The Project on Nuclear Gaming

Investigating how nuclear capabilities shape state behavior

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Outline

PoNG Introduction
   About PoNG
Research Setup
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   From Gaming to Theory
Concluding Remarks
The Project on Nuclear Gaming
Project Questions

• What impact do nuclear weapons capabilities have on deterrence and strategic stability?
• How can serious games be constructed and executed to place players in situations to model conflict escalation dynamics and nuclear deterrence?
Research Approach

• Three Types of Gaming Techniques
  – Scenario Analysis
    • Allows for expert-level, open-ended play
    • 3-player (Nuclear dyad in a multi-polar world)
  – Board Game
    • Allows for “structured” play
  – Online Games
    • Allow for large-$n$ playthroughs and analysis
    • Allows for multi-$N$ games
Research Outcomes

• Improved understanding of nuclear thresholds
  – Modeling crisis decision-making
  – Modeling escalatory behavior
  – Examining the nuclear thresholds, escalation dynamics, and “next turn” dynamics

• Demonstrate use of gaming techniques to address social science research questions
  – Expansion into non-state actor modeling
  – Expansion into “proliferation games”
Research Question

• Do nuclear weapons with alternate effects change the threshold of nuclear use?

• \( IV(\text{PlayerCapability}) \rightarrow DV(\text{NuclearUse}) \)

• Methodological Challenge:
  – The dearth of empirical data related to the effects of nuclear capabilities upon state behavior

• The Solution:
  – Rigorous, multi-dimensional war-gaming that provides an experimental setting for analyzing behavior (Wack 1985; Kupers and Mangalagiu 2013; Barma et al. 2015; Lytwyn 2017)
Continuum of Capabilities

- Conventional Weapons
- High-Yield Nuclear Weapons
- High Precision, Low-Yield Nuclear Weapons*
- Tailored Radiation Weapons*
- Electromagnetic Pulse Weapons*
- IT-enabled Cyber Weapons*

*denotes AERs
## Experimental 2x2

<table>
<thead>
<tr>
<th>Player 1 Capability</th>
<th>Player 2 Capability</th>
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<tbody>
<tr>
<td>Traditional (T)</td>
<td>Traditional (T)</td>
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<tr>
<td>AER (A)</td>
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Mapping Escalation Dynamics

Figure. Spectrum of Conflict with Nuclear Adversary

**Integrated Tools**
- Diplomacy
- Information
- Military
  - Conventional
  - Cyber/Space
  - Nuclear
  - Economic

**Decision Calculus** (specific to a decision)
- Costs of Action
- Benefits of Action
- Benefits of Restraint
- Costs of Restraint

- Adversary action
- US/Allied action
- Decision/Escalation Control Point
- Escalation Milestone

**Timeline**

- Rhetoric, R&D, Misinformation
- Conventional Conflict Begins
- Nuclear Capability Demo
- Other Dimensions of Crisis/Conflict
  - Hybrid Warfare
  - Asymmetric Warfare

**Intensity**
- Large Scale Nuclear
- Limited Nuclear
- Off-ramp
- Conventional Conflict

**Berkeley University of California**
Introducing the Game
Revisiting the Conflict Ladder

Figure. Spectrum of Conflict with Nuclear Adversary (Adm. Haney)
Theorized Game Outcomes

- **More Games Go “Nuclear”**
  - AER may deter conflict initiation, but provide wider pathways to nuclear use
  - AER may be destabilizing

- **Games Escalate “Slower”**
  - AER may be stabilizing

- **Games Escalate “Faster”**
  - AER may strengthen the stability-instability effect

- **Fewer Games Go “Nuclear”**
Risks and Challenges

• Variation in results across game outcomes
  – What inferences can be drawn from differing conclusions across game types?

• Findings are only as good as the simulation environment
  – Appropriateness of win conditions
  – Inclusion of relevant control variables
  – The games are set up to test “crisis stability”
  – Iteration unlike in the real world, these games “end”
  – “Gaming behavior”
Future Work

• Delivering game at various electronic gaming conferences:
  – Connections UK Wargaming conference in London (September 2018)

• Presenting at:
  – APSA, ISA, INMM, CSIS PONI, NWC, NDU, King’s College

• Workshop at University of California, Berkeley
  – In cooperation with LLNL and SNL (early 2019)

• Delivery of online game and data collection in early FY2019
The Team

Michael Nacht (PI), Bethany Goldblum, Andrew Reddie, Sarah Laderman, Roshni Iyer, Jake Tibbetts, Soravis Prakkamakul, Roshan Krishnan

Sheryl Hingorani (Co-PI), Jason Reinhardt, Laura Epifanovskaya, Kiran Lakkaraju, Joshua Letchford, Jonathan Whetzel; Matthew Sumner; Donna Djordjevich

Wes Spain (Co-PI), Cary Spencer, Craig Wuest, Andrew Reddie
Back-Up Slides
Game Structure
Coding Player Behavior

We code conflict classes based on data collected during the game.

- Classes are defined by collective set of player actions, and not on outcomes
  - Escalation is unilateral
  - De-escalation is unanimous
- Deterrence is a function of the choices made by the players, so outcomes are less important
- Classes are treated as a collective status, or as an aggregated assessment
  - Not currently looking at sub-player groupings, such as dyads
  - Raw data can be "re-classed" using other rules later to facilitate other questions

Player 1: Trade
Player 2: Threaten Military Action
Player 3: Do Nothing

Non-Nuclear Threat
Landing Page