Research Statement

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My research interests lie in the areas of microeconomic theory, game theory, mechanism design and network economics. In particular, over the past five years, my research has been focused in three subfields: robust mechanism design, coalition formation and aggregation theory of expert opinions.

Research Area I: Robust Mechanism Design

I devote a large part of my time designing mechanisms in settings where the designer does not have enough information about the (potential) participants to be able to form a prior belief about characteristics of the agents. We have in mind a designer who is dealing with agents in a large and complex network (such as the Internet) and who lacks specific knowledge about them. For instance, the designer of an auction might not know whether or not a group of agents know each other and can collude or coordinate bids. In routing games, the designer might not know whether or not the agents can coordinate routes. My research creates robust mechanisms that do not use specific knowledge about the information held by the agents in the economy, but instead work for a wide variety of circumstances. I have published four of my papers in this area ([2] [4] [5] [6]), and two more are under review ([8] [9]). I have also advances in several additional projects in the area ([10] [12] [15] [16] [18] [19] [20] [22]).

Research Area II: Coalition Formation

My focus in the area of coalition formation over the past two year has been to construct equilibriums that predict which coalitions are going to form when agents are endowed with power (e.g. political or military) and there are externalities across agents. These problems often occur in political contests, where parties tend to form coalitions with other parties of similar ideologies rather than forming the grand coalition. In addition, externalities might be interpreted as altruism generated by cultural characteristics such as race, language, religion or ancestral

homeland (e.g. when there is homophily). As part of the project, three very general models have been introduced where agents are endowed with power and have externalities toward other agents. We investigate equilibrium notions that are stable to coalition maneuvers by the agents in the spirit of the core. This research originated as part of the funded AFOSR Coherence-Based Modeling of Cultural Change and Political Violence (CCPV) project while interacting with a broad range of scientists. My current AFOSR Young Investigator Program focuses on this area. Two papers are currently under review ([7] [10]) and one more is under preparation ([11]). Several experiments are currently under preparation (multiple pilots have been run with people from multiple countries, most notably Iran, Israel and Turkey) and I anticipate this will lead to more papers. Four UH undergraduate and graduate students have funded and are collaborating with me in this area.

Research Area III: Aggregation Theory of Expert Opinions
The last area of research I have concentrated on is aggregation theory. More specifically, I am studying the aggregators of expert opinions when experts do not share the same expertise. The intent is to axiomatize methods in different contexts, such as the ranking of students when they do not share the same set of classes or the division of money across different tasks when experts can only provide recommendation on the needs of some tasks. A joint working paper with UH student Chuong Mai is under review ([9]) and two more are under preparation ([16] [17] [21]).

Funded Project: Coalition Formation in Tournament Games with Externalities (2011-2014)
This proposal studies the formation of coalitions in tournament games. In a tournament game, every agent is endowed with a level of power (e.g. political or military). Agents form coalitions to compete for a prize. The coalition that forms with the largest power distributes the resources across its members. Such games have important applications, for instance in political contests or military wars.

The main concern of this proposal is to construct equilibrium notions that accurately predict which coalitions are going to form when agents are endowed with certain power and also have externalities toward other agents. These problems often occur in political contests, where parties

tend to form coalitions with other parties of similar ideologies rather than forming the grand coalition. Alternatively, externalities might be interpreted as altruism generated by cultural characteristics such as race, language, religion or ancestral homeland (e.g. when there is homophily).

This project introduces new models of coalition formation where agents are endowed with power and have externalities toward other agents. It investigates equilibrium notions that are stable to coalition maneuvers by the agents in the spirit of the core.

The intellectual merit of this project is to propose simple economies with externalities and equilibriums that predict which coalitions form even when the core is empty. This project also tests such equilibria in the lab and complements previous research done by the Air Force.

Coalition formation with externalities has broader impacts in political sciences and sociology, such as stability of economic and political unions or the formation of alliances across different cultural groups. This research agenda is complemented by the active recruitment of undergraduate and graduate students (especially from underrepresented minorities) into research.

This proposal is currently funded by the prestigious AFOSR Young Investigator Program. 43 young Investigators (within 5 years of PhD graduation) were funded from all fields in science and Engineering. The program is highly competitive, with success rates between 13 to 19% over the last three years.

Two published papers have been supported under this project ([5], [6]), three more are under review ([7] [8] [10]), two more are under development ([11] [15]) and several experimental projects are currently being performed.

REFERENCES

Publications

1. Dissection of cooperative solutions in game theory using representation techniques (Joint with L. Hernandez and F. Sanchez). *International Journal of Game* **Theory** 35 (3) 395-426 (2008).

2. The Worst Absolute Surplus Loss in the Problem of Commons: Random Priority vs. Average Cost. *Economic Theory 34 (1) 69-84 (2008).*

3. Solutions without dummy axiom for TU cooperative games *Economics Bulletin* **3** (1), 1-9 (2008)

4. Prior-free cost-sharing design: group strategyproofness and the worst absolute loss. *Social Computing and Behavioral Modeling* (2009)

5. Implementing Efficient Graphs in Connection Networks. *Proceedings of Electronic Commerce Conference* (2011), *Economic Theory* (2012)

6. Group strategyproof cost sharing: the role of indifferences. *Games and Economic Behavior* (2013)

Submissions

7. Stable Coalitions with Power Accumulation (joint with student Karl Jandoc) (2013) Under Review *Review of Economic Studies*

8. Optimal group strategyproof cost sharing (2013) Under Review *Economic Theory*

9. Optimal division of a dollar under ordinal reports (joint with student Chuong Mai) (2012) Under Review *Mathematical Social Sciences*

10. The no-threat equilibrium in tournament games with externalities (2013) Under Review *Theoretical Economics*

Working papers (drafts available on my website http://www2.hawaii.edu/~rubenj)

11. Three equilibria in Tournament Games with Externalities (2012) First Target: Games and Economic Behavior

12. Collusion-proof cost sharing (2012) First Target: Journal of Mathematical Economics

13. Convex rationing solutions (2012)
    First Target: Journal of Economic Theory

Work in Progress (preliminary progress available upon request)

14. Efficient allocations in water networks (joint with Karl Jandoc and James Roumasset)

15. Dividing a dollar under network Effects (joint with Rajnish Kumar)

16. Implement efficient allocations in bilateral networks (joint with student Kohei Nitta)

17. Monotonic solutions to the expert aggregation problem

18. Optimal collusion-proof mechanism in a network

19. Optimal group strategyproof mechanisms for divisible goods (joint with Sidartha Gordon)

20. Routing-proofness in congestion-prone networks (joint with Hervé Moulin)

21. Aggregating student rankings

22. Group strategyproof double auctions (a negative result)