Referee report on

**"Do Less-Violent Technologies Result in Less Violence?
A Theoretical Investigation Applied to the Use of Tasers by Law Enforcement"**

MS #331

The paper considers an important question in law enforcement: Given the widespread adoption of taser weapons by police departments in the U.S., is it possible that these weapons do more harm then good?

Conventional wisdom holds that, because tasers are perceived as non-lethal when used correctly, they reduce deaths in some cases where officers would otherwise resort to using firearms. However, there is a reverse effect. This arises because tasers could also be used in cases where officers would otherwise resort to lesser means, such as perhaps pepper-spraying a suspect. Thus, a taser gun can be a substitute for both more violent *and* for less violent technologies.

The paper tries to find out under which circumstances the first effect dominates, and when the second effect dominates. The results could inform us as to whether law enforcement officers should be issued tasers or not. (Note that this has nothing to do with the potential for tasers to be *ab*used or used incorrectly, which is a different set of questions altogether.)

In order to answer the question, a game theoretic model is developed in which a criminal decides whether or not to resist arrest by a policeman, and the policeman decides what type of technology to use to apprehend the criminal. Depending on the relative costs and benefits of using one technology versus another, the availability of a taser can lead to more or less violence in equilibrium.

I believe the motivation is an important one, and one which has drawn much attention in the literature as well as the media. I think, however, that the model used in the present paper is not very well conceived to answer the questions posed.

- It is assumed that "each player's selection occurs without knowledge of the other player's selection." So this is essentially a simultaneous move game; not one of deterrence, as the author notes. I think it would be much more realistic to assume that an enforcement officer decides to use a gun or a taser on a suspect *after* observing whether the suspect is resisting, and not indiscriminately.
- A criminal who does not resist receives the same payoff, regardless of the officer's action. So basically, the criminal's payoff from not resisting is the same, regardless of whether he is unharmed, tasered, or shot. Does this make sense?

- In the end of section 2, it is assumed that there is a λ chance that the criminal is hard-wired to "not respond to the enforcement official or her choice of technology." But I thought that it wasn't possible to respond to the other's action.
- What is the officer's payoff from arresting a non-resisting criminal? It is never specified.
- There is also some confusing writing. Why is does the criminal carry an index? There are just two players, the officer and the criminal; why do we need to call the criminal C_i?

It appears the results are then derived correctly, but given the flaws in the model I just do not know what I can really learn from the results.

To give an example, when comparing the harm done when a taser is available to when it's not, the author makes use of the assumption that "the harm is incurred only if the criminal resists arrest." As shown in the paper, there is a mixed equilibrium in which it has positive probability that the criminal does not resist and the officer still uses a taser. I would think that in this case there is, in fact, some harm done to the suspect, which the model assumes away. Thus, the comparison of harm done in various scenarios depends on an assumption that's untenable (in my view).

I think a more realistic model would perhaps capture the following elements:

1. The officer observes an exogenously given set of technologies available to him.
2. He then meets a suspect at the scene of the crime, and decides which of the available technologies to threaten the suspect with.
3. The suspect observes the officer's choice and decides whether to resist or comply.
4. If the suspect complies he is apprehended without incident. If he resists, the officer decides whether or not to use the selected weapon.

There would have to be payoffs specified for all terminal nodes of the tree, and then a subgame perfect equilibrium could be solved for. I cannot imagine that it would be more difficult to solve such a model, compared to the model presented in the paper, and I would be more confident that the results tell me something useful about the (doubtlessly important) questions that motivate the paper.