Research Statement for Eric Set

My research concerns the origin, quantification, and impact of phenomenon often studied under the label behavioral economics. Most of my research favors the tools of experimental economics, although I frequently borrow techniques from other disciplines, such as genetics or psychology. I believe strongly in the value of introducing new methods and perspectives to confront economic questions, which I feel I have been able to do with each new project.

The aim of the research described in my job market paper, “Overreacting to biased information: experimental evidence,” is to enable a different approach to the long-studied problems of persuasion and biased information. It is not difficult to believe that people may be boundedly rational when faced with biased information, and certainly this would have significant implications in many domains, including politics, but quantitative models of individual behavior are lacking. To bridge this gap, I designed a novel laboratory experiment, inspired by a model of electoral competition, to measure how people actually respond to information bias. My task, which I call the Campaign Game, sets up a game of informed Candidates persuading a decisive Voter. In order to shed light on cognitive aspects of information processing, confounding factors, like preferences and candidate strategy, are meticulously controlled through the payoff structure and relative uncertainty. I implemented the task in z-Tree, a standard software package for experiments, and ran sessions in university computer labs with undergraduate participants. An anonymous supporting task and post-experiment survey was also conducted to get a sense of participants’ thinking during the task and their attitudes to the political frame. I analyzed the data by projecting it onto a simple model I developed that translates differences in belief updating between neutral and biased messages into a few interpretable parameters. This strategy has the advantage of being relatively easy to integrate with other behavioral findings, such as non-expected utility or even non-Bayesian updating, and is anticipated by the experimental design. Analyzing the data at both the aggregate and individual levels revealed Voters who were naïve to the information bias of Candidates when updating, leaving them open to persuasion. Many participants remarked directly on the necessity of taking into account the Candidates’ motives and strategy, however. This suggested that making these facts salient would not be sufficient to prevent persuasion, calling into question the effectiveness of common real-world interventions, like requiring the disclosure of competing interests. To test this hypothesis, I ran additional sessions with a message to subjects presented halfway through the experiment. This message emphasized the Candidates’ motives and their self-centered communication strategy. If the message had an impact, one would expect to see a sharp improvement in the later rounds that exceeded the improvement observed in the previous sessions (which was very low and not statistically significant). In fact, performance after the message was not better, and even slightly worse. Further analysis, in which I grouped rounds according to the relative difficulty in making comparisons, revealed a pattern of adjustment that is consistent with well-known heuristics, with unfortunate shortcomings. Finally, while discussing the results of my experiments, I translated the main findings into a simple model and applied it to the question of negative political campaign advertisements. The exercise produced the novel conclusion that some complaints about political attack advertisements can be ascribed to an association with the negative surprise in candidate quality that often follows. Although a small step, I hope this
research nudges the field towards considering bounded rationality of a particular form when studying the effect of persuasion and bias.

Social cognition is also the theme of my paper, “Dissociable contribution of prefrontal and striatal dopaminergic genes to learning in economic games,” with Ignacio Sáez, Lusha Zhu, Daniel Houser, Noah Myung, Songfa Zhong, Richard Ebstein, Soo Hong Chew, and Ming Hsu. As the title suggests, in this paper we turned inwards towards biology. Combining research in behavioral and neuroeconomics with genetics, we studied how variation in dopaminergic pathway genes leads to differences in how people play a competitive economic game. In a departure from most studies of genetics and economic decision-making, we adopted a pathway-focused approach. Specifically, our study emphasized twelve genes with clear functions within the dopaminergic synapse pathway as described by the Kyoto Encyclopedia of Genes and Genomes (KEGG), a manually curated database of biochemical pathways and other biological spaces. The pathway approach offered a balance of relevance, interpretability, data efficiency, and statistical power over other common strategies, the genome-wide association study and the candidate gene study. Compared to genome-wide association studies, which look at individual SNPs, many of which are unstudied, our strategy exploited variation at the gene level, where the products of genes are better defined and understood. Relative to candidate gene studies, we relied less on the availability of highly specific biological knowledge and adopted a perspective that was more appropriate for when small genetic changes have a cumulative effect, as one might expect with economic behavior. We had 218 ethnic Han Chinese subjects at the National University of Singapore play a computerized implementation of the so-called Patent Race game, in which two players with asymmetric endowments make a decision about how much to invest (and potentially waste). The player investing strictly more than their opponent wins the prize. Behavior in this game is well characterized by the Experience-weighted Attraction (EWA) model of strategic learning. We combined the behavioral data with the subjects’ genetic data, comprised of over 700,000 biological markers (both single-nucleotide polymorphisms and variable number tandom repeat), gathered in previous studies. In our analysis, individual dopaminergic genes were represented eigenSNPs formed from principal components to overcome problems created by high correlation among markers within a gene. The eigenSNPs were embedded into a gene-enriched extension of the EWA model. We targeted two parameters of the model – one capturing a learning rate, and another allowing for a degree of learning on counterfactual outcomes that can related to beliefs. Research in neuroeconomics has linked these parameters to brain structures intimately tied to dopamine function. The fit of the enriched models were evaluated against two distinct benchmarks. To determine whether the gene under analysis had a significant effect, p-values were determined by permuting the data, separating the gene-behavior link. To determine whether any genetic influence we detected exceeded the influence of a typical background gene, we compared the fitted model to those generated by statistically similar genes outside the dopaminergic pathway. Ultimately, we found high agreement between the two. We also conducted similar analyses exploring the possibility of genetic interactions with the help of external computational resources. The results, combined with knowledge embedded in the pathway maps and previous findings, allowed us to draw a link between two aspects of strategic learning, specific neurological structures, and genes whose proteins perform distinct functions in the dopaminergic system. We plan to extend this project to other pathways, more complex models of genetic interaction, and even imaging genetics.
(imaging data has been collected). Our research into the dopamine pathway was published as an article in the Proceedings of the National Academy of Science in 2014. Ignacio Sáez, Ming Hsu, and I discuss the pathway plus computational model approach at length in a separate article, "From genes to behavior: placing cognitive models in the context of biological pathways," published the same year in Frontiers in Neuroscience.

From genes to an entirely different level of abstraction, "How prosocial preferences can aid institutional capture," is a project in its early stages that concerns itself with the development of institutional norms, especially negative ones. My interest, inspired by anecdotes about oppressive institutions, is in the possible influence of two established patterns in social preferences: that people care about the welfare of others, and that closer relations weigh more heavily than distant ones. Although the study of social and other-regarding preferences is one of the most mature areas in behavioral economics, research exploring the implications beyond small groups is limited. I started with the idea that co-workers one sees on a regular basis are relatively close – one cares about them more than one cares about a stranger. Interactions in an organization are modeled as a series of stag hunt games played by members represented by nodes in a graph, following in the style of the literature on learning by large groups. I extended this model by modifying the stag hunt game, assuming that some individuals have social preferences. In the simplest case, employees incorporated the earnings of colleagues in their own preferences to some degree. As in earlier institutional learning models, agents first adopt a strategy – to hunt stag, which pays better but succeeds only with cooperation, or hare, which has a lower but reliable payoff – and then they interact with a random neighbor. In this simple model, my interest is in the development of dishonesty and corruption that benefits from collusion: for example, colluding to leave work early, or to looking the other way when a colleague takes liberties with government resources. As in similar models, most agents select their strategy based on their prior experiences, with some small chance of random "mutation." Intuitively, the individual chooses stag once it is sufficiently popular among their neighbors. Relative to a stag hunt without social preferences, more socially motivated workers choose the dishonest action more easily, as their closer colleagues benefit and the negative consequences are assumed to be distant and abstract. Using data generated from emails collected in the prosecution of Enron, I simulated the decisions of hundreds of works in a small organization with a complex network structure. Besides confirming that social preferences could sometimes increase the rate at which the organization predominantly chooses the stag (corrupt), the simulation also provides interesting new insights. For one, centrally located individuals can be highly influential, though they themselves are more difficult to influence. A real-world case prediction is that a middle manager who interacts with many lower ranked workers could be more influential to the institutional culture than a higher ranked manager who works only with a few others. Such a high-ranking but unconnected manager might even work in a distinct culture, as the simulations also illustrated how smaller subgraphs – perhaps special units within an organization – were more likely to have a behavioral norm in contrast to the rest of the organization. I next plan to test the main hypothesis, that social preferences can precipitate a situation in which corruption is the norm, in an experimental setting. Simulation and theoretical results from this project were presented at the Southern Economic Association meeting in 2015.
I have been fortunate to collaborate extensively with Ming Hsu and the Neuroeconomics Lab at UC Berkeley. These projects often involve special populations, including lesion patients, former inmates, and individuals scoring highly on measures of psychopathy. Designing and administering experiments for these populations sometimes has unusual requirements. Lesion patients, for example, are valuable for establishing a causal link between neural structures and behavior. However, these patients frequently exhibit language and attentional deficits that prohibit the use of standard behavioral economic task implementation used primarily with undergraduate students. Research with lesion subjects was conducted with Lusha Zhu, Anna Jenkins, Ignacio Sáez, Donatella Scabini, Robert T. Knight, Pearl H. Chui, Brooks King-Casas, and Ming Hsu. Similarly, in a behavioral analogue of a brain lesion, the constellation of traits that define psychopathy include only an instrumental regard for the well-being of others that contrasts with the widespread finding that most people care about others, i.e. have social preferences. However, the educational background and cognitive abilities of these individuals are diverse, and emotional control is a possible problem. I was fortunate to have the expert guidance of psychopathy researcher Edelyn Verona, of the University of South Florida, with Michael Kruepke, Alexander Slade, and Ming Hsu. Two projects featuring more conventional subjects, exploring framing and time preferences, as well as rationality and social preferences with stereotypes, are also in progress.

My affinity for special populations and genetics was anticipated by an early study, “The heritability of attitude toward economic risk,” in which I and my coauthors, Songfa Zhong, Soo Hong Chew, Junsen Zhang, Hong Xue, Pak Sham, Richard P. Ebstein, and Solomon Israel, measured the heritability of risk preferences using Chinese twins and a classical twin design. In this design, differences between the correlations of monozygotic and dizygotic twins are exploited to estimate the contribution of genetics to risk preferences. The subjects ranked three options in a simple incentivized risk task designed for a diverse range of ages and educational background. Comparing the polychoric correlations established a strong genetic influence, and a more formal estimate of commonly used structural model pointed to the importance of nonadditive genetic effects (around 57%, versus 0% for additive effects) in determining risk attitudes. In 2009, this paper was published in Twin Research and Human Genetics and has been cited over 50 times (as of Nov 2016).

In summary, I am attracted to novel approaches and perspectives using behavioral economics and mostly experimental economics methods with a wide-range of populations. The hope is that my research could have direct applications in the study of complex social systems, such as in political economy. Looking forward, I expect to continue my emphasis on the how and why people think the way they do, how and why (and when) people prefer the things they do, and the unexplored consequences of it all.

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