigate whether and how access to information about previous choices of others improves accuracy of a single irreversible choice in settings where learning from repetition is not possible. Many important decisions, including for example a selection of a medical procedure or surgery, are done in such circumstances. We use networks to model exactly which agents view which choices of others. The paper presents properties of networks that improve accuracy of the whole group (*social criterion*) or of the final decision-maker (*individual criterion*), with the former informing on collective decisions by committees and the latter on organizational structures with a leader and ultimate decision maker. We conduct an experiment to test theoretical predictions and employ experimental design with two treatment variables: 1). the structure of the network and 2). the assignment to positions within the network, which can be random or endogenous. Behavior of Bayesian agents serves as a theoretical benchmark. We also simulate Bayesian decisions based on experimental data to serve as our hypotheses for testing consistency with observed human decisions. In addition to confirming theory, albeit with efficiency loss compared to Bayesian agents, the experiment allowed us to identify impactful behavioral phenomena. In treatments with endogenous assignment (done via allocation mechanism that was designed for this setting and reveals positions' valuations), more sophisticated subjects better understand the benefits of observational learning and are bidding higher for later positions. This leads to less sophisticated subjects ending up in early positions, generating noisy early choices, and eroding the expected payoff premium of being later in the network. We also find that individuals tend to disregard own signal (more than they should) in favor of observational learning when the number of observed actions by others is increasing. The combination of both of those findings is concerning for organizations where the final decision maker's accuracy matters the most. If the CEO is the most sophisticated agent and is most qualified to make an assessment, the result may be suboptimal if correct judgements are missed in the early stages, particularly since the final decision-maker will have a tendency to disregard own signal and rely on

observational learning. Our follow up paper studies the effect of overconfidence in this setting, and I am also planning a number of extensions.

In my studies of bargaining, I investigated the effect of reward and punishment options, as well as the impact of the *locus-of-control* personality trait on behavior (joint work with Dmitry Ryvkin). I also explored a modification of bilateral bargaining setting to investigate behavior when one party can take the resources of another party, which can be applied to issues ranging from robbery to international conflict. In a working paper "Bargaining under a threat," with David Johnson, we study decision making in a setting where one party can take assets of another party and face uncertain consequences. The party under the threat of the attack can try to bargain to avoid it, and make an offer to the potential offender. We study behavior of both parties and investigate the effect of (deterrence) policies by varying the likelihood of the offender being caught after the attack (example: improving law enforcement) and the amount of penalty imposed on the offender if caught (example: changing the legal code for such crimes). I also have solo work-in-progress "The effect of perceived similarity on fairness and bargaining" that investigates the effect of perceived differences between parties on their economic decisions. I investigate changes in the behavior of the proposer and responder depending on whether the other party is perceived as being the same or different. The results inform on the outcomes of economic engagements, explain the variation in assessments of what's fair, contribute to our understanding of other-regarding preferences, and explore whether the specific bargaining role is more affected by these behavioral considerations.

Considering the rapidly growing interest in AI, I mention my work "An Initial Implementation of the Turing Tournament to Learning in Two Person Games," with Richard McKelvey and Jasmina Arifovic, which presents the novel method of evaluating learning models and, specifically, measuring how accurately they represent human behavior. One can consider the AI approach two-fold here. On the one hand, the question of having a learning model that precisely mimics how people make choices in repeated settings speaks directly to the question whether AI can simulate and replace human decision-making, a long-standing question with a notable example of the classic Turing Test. On the other hand, our novel method introduces an algorithm (one can say also an AI) that aims to detect whether the behavioral/choice data presented for evaluation has been generated by a human or a machine. We call the latter novel entity a "detector." We selected a representative, small but sufficiently diverse, set of two-person games which the same pair of subjects played over a number of periods. Data from some of those periods was used to calibrate the parameters of the learning models, which then generated data to be compared with human choices in the respective/remaining play periods of the specific game. The detectors were presented with datasets, human or machine generated, and assigned the likelihood whether it was human. We proposed evaluation methods for aggregating the scores of the detectors to identify the winners of the tournament, with the winning learning model being the one coming closest to (i.e. being non-distinguishable from) human behavior. This work provides fertile ground for future extensions.

My other ongoing and past projects are listed in the CV and include additional areas of research interests, for example individual behavior under risk and uncertainty.