Game Theory and Homeland Security Resource Allocation

Jun Zhuang, Vicki M. Bier
University of Wisconsin-Madison

In this work, we identify equilibrium strategies for both attacker and defender in a general model of whether and how the defender should disclose her resource allocation in the homeland security context. The key novel feature of our model is studying the defender options of whether to disclose arbitrary types of defensive information, including correct information (transparency), incorrect information (deception), or null information (secrecy). For simplicity, and to help ensure that we are focusing on the most fundamental reasons for secrecy or deception, we begin by examining this question in a single-target, single-period game.

In the case of complete information, our results show that secrecy is preferred to disclosure only under special circumstances (e.g., when the cost of disclosure is much larger than the cost of secrecy). In the case of incomplete information, however, our analysis shows that there some equilibria in which secrecy and/or deception can be strictly preferred by some types of defenders in order to mimic other types of defenders that are of less interest to attackers.

We propose to extend the model introduced to address situations in which the defender types (i.e., asset valuations) can be either discrete (binary) or continuous. Moreover, we plan to then model multiple-stage games in order to address more general phenomena, such as defender reputation effects and attacker learning over time. We hope that the results of this work will provide guidelines to defenders on the conditions under which secrecy and/or deception are appropriate in defending against terrorism, and when publicly known defenses can be expected to provide better deterrence.

Previous Publication:

- Zhuang, J and V.M. Bier. "Balancing Terrorism and Natural Disasters---Defensive Strategy with Endogenous Attacker Effort," *Operations Research*, in press.
- Zhuang, J, V.M. Bier and A. Gupta. "Subsidies in Interdependent Security with Heterogeneous Discount Rates," The Engineering Economist 52(1):1-20, 2007, in press.
- Zhuang, J and V.M. Bier. "Katrina vs. 9/11--How Should We Optimally Protect Against Both?" in Richardson, H., Gordon, P., Moore II, J. eds., Post-Katrina: Economics, Social Aspects, and Risk, Aldershot, England, Edward Elgar, in press.