Recruiting Your Way to Victory:
Varying Strategies in Insurgent/Counterinsurgent Warfare

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Abstract
Bennett (2008) introduced an agent-based simulation of insurgency government which modeled the interactions of civilians, insurgents, and soldiers (government forces). That simulation allowed insurgents to could attack government (military) targets, and in turn be attacked and captured or killed by government forces. When government forces inflicted collateral damage, it risked creating new insurgents. This paper expands the initial model by adding the option for insurgents to recruit supporters rather undertaking a military attack, and adding the option for soldiers to “counter-recruit” by doing “good works” in the community. I find that recruitment by both insurgents and soldiers dominates undertaking military action unless government soldiers are both relatively ineffective and inaccurate when responding. But when soldiers are ineffective and inaccurate, we can see a variety of strategic interactions between insurgents and the government.

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Introduction

Bennett (2008) introduced an agent-based simulation of the early stages of an insurgency against a government. The simulation modeled the interactions of civilians, insurgents, and soldiers (government forces), allowing actions by insurgents who could attack government (military) targets, and in turn be attacked and captured or killed by government forces. Civilians constituted an audience for insurgent-soldier interactions, and could join or be deterred from joining the insurgency. The initial simulation focused on the conditions under which soldiers’ actions would lead to the growth or defeat of the insurgency. But the only actions available to either insurgents or soldiers in the first model were violent actions, with insurgents always attacking soldiers when given the opportunity, and soldiers always attempting to capture or kill insurgents in response. This neglected the possibility of peaceful recruitment, which we could conceive of as persuasion (possibly coercive) by insurgents, or a “hearts and minds” strategy on the part of a government. This paper introduces and explores a new version of the simulation that focuses on choices concerning recruiting vs. engaging in violent activity.

In particular, this study will use an agent-based simulation to address questions such as the following:

- Is there an optimal amount of non-violent recruiting that insurgents should do, rather than conducting attacks on government forces in trying to provoke a response?
- Does (or how does) the optimal insurgent strategy depend on context? For example, does the optimal level of recruitment depend on likely government responses? On the number of recruits that can be attracted by insurgents? On the effectiveness of recruiting in increasing the anger of recruited civilians? Or is there a dominant strategy such that an optimal balance between peaceful recruiting and violent action exists regardless of the setting.
- For governments, is there an optimal amount of counter-recruiting (as opposed to targeting insurgents militarily) that maximizes government effectiveness at defeating an insurgency? Does (or how does) this balance depend on features of the government (e.g., soldier accuracy or effectiveness, recruitment effectiveness), or of the insurgency (e.g., insurgent strategies, insurgent recruitment effectiveness)?
- Are government and insurgent strategy choices contingent on the strategy choices of the other party, or are there clear dominant strategies for each party? Or, are there circumstances under which there is a dominant strategy and other circumstances where no strategic interaction exists?

Questions such as these are important because in the real world, both insurgents and governments have a range of strategies they can employ to pursue their (opposed) goals. Effective policy vis-à-vis the opponent depends on thinking through the implications of these strategies. For example, while we might like to recommend to a government that it pursue a peaceful strategy of accommodation/persuasion when dealing with a particular insurgency, this strategy might be less effective at shortening an insurgency than a military strategy if
government military forces are highly effective. Peaceful recruitment of civilians to the
government side might be the best government strategy only if government forces are militarily
ineffective, or if government raids are likely to anger civilians by inflicting high levels of
collateral damage. Alternatively, if insurgents adopt a strategy with a large amount of
recruitment, it is possible that government counter-recruitment is not typically an effective
strategy and that only removal of the recruiting insurgents militarily is effective. The
government “best response” to insurgents might depend on insurgent characteristics, or on
government characteristics. But with a variety of factors in place, it is also quite possible that
best responses depend on some (possibly non-linear) combination of contextual factors.
Thinking through (or rather, working through) such non-linear combinations is an area where
simulation methods excel. While we might be able to write out a formal (rational) model of
insurgent/government interaction, as we will see in the development of the model here, there
are potentially a large number of relevant parameters and interactions that might make it
difficult to solve the resulting game to our satisfaction. Analyzing the results of a set of
simulations may also prove difficult, but examining outcome patterns is far from intractable.

I first examine these questions about government and insurgent strategies in isolated
models where I allow 1) only insurgent recruitment, with governments only having a military
response options, and 2) only government recruitment, with insurgents having only a violent
attack option. Then I move to a model that allows both insurgents and governments to engage
in recruitment. Because it has a much higher number of simultaneous “moving parts,” this
model becomes much more complicated to analyze than the separate models, but it is of
course realistic to think that government and insurgent options might interact and need to be
examined simultaneously. Below, I start by summarizing the initial insurgency model, and then
proceed to its expansion to allow recruitment.

**The Initial Model**

The simulation assumes two core types of agents: civilians, and soldiers. Soldiers
represent the government, or potentially troops of a supporting (or occupying) power. No
distinction for simulation purposes is made between government soldiers and international
soldiers; all soldiers are taken as representatives of a group to which the insurgents are
opposed. Civilians represent the mass of a population. Individual civilians are characterized by
a degree of anger at the government, a degree of fear of the government, and a propensity to
use violence under the right circumstances. An insurgent is a civilian who is willing to engage in
violence against the government, and specifically against a nearby soldier. Insurgents in turn
may be latent insurgents who are willing to engage in violence, or active insurgents who have
actually done so.

Growth of insurgency occurs in the model when ordinary civilians turn into insurgents,
which occurs under particular circumstances. The transition decision rule for the civilian agents
is that if a civilian is more angry than afraid, and if the civilian’s anger passes an individual
threshold propensity to use violence, then this civilian becomes a latent insurgent. This is a
civilian who is angry enough, and is not so afraid of the government, that they will attack a
government target (a soldier) if given the opportunity. If a latent insurgent is within a defined
range of a soldier and is given an opportunity, then the latent insurgent will conduct an attack and become an active insurgent.

Any attack by an insurgent is assumed to expose a previously-hidden insurgent, and allows a targeted soldier to respond to the attack by targeting the insurgent with a counterattack of their own. The intent of such counterattacks is to remove (capture or kill) the insurgent so that the insurgent is unable to make further attacks, and reduce the size of the insurgency. Such counterattacks may also deter other civilians from becoming insurgents by increasing their level of fear.

It is the government’s assumed goal to remove all of the latent insurgents from the world, thereby defeating the insurgency. But a soldier’s counterattack can sometimes backfire. The simulation models effects on both the targeted insurgent and surrounding civilians that result from counterattacks. First, a counterattack may remove (capture or kill) an insurgent. But this is not certain, as even effective militaries are not always able to capture or kill the insurgents that they pursue. Soldiers remove targeted insurgents with a probability equal to the soldier’s level of effectiveness. Second, a soldier’s counterattack may affect the anger and fear levels of surrounding civilians. Militaries run the risk of inflicting “collateral damage” or surrounding homes or individuals when they engage in anti-insurgent activity. The probability that a soldier’s counterattack inflicts collateral damage on each civilian in the neighborhood of the targeted insurgent is parameterized by the soldier’s level of accuracy (each nearby civilian is injured with probability 1-accuracy, and multiple civilians may be hurt in the soldier’s counterattack). When any civilian is hurt, his/her level of fear of the government increases (a deterrent effect), but their level of anger also increases in proportion to the total number of civilians injured by the soldier’s counterattack. Counterattacks against insurgents can thus backfire because they can create more insurgents than are removed if they increase the level of anger of a significant number of civilian agents.

With these features in place, the dynamic of the simulation is one where an insurgent attack triggers a response that may remove an insurgent, but also runs the risk of creating more latent insurgents. The relative risk of these occurrences, and the variety of interesting dynamics that can result from the model, emerge from the combinations of values on these critical parameters that influence the course of insurgencies. The main analytic focus of version 1 of the insurgency model was on tradeoffs and effect of the accuracy and effectiveness of government forces (denoted “soldiers”). That simulation indicated that it was very easy for counterattacks against insurgents to be self-defeating, and illustrated that an insurgency could grow rapidly and become widespread purely as a result of government actions against insurgents. It further suggested that a higher level of accuracy among government forces (avoiding civilian injury and the resulting widespread anger increases) was more important in defeating an insurgency quickly than was a higher level of effectiveness at capturing insurgents in any given counterattack, particularly if we hypothesize a real-world tradeoff between the two concepts.

The course of the simulation is that in each time tick of the simulation, one latent insurgent is randomly selected to attack a soldier in range of the insurgent. Following this attack, the soldier responds with a counterattack. With probability equal to effectiveness, the insurgent is removed from the simulation. Then, with probability equal to 1-accuracy, each civilian in the neighborhood surrounding the insurgent is injured. The level of fear of each
injured civilian in the neighborhood is increased, and the level of anger of each injured civilian is increased by an amount proportional to the total number of civilians injured. If anger and fear levels change appropriately, either latent insurgents in the neighborhood may become non-latent insurgents, or non-insurgents may become latent insurgents. In combination with the (possible) removal of the initial insurgent, this may lead to a net increase or decrease in the total number of latent insurgents. The simulation continues until all of the insurgents in range of a soldier that could be targeted are removed from the simulation, or the simulation hits a specified tick cutoff (typically simulated at 2000 or 5000 ticks, indicating a self-sustaining insurgency, which is typically quite obvious well before the cutoffs used in the simulations).

The simulation was programmed in Java using the RePast simulation libraries. RePast handles many standard agent-based simulation functions with ease, such as drawing and displaying maps and displays, keeping track of agents and their status, and recording the history of multiple simulation runs. Code was developed for the soldier and civilian agents, to specify the agents’ decision rules, and to specify the sequence of actions. A single iteration of the model can take from a few seconds (if the insurgency ends with 50 to 100 ticks), or a few minutes (if the insurgency becomes self-sustaining). Code for the simulation is available from the author (eventually on the author’s website).

The Recruitment Model

Version 1 of the insurgency model (Bennett 2008) produced very interesting and suggestive results about the dynamics of insurgency. It intentionally focused on insurgent actions and government reactions to show how insurgency may be abetted by poorly-planned (i.e. inaccurate) government responses. But the model assumed that both insurgents and governments had only one option available to them, namely to use violence. In reality, an important part of insurgent strategy is non-violent recruiting, and the choice of when to use violence (vs. wait) is an important decision both tactically and strategically. For governments, the importance of a more persuasive and peaceful “hearts and minds” strategy has been emphasized by many observers who fear that governments (or militaries) can be their own worst enemies in terms of defeating an insurgency when they use violence. In fact, Findley and Young (2007) simulated the differential effects of a “hearts and minds” vs. “deterrent” strategy for fighting insurgents, and concluded that a persuasive strategy generally dominates the violent deterrent strategy. But even when governments use a “hearts and minds” strategy as primary, with military action only secondary, military action remains a possibility. And even a single military action that goes wrong (in the form of inflicting major civilian casualties) can sometimes undo the positive work of many months. In this expansion of the initial simulation, I shift the focus to allow peaceful insurgent and government recruitment/persuasion, and the effects that allowing peaceful actions have on government and insurgent strategies. The goal continues to be to better understand some of the conditions under which a nascent insurgency will stop, or become self-sustaining and widespread.

The recruitment model makes four fundamental additions to the model. First, in the new variant, insurgents and soldiers take turns undertaking independent actions. In the initial model, insurgents took all of the primary actions, and soldiers only responded (by
counterattacking). Second, in the new variant, both soldiers and insurgents have a choice of two actions, either to attack, or to recruit. Third, insurgents in the new model may be either exposed or unexposed; only exposed insurgents are subject to targeting by soldiers. When insurgents attack a soldier, they automatically become exposed; when they recruit, they are exposed with lower probability. Fourth, civilians respond negatively to collateral damage inflicted by soldiers, but in the new variant this response differs in magnitude depending on the actions of soldiers and whether they were provoked. In particular, when collateral damage results from a counterattack against an insurgent immediately after an insurgent attack, civilian anger increases less than when collateral damage is a result of a preemptive attack by a soldier.

The new model thus captures additional features of reality that relate to recruitment. First, we know that secrecy and intelligence are a critical part of combating an insurgency. Insurgents require secrecy, especially in the early stages of an insurgency. Governments desire the opposite (exposure), and work hard to obtain the intelligence needed to target previously hiding insurgents. Second, in part because it may better maintain secrecy, we anticipate that insurgents might try to recruit rather than undertake visible attacks at every opportunity. Third, we know that most governments are aware of the “hearts and minds” issues involved in fighting for the support of a civilian population, and may often seek to provide basic services or counter-insurgent incentives that are akin to recruiting the population to the government side. Finally, we know that most civilians are not solely reactive; they can judge insurgent as well as government actions, and know when an insurgent was “asking for it,” vs. when some government military action is seen as unjustified or without cause. What we wish to see is the interplay of these additional features of insurgency.

Several of the above features are worth highlighting. The structure of the model allows the negative effect (increased anger) of collateral damage to overcome the effect of good works. We can think of this as months of slowly developing good will being undone by a single action. But even though civilians respond by getting angrier at soldiers in response to collateral damage, soldiers responding to an attack will increase civilian anger less than soldiers coming in to attack insurgent without immediate provocation (when soldier’s choose to attack rather than recruit).

Either recruitment of others or attack makes an insurgent into an active insurgent. However, active insurgents may or may not be exposed, that is, subject to targeting by soldiers. Once an insurgent is exposed, we assume that they are always exposed (we may assume that they are always under some type of surveillance or study after the government is aware of their active opposition) and a possible target for soldiers if they choose to attack. But the exposure rate of an unexposed insurgent is lower if they just recruit than if they carry out an attack. Recruitment is a quieter, and potentially secretive, activity. In the model, peaceful recruitment by either an insurgent or a soldier modifies the civilian’s level of anger without affecting their level of fear (increasing anger in the case of insurgent recruitment, decreasing it given soldier recruitment). Fear is affected only by observing violent military action (attacks) against a nearby insurgent. Insurgents and soldiers can affect the anger level of a number of civilians, where the exact number is given by a parameter in the model. Thus we can model circumstances where recruitment is easy and widespread (e.g. free recruiting/speechmaking in
public places), or that it is quite difficult (e.g. where public gatherings are prohibited or speech is suppressed).

All activity in the model continues to occur at a localized level, that is, within neighborhoods of specified size (the size is defined by a model parameter). As a result, soldiers do good works in their neighborhood, and insurgents recruit in the neighborhood where they are. Soldiers can only attack insurgents in their neighborhood. This allows the possibility that local pockets can develop where insurgents recruit and anger becomes high, but where the insurgents are not subject to any targeting from soldiers. In such a case, the insurgents cannot attack soldiers either, because they are isolated. This possibility – of untouched pockets of anger and resistance – seems empirically to be quite possible in the real world. This possibility may also lead to an exploration in future work of government strategy choice related to the disposition of soldiers throughout a country – when soldiers are spread, they can react to insurgents throughout the country, but if the soldiers are concentrated, they may be able to respond more effectively to local provocations, but at the cost of other regions of the countries becoming sympathetic to the insurgents.

The model continues to assume that the supply of soldiers and civilians is effectively infinite, at least during the period I am interested in, at the early stages of an insurgency. Thus soldiers do not die, and although insurgents die and are removed, they are always replaced (with a randomized civilian placed somewhere in the world grid).

In more detail, the sequence of actions in the new simulation is as follows.

1. Insurgent turn
   a. A random insurgent (latent or active) is selected
   b. The insurgent selects (probabilistically) one of two actions: recruit or attack
   c. If insurgent-selected action is attack:
      i. If a soldier is in range, insurgent attacks a soldier:
         1. Insurgent is exposed fully
         2. The targeted soldier may counterattack (responds with soldier’s response probability, currently 1.0)
         3. If the soldier counterattacks, the standard capture/collateral damage/update sequence is followed
            a. Probabilistically, the insurgent is killed and removed from simulation
               i. If removed, a new civilian is added to the simulation at a random location and with random characteristics
            b. Probabilistically, civilians surrounding the insurgent are wounded
            c. Anger and fear is updated for civilians who were wounded
               i. Because the soldier counterattack was a response to an insurgent, anger increases moderately
   d. If insurgent selected action is recruit:
      i. If any civilian is in range, insurgent recruits one or more civilians, up to a number specified in a model parameter
         1. Insurgent is exposed with moderate probability
2. Recruited civilians experience a moderate anger increase
3. If the insurgent is exposed, nearby soldiers can make a counterattack/“attack of opportunity” on insurgents (responding with soldier’s response probability, currently 1.0)
   a. Given a counterattack, the standard capture/collateral damage/update sequence is followed
   b. Because the soldier counterattack was a response to an insurgent, anger increases moderately

2. Soldier turn
   a. A random soldier is selected
   b. The soldier selects (probabilistically) one of two actions: recruit or attack
   c. If soldier-selected action is attack:
      i. If there is an exposed insurgent in their neighborhood, soldier preemptively targets an exposed insurgent
         1. Given the attack, the standard capture/collateral damage/update sequence is followed
         2. Because the soldier counterattack was not in response to an insurgent, anger increases at a higher rate
   d. If soldier-selected action is to recruit (by doing good works in the neighborhood)
      i. If there is a civilian in the soldier’s neighborhood, it may be recruited, up to a number specified in a model parameter
         1. Recruited civilians experience an anger decrease
         2. No worry about collateral damage

3. Repeat from step 1 until no latent or active insurgents remain, or 5000 ticks are reached.

The model parameters and their default values in the initial version of the simulation are listed in Table 1. The additional parameters introduced in the new recruitment simulation are listed in Table 2.

**Table 1: Summary of Key Model Parameters, Initial Model**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Scope</th>
<th>Definition</th>
<th>Range</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space Size</td>
<td>Global</td>
<td>Dimensions of map grid</td>
<td>1+</td>
<td>50</td>
</tr>
<tr>
<td>Interaction</td>
<td>Global</td>
<td>Size of neighborhood for insurgents looking to attack, and for collateral</td>
<td>1 to size of</td>
<td>3</td>
</tr>
<tr>
<td>Range</td>
<td></td>
<td>damage range</td>
<td>map</td>
<td></td>
</tr>
<tr>
<td>Effectiveness</td>
<td>Global / All</td>
<td>Probability of removing an insurgent during a soldier’s counterattack</td>
<td>0.0 to 1.0</td>
<td>0.8*</td>
</tr>
<tr>
<td></td>
<td>Soldiers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>Global / All</td>
<td>1-accuracy equals the probability of injuring any civilian within</td>
<td>0.0 to 1.0</td>
<td>0.8*</td>
</tr>
<tr>
<td></td>
<td>Soldiers</td>
<td>interaction range</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
during a soldier’s counterattack

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Scope</th>
<th>Definition</th>
<th>Range</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>Global / All Soldiers</td>
<td>Probability of a soldier responding to an attack. Always 1.0 for this simulation (included for later expansion).</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Anger</td>
<td>Individual / Each Civilian</td>
<td>Level of this civilian’s anger at the government</td>
<td>0.0 to 1.0</td>
<td>Normally distributed, mean 0.25, std. dev. 0.125.</td>
</tr>
<tr>
<td>Fear</td>
<td>Individual / Each Civilian</td>
<td>Level of this civilian’s fear of government response to insurgent act</td>
<td>0.0 to 1.0</td>
<td>Normally distributed, mean 0.5, std. dev. 0.25.</td>
</tr>
<tr>
<td>Violence Threshold</td>
<td>Individual / Each Civilian</td>
<td>Level that anger must pass for civilian to be willing to engage in violent insurgency</td>
<td>0.0 to 1.0</td>
<td>Normally distributed, mean 0.5, std. dev. 0.25.</td>
</tr>
<tr>
<td>Fear Increment</td>
<td>Global</td>
<td>Amount that fear increases in each civilian injured by a soldier counterattack</td>
<td>0+</td>
<td>0.10</td>
</tr>
<tr>
<td>Anger Increment per Injury</td>
<td>* Superseeded in recruitment model</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* This is one of the key parameters systematically varied in the simulations

**Table 2: Summary of Key Model Parameters, Recruitment Model**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Scope</th>
<th>Definition</th>
<th>Range</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>P(Insurgent Recruits)</td>
<td>Global / All Insurgents</td>
<td>Probability an insurgent will recruit when selected to take action (alternative is to undertake attack, with probability 1-insurgentPRecruit</td>
<td>0.0 to 1.0 (initially varied by 0.33)</td>
<td>0.5*</td>
</tr>
<tr>
<td>Anger Change Given Insurgent Recruitment</td>
<td>Global / All Insurgents</td>
<td>Change in civilian anger after being recruited by insurgent</td>
<td>-1.0 to +1.0 (normally&gt;0) (initially varied as 0.05, 0.10, 0.25)</td>
<td>+0.10</td>
</tr>
<tr>
<td>Number Recruitable by Insurgent</td>
<td>Global / All Insurgents</td>
<td>Number of civilians an insurgent affects if it recruits</td>
<td>1+ (initially varied as 1, 4, 8)</td>
<td>3*</td>
</tr>
<tr>
<td><strong>P(Insurgent Exposed) Given an Attack</strong></td>
<td><strong>Global / All Insurgents</strong></td>
<td>Probability an insurgent is exposed when it attacks</td>
<td>0.0 to 1.0</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>P(Insurgent Exposed) Given it Recruits</strong></td>
<td><strong>Global / All Insurgents</strong></td>
<td>Probability an insurgent is exposed when it recruits</td>
<td>0.0 to 1.0 (initially varied as 0, 0.25, 0.5, 1.0)</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>P(Soldier Does Good Works)</strong></td>
<td><strong>Global / All Soldiers</strong></td>
<td>Probability a soldier will recruit (build infrastructure, etc.) when selected to take action (alternative is to undertake attack, with probability 1-P(Good Works))</td>
<td>0.0 to 1.0 (initially varied by 0.33)</td>
<td>0.5*</td>
</tr>
<tr>
<td><strong>Anger Change Given Soldier Recruitment</strong></td>
<td><strong>Global / All Soldiers</strong></td>
<td>Change in civilian anger after being recruited by soldier</td>
<td>-1 to +1 (normally&lt;0) (initially varied as -0.05, -0.10, -0.25)</td>
<td>0.10*</td>
</tr>
<tr>
<td><strong>Number Recruitable by Soldier</strong></td>
<td><strong>Global / All Soldiers</strong></td>
<td>Number of civilians a soldier affects if it recruits</td>
<td>1+ (initially varied as 1, 4, 8)</td>
<td>3*</td>
</tr>
<tr>
<td><strong>Anger Increment per Injury (Moderate)</strong></td>
<td><strong>Global / All Soldiers</strong></td>
<td>Amount per injured civilian that anger changes in each civilian injured by a soldier counterattack (when soldier was responding to insurgent action)</td>
<td>-1 to +1 (normally&gt;0) (initially varied as 0.05, 0.10)</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Anger Increment per Injury (High)</strong></td>
<td><strong>Global / All Soldiers</strong></td>
<td>Amount per injured civilian that anger increases in each civilian injured by a soldier proactive attack (when soldier attacks in turn rather than recruiting/building</td>
<td>-1 to +1 (normally&gt;0)</td>
<td>0.10</td>
</tr>
</tbody>
</table>

* This is one of the key parameters examined in the initial simulations
Simulations

I now turn to a discussion of the simulation results. Analysis is performed primarily by examining graphs of the relationships between government strategy and insurgent strategy (strategy being the probability of recruiting vs. attacking when given a choice), subject to various other combinations of conditions.

Dependent Variables

Each run of the simulation produces an entire history of interactions between an insurgency and the government, and continues either until the insurgency is defeated (no latent insurgents remain in the world), or 2000 ticks are reached (loosely indicating a self-sustaining, or at least long-running, insurgency). For this paper, over 4,000,000 simulations were run, consisting of multiple runs given combinations of input parameters selected to cover the parameter space. Since it is difficult to analyze a “history” in some general sense, and since we are ultimately interested in what the simulations tell us about the success of the insurgency under the specified conditions, I focus on 3 indicators of success.

- Length. Insurgents want a long insurgency (that is, an insurgency that remains undefeated for a long time), while governments want to quickly defeat insurgencies.
- Peak number of insurgents. Insurgents want and need to gain support in the population if they hope to defeat an incumbent government. The simulation does not attempt to model the collapse of a government or its replacement by an insurgent-led group. The simulation does track the size of the insurgency, though. Presumably, the larger the insurgency becomes, the more likely it is to be successful. Hence, we can analyze the peak number of (active or latent) insurgents as an indicator of the probability of success of the insurgency. Insurgents want a large peak strength, while governments would prefer to defeat an insurgency before it becomes large, and so government success is indicated by a lower peak insurgent count.
- Speed of growth. Since insurgencies are especially vulnerable early in their lifespan, insurgencies would prefer to gain widespread support quickly rather than slowly, all other things equal. A final measure of the success of an insurgency is how quickly it can gain the support of the population. I will examine the time it takes for the insurgency to gain 25% support from the population in the form of latent insurgents. Insurgents want the shortest possible time to reaching this level, while governments want to delay this time.

Anticipated Patterns

In this study, I am particularly interested in the strategy choices of the insurgent and government forces in terms of how often to recruit, and how often to engage in armed attacks. We can anticipate several possible patterns that we might observe:

- We might see a strategic interaction between government and insurgent strategy. For instance, it might be smart for a government (that is, shorten an insurgency) to

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1 The range and increments for the parameter values yielded 259,200 unique combinations. 10 or 20 runs were done on each combination, resulting in 4,361,548 total simulations.
recruit only if the insurgents are recruiting. Conversely, it might be smart for insurgents to recruit (lengthening an insurgency) only if government is following a particular strategy. The optimal choice of strategy might then be contingent on the other’s strategy.

- Alternatively it might be that a strategy with a high probability of government recruitment always leads to a shorter insurgency than a strategy with more military action, or that a high-probability-attack strategy is always best. That is, there may be a dominant strategy under the modeled conditions.
- It might be that under some conditions, there is strategic interaction, and under other conditions there is not. For example, I would anticipate that if soldier accuracy is very low, there might never be a circumstance where an “attack” strategy is better than a “recruit” strategy. But if accuracy is higher, then perhaps the government can choose to attack sometimes (under particular other conditions).

**Actual Patterns**

1. **Overall Pattern**

An analysis of the simulations taken as a whole initially suggest little strategic interaction between the two sides’ choices, instead suggesting a dominant strategy that favors recruitment by insurgents (rather than armed attack), and counter-recruitment by governments (rather than preemptive targeting of insurgents). Figure 1 shows the average length of an insurgency vs. government and insurgency strategy, with all parameters varying across the range of values previously specified. Figures 2 and 3 show the peak number of active insurgents and the time it takes for latent insurgents to hit 25% of the population, respectively. The x axis in each figure represents the government strategy to recruit or engage in preemptive military action (labeled “SoldierPGoodWorks”) and ranges from 0 to 1, where 1 represents 100% recruitment, and 0 represents no recruitment. The y axis in each figure represents the insurgent strategy to recruit or engage in preemptive military action (labeled “InsurgentPRecruit”), and ranges from 0 to 1 where 1 represents 100% recruitment, and 0 represents no recruitment and only violent attack. In all cases, we observe that from the government’s perspective, the best outcomes (shortest insurgencies, lowest peak members, and slowest penetration of the population) occur when government recruitment is at its maximum (towards the left of each figure). From the insurgents’ perspective, the best outcomes (longest insurgencies, most peak members, and quickest penetration time) occur when insurgents recruit to the maximum (towards the back of the figures). The optimal choice by the insurgents and by the government does not depend on what the other actor is doing – both have a dominant strategy of recruitment or counter-recruitment.

----- Figures 1, 2, 3 about here *******

The general finding that recruitment and counter-recruitment is generally to be preferred to attack is actually somewhat surprising at first glance. Starting in version 1, the simulation was designed focusing on the effects of attack on civilian populations, and version 1 demonstrated that insurgent attacks and collateral damage from counter-attacks could drive the spread of insurgency through a population. An initial expectation might have been that the
new simulation would see a reproduction of this effect, with insurgencies choosing to engage in violence at least some of the time in order to provoke a response. Instead, the simulations suggest that in order to last longer and maximize support in the population, insurgents (in general) should engage in recruitment rather than violence. This is at surprising in real world terms as well because it is at odds with what we know of insurgent behavior. Insurgencies certainly do engage in violence.

One possible answer to the surprise finding that pure recruitment is optimal is to note that the initial patterns display average length and activity across all estimated combinations of parameters. As such, they represent general relationships without “controlling” for other parameters. We might see these patterns as being fairly naïve, in the sense that while they would represent the best guess as to expected patterns given no knowledge of context. Thus they are useful and interesting in a general sense. But we might expect that under different contexts, this relationship would not hold. In particular, even version 1 of the simulation (without recruitment) found that insurgencies could be defeated quickly if government forces were effective and accurate. Facing effective and accurate forces, it is quite reasonable to believe that the optimal insurgent strategy is to engage in recruitment, mainly for the reason that peaceful recruitment exposes insurgents to government action less than does violent attack, even if the attack/counter-attack sequence were to provoke some collateral damage. As a result, we should turn next to particular subsets or “contexts” for interaction within the simulation data.

2. Interactions: Context

As a first cut at identifying those circumstances where violence by insurgents is optimal, we begin by varying levels of government accuracy and effectiveness individually. In version 1 of the simulation, varying these levels in combination led to quite interesting conclusions about the tradeoffs between effectiveness and accuracy in government forces. But the initial pattern suggesting that recruitment is optimal remains given these individual variations. Figure 4 shows the overall length of insurgencies when across levels of soldier effectiveness, while Figure 5 shows the overall length of insurgencies when across levels of soldier accuracy (keeping effectiveness at levels above 0 to avoid the circumstance where the government has absolutely no chance of being successful in targeting insurgents). Even when accuracy and effectiveness are very low, it always is in the interest of an insurgency to recruit heavily, and engage in no (or few) attacks. Although I do not show them for reasons of space, figures showing the peak number of active insurgents and the time for an insurgency to spread to 25% of the population show similar relationships — whatever the individual level of accuracy or effectiveness, in the rest of the sample as a whole, recruitment is the dominant strategy.

-- Figures 4 and 5 about here --

Further investigation revealed that the key to identifying cases where armed attack is the optimal strategy for insurgents and governments depends on circumstances where both soldier accuracy and soldier effectiveness are low, and where recruitment is relatively ineffective. Essentially, the move to violence only occurs when government responses inflict so much damage (low accuracy) that this response “buys” more recruits than a peaceful recruiting
meeting. Only when recruitment is more than minimally effective does recruitment become optimal. Figure 6 show the length, peak activity, and time to a 25% insurgent level for those simulations where government effectiveness and accuracy were both set to 0.25, and insurgent recruitment is set so that a round of recruiting can only increase the anger of 1 individual. Under these conditions, governments can again shorten insurgencies only by engaging in recruitment, and insurgents maximize the length of insurgencies by recruiting. And looking at the peak level of insurgency, governments can reduce this level the most by also engaging solely in recruitment. But in this circumstance, and if the insurgents’ main concern is maximizing the peak number of insurgents, the best insurgent strategy is a mixed strategy of some attack and some recruitment. Presumably in this case, if the insurgents spend too much time on recruitment, they are missing out on opportunities for counterattacks by soldiers to create new insurgents via the mechanism of collateral damage. But if they spend all of their time attacking, they are exposing themselves too much to soldiers, who can then target them.

-- Figure 6 about here --

3. Strategic Interactions

The first two dependent variables in Figure 6 demonstrated only interactions with “context.” The best insurgent and government strategies in these cases are dependent on the government accuracy and effectiveness being low. But the particular government strategy employed does not affect insurgent behavior, and the particular insurgent strategy employed does not affect government behavior. The final segment of Figure 6 finally shows such strategic interaction. An examination of the speed at which insurgency spreads and how this speed relates to government and insurgent strategy choice shows clear contingency. Recall that we assume that governments prefer slowly spreading insurgencies, in our context illustrated by increasing the time it takes for 25% of the population to become latent insurgents. The government would prefer “peaks” on the final segment of Figure 6. In contrast, the insurgents presumably want a quickly spreading insurgency, and so prefer low points on the figure. Government maximization of time depends on insurgent strategy. If insurgents are not recruiting at all (InsurgentPREcruit=0), then a government would employ a mixed attack/recruit strategy, setting its probability of doing “good works” at a middle level. The government would continue such a mixed strategy even if insurgents were using a mixed strategy. But if insurgent recruitment reaches a very high level (near 1.0), the optimal government strategy actually shifts to a point where less “good works” and more attacks should be used.

From the insurgent point of view, whether the government is spending 100% of its efforts, 0%, or something in between on recruitment, insurgents would speed up the spread of the insurgency by carrying out 100% attacks, with no recruitment. The insurgents would certainly prefer the government to also try a 100% government recruitment strategy, as this would allow the insurgency to spread fastest. But although it is a bit difficult to tell from the figure, the insurgency spreads only slightly slower in this scenario if the insurgents recruit 100% as if they recruit 0%. The insurgents are nearly indifferent between 0% recruitment and 100% attacks, or 0% attacks and 100% recruitment. What the insurgency must avoid in this case is a mixed effort. If the insurgency splits its efforts in this situation, the government can capitalize and slow the spread of the insurgency.
Other combinations of parameters can produce similar relationships, but this appears to be the case only within the range of relatively low soldier accuracy and effectiveness. Within a range where these levels are low, we can produce similar looking relationships even if we tradeoff between parameters, so that (for instance) we could raise the number of recruitable civilians if we lower effectiveness and still see similar strategic interactions. But if accuracy and effectiveness are high, then the simulations are dominated by relatively quick victories by governments, without interaction.

Conclusions

This paper has focused on development of a simulation that allows the exploration of government and insurgent strategies for engaging in violent attack vs. engaging in peaceful recruiting. In addition to determining which strategy would be favored, analysis focused on looking for those circumstances under which optimal strategy choice was dependent on the characteristics of the other party, or on the strategic choices of that party. While it appeared that recruitment was the optimal strategy for both insurgents and governments when aggregating across the full range of parameter values, there were particular contexts where this was not true. In particular, when government forces were relatively ineffective and inaccurate, insurgents do have incentives to undertake attacks, which leads to growth in the insurgencies by leading to counterattacks, collateral damage, and a population which increases its anger at the government because of government missteps. It also turned out that only this situation did we see real strategic interaction between the players, where the benefit of a strategy choice was clearly contingent on the choice of the other.

These results give us some interesting insights into real world circumstances of insurgency. For instance, one might ask why we see so many violent attacks by insurgencies in the real world if the model suggests that recruitment is typically the best strategy. The answer provided by the model is that the violent insurgencies we see have been “selected out” by history and circumstance, and are only the tip of the range of insurgencies that have existed and could potentially exist. The model suggests that violent action is a good strategy when government forces are inaccurate or ineffective. In such cases a mixed strategy of attack and recruitment is beneficial. We observe these insurgencies in the news precisely because they draw attention to themselves by violent actions. When an insurgency is facing an effective government, it may engage in recruitment, but the outside world (and perhaps even authorities) may not observe this without the large scale violence of a mixed-strategy insurgency. Only particular insurgencies are newsworthy - “peacefully recruiting” insurgencies are there, but not widely seen. In addition, in the cases where insurgencies just recruit, the model would suggest that they are doing so because they are facing highly effective governments that can act and remove/defeat the insurgency if insurgents are revealed. When an insurgency faces an effective government, it must be very careful, as insurgencies that take violent action against or otherwise reveal themselves to effective government forces are quickly removed from the sample. The cases that we manage to see over a long period, such as in Iraq, are cases of mixed-strategy insurgencies that chose violence because they are facing a
government and related soldier support that is ineffective at capturing insurgents, and inaccurate in terms of avoiding collateral damage. It may be that violent societies are not as much active “breeding grounds” for insurgency or terrorism, as simply areas where ineffective or counter-productive government/military actions simply allow insurgencies to occur.
Bibliography


Figure 1: Length of Insurgency by Strategies, All Cases

Figure 2: Peak Active Insurgents by Strategies, All Cases
Figure 3: Time for Latent Insurgents to Reach 25% of Population, All Cases
Figure 4: Length of Insurgency by Government and Insurgent Strategy, varying levels of soldier effectiveness
Figure 5: Length of Insurgency by Government and Insurgent Strategy, varying levels of soldier accuracy
Figure 6: Length, Size, and Speed of Insurgency Spread, by Government and Insurgent Strategy, given low soldier accuracy, low soldier effectiveness, and low insurgent recruitment ability