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Resilience in Civil Conflict and Implications for Intervention Policies: An integrative systems approach to policy design

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Abstract

The USG and others in the international community have adopted resiliency frameworks for designing and evaluating conflict intervention policies in both the security and development/aid sectors. These frameworks acknowledge the need for multi-level systems analysis that bridge security and development/aid domains. In practice, however, they tend to focus on either individual agent agency or system structure within single domains, and lack understanding of integrative causal mechanisms and dynamic feedback processes. In this paper, I demonstrate a theoretically grounded approach for combining individual agency and system-level dynamics at the nexus of security-development policy domains for evaluating impact of interventions on resiliency of various actors in instances of recurring armed civil conflict. Building on the work of (Choucri et al., 2007) to model state stability, I show how integrating individual agency with system dynamics can operationalize the USG resiliency framework for policy analysis of third party interventions through security and aid vectors. In so doing, sensitivity of combatant as well as societal resiliency to different vectors for implementing intervention strategies can be examined. The modeling framework is demonstrated for case studies of recurring conflicts.

1. Introduction

Intrastate civil conflicts present persistent threats to US and global security interests that continually challenge policy makers with difficult questions of when and how to intervene, weighing normative, material, economic, and political factors. Civil conflict is ubiquitous in the world, and can generate productive and positive outcomes, as well as generate security threats. It can be armed or unarmed, violent or nonviolent. This paper concerns organized, acute, armed intrastate civil conflicts[1], in which at least one side involves non-state actors who regard it as necessary and good to wage conflict against hostile opponents because of incompatible issues seen to be at stake. These incompatibilities typically pertain to control of the government (type

[1] Armed civil conflict includes one-sided violence (e.g., mass killings through genocide or politicide), insurgencies, and civil wars.

of political system, the replacement of the central government, or a change in its composition) or territory (the status of a specified territory, e.g., secession or autonomy). Settlements that involve compromise of these fundamental incompatibilities, or submission to opponents, is considered disastrous, so that the strongest means available are applied (Sharp & Paulson, 2005).

Research in recent years has improved understanding of the conditions under which political instability is likely to break out e.g., (Goldstone et al., 2010), the dynamics of conflict escalation due to repression and instrumental violence e.g.,(Hoover & Kowalewski, 1992), (Moore, 1998), (McAdam, Tarrow, & Tilly, 2001), (Stathis N. Kalyvas, 2006), (Ortiz, 2007), (O'Loughlin & Raleigh, 2008), (Jones, 2010), and the factors that impact conflict duration and termination e.g., (Buhaug, Gates, & Lujala, 2009; Collier, Hoeffler, & Söderbom, 2004; DeRouen & Sobek, 2004; Fearon, 2004; Hegre, 2004). However, this research fails to adequately account for the way in which conflict dynamics co-evolve with interventions by third parties and contribute to the recurrence of conflicts in the same localities. For example, even as the number of intrastate peacekeeping operations deployed to, and amount of humanitarian aid delivered to conflict regions has soared since the end of the Cold War,[2] armed intrastate conflicts have reversed a declining trend in 2003 and have continued to rise ever since (Figures 1 and 2). The type of armed conflicts during this period has shifted periodically between centralist wars and separatist wars (Hewitt, Wilkendfeld, & Gurr, 2010)

Thirty-one of the thirty-nine different conflicts that became active between 1993 and 2003 were recurrences of previous conflicts. Indeed, the percentage of terminations that restart in less than five years has steadily increased over the past 50 years, suggesting that new policies are needed for civil conflict control.[3] These statistics are particularly troublesome regarding humanitarian interventions on behalf of noncombatants, and peace operations. While ostensibly intended to reduce the impact of conflict on noncombatants, these interventions have sometimes become protracted without making significant impact in improving security (e.g., Somalia in 1993), contributed to conflict escalation (e.g., the former Yugoslavia in 1991), and/or seemingly have perpetuated recurring conflict syndromes (e.g., Iraq, Afghanistan, Sudan). A key policy

2 Peacekeeping operations increased tenfold from an average of less than two per year during the Cold War to a combined average of more than 20 per year since (Hewitt, Wilkenfeld, & Gurr, 2008).

3 Data from Uppsala Conflict Data Program Uppsala University, Uppsala, Sweden/Human Security Report Project (HSRP), School for International Studies, Simon Fraser University, Vancouver, Canada. Published in the *Human Security Report 2009/2010(Mack, 2011)*.

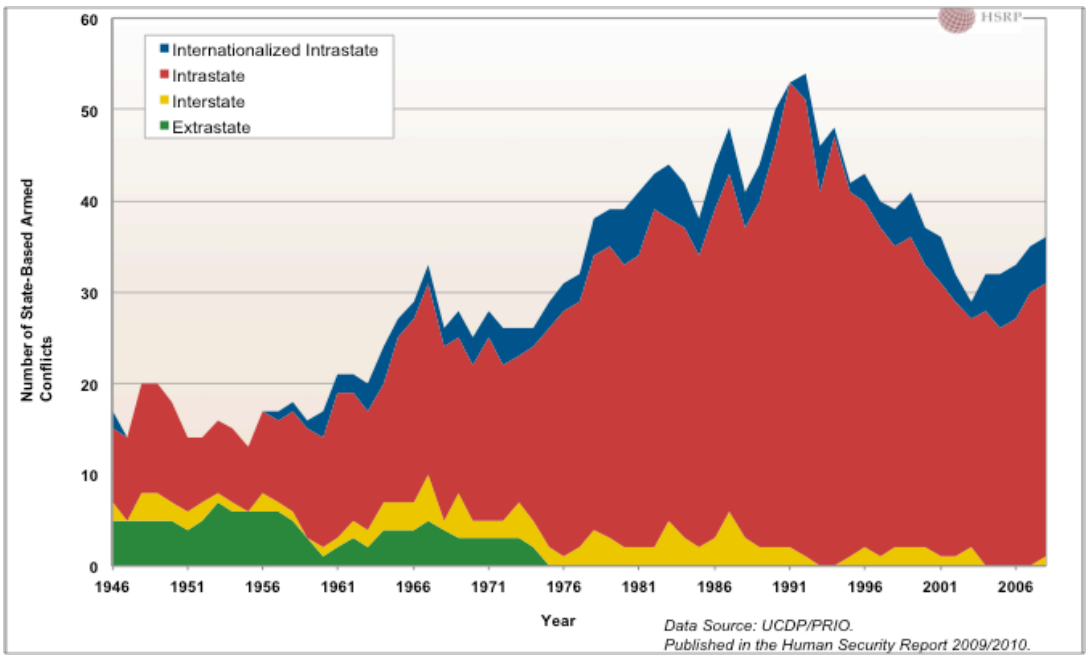

Figure 1 Trends in State Based Armed Conflict 1946 – 2008 ("Human Security Report 2009-2010: The Causes of Peace and the Shrinking Costs of War," 2011)

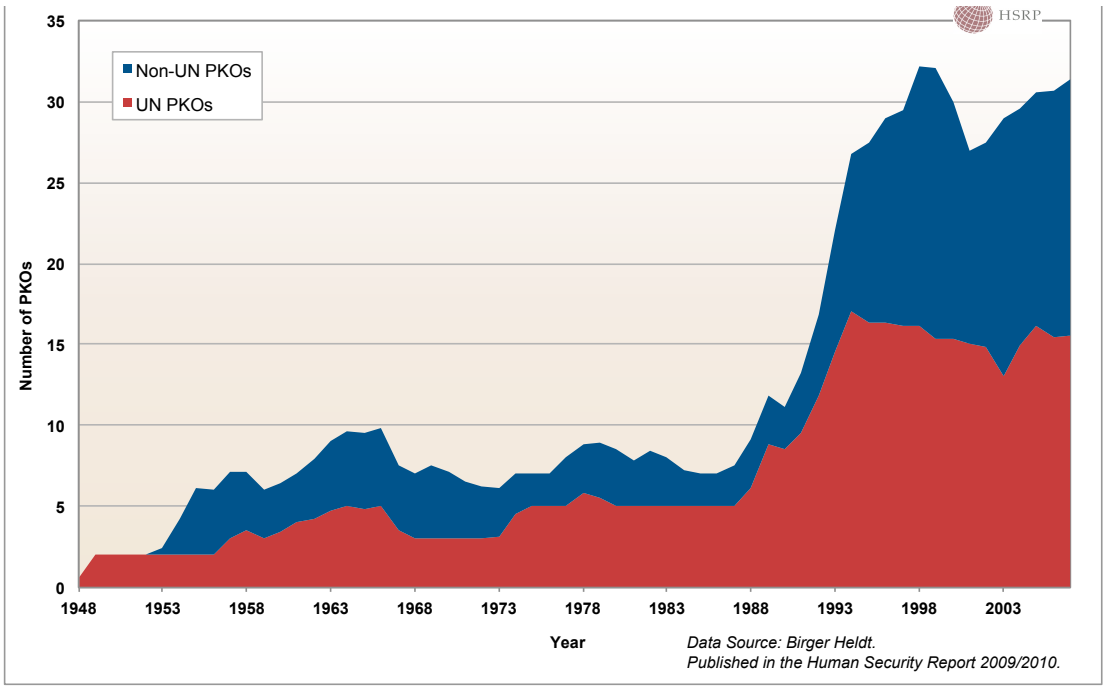

Figure 2 UN and Non-UN Peacekeeping Operations 1948 – 2007 ("Human Security Report 2009-2010: The Causes of Peace and the Shrinking Costs of War," 2011)

research question is, what types of third-party interventions in civil conflict are most likely to lead to intended outcomes that are stable in both the short and long term, and what are the conditions and commitments necessary for those outcomes to be realized? A closely related question is, what is the relevant time frame necessary to evaluate impacts of interventions?

Recognizing the importance of these questions, the USG and others in the international community have adopted resiliency frameworks for designing and evaluating conflict intervention policies in both the security and development/aid sectors.[4] These frameworks acknowledge the need for multi-level systems analysis that bridge security and development/aid domains. In practice, however, they tend to focus on either individual agent agency or system structure within single domains, and lack understanding of integrative causal mechanisms and dynamic feedback processes.[5] This paper presents an integrated agent based and system dynamics model to explore the impact of interventions on violent civil conflict dynamics from the conceptual framework of resilience in dynamic systems, where resilience is defined as the capacity of a system to absorb disturbance and re-organize while undergoing change so as to still retain essentially the same function, structure, identity and feedbacks (Walker, Holling, Carpenter, & Kinzig, 2004).

The resilience perspective introduces the idea of fundamentally different, multiple basins of attraction (system outcomes) that can result from system disturbances, and emphasizes non-linear dynamics, thresholds, and uncertainty and surprise in studying how periods of gradual change interplay with periods of rapid change, and how dynamics of change interact across temporal and spatial scales (Folke, 2006). In doing so, resilience research is concerned with not only with the capacity of a system to absorb shocks, but also the capacity for renewal, re-

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[4] See, for example, (Bird, 2009; *Building Resilience to Recurrent Crisis: USAID Policy and Program Guidance*, 2012; Chandler, 2012; Clark, 2013; Irmer, 2010)

[5] The US AID adopted a resiliency framework for considering development and aid policy after the 2008 famine in the Horn of Africa, which resulted in renewed conflict in the region (Chandler, 2012). US AID programs nearly 60% of its total resources as humanitarian aid or development assistance in fragile and conflict-affected countries (Simmon, 2013), yet as discussed above, the impact of these programs have not achieved the "resilience" impact desired. A participants in an experts' workshop, "Assessing the Links: Food, Agriculture, Conflict, and Fragility," convened at the Woodrow Wilson International Center for Scholars in March 2012 noted that "The immediate challenge for USAID is to integrate analytical efforts on conflict and food security with a view to shaping more effective interventions". Yet two years later, at another experts workshop on resiliency in development and aid programs in which the author participated in February 2014, it was evident that the community lacked adequate capabilities for analyzing the impact of interventions on resiliency of actors in conflict settings at a systems level.

organization and creation of new development opportunities in response to those shocks. As noted by Folke (2006),

> *The resilience perspective shifts policies from those that aspire to control change, to managing the capacity of social–ecological systems to cope with, adapt to, and shape change. It is argued that managing for resilience enhances the likelihood of sustaining desirable pathways for development in changing environments where the future is unpredictable and surprise is likely.*

The resiliency perspective clearly has roots in system dynamics with relevance to managing civil conflict, but has yet to be applied to study civil conflict dynamics and policy outcomes at a systems level from the perspective of all actors. In recent years, the conflict literature that does introduce a resiliency framework for policy analysis tends to focus on the government as an actor or on civilians as noncombatants. This author is not aware of any work that applies the resiliency framework equally to all actors in the system, and to the system as a whole. In the work described herein, system level stocks, such as combatant legitimacy (government and/or rebel) are controlled, in part, by perception-based choices of individual agents (and their associated states) that, in turn, depend upon system level flows such as violence, security, and social services. System level capacities are determined by both endogenous and exogenous factors (e.g., interventions). This integrated modeling approach facilitates analysis of policy interventions at the micro and macro levels in a holistic manner, and contributes a much-needed bridge between the quantitative methods employed at these two levels of research in the conflict research (Sambanis, 2002).

The remainder of this paper is organized as follows: Section 2 reviews theoretical foundations of civil conflict dynamics, summarizes the theoretical framework used herein for conflict dynamics and resiliency, and presents a high-level conceptual model for analysis of policy interventions. Section 3 presents a series of model specifications to test hypothesized causal mechanisms for the relationship between interventions, resilience, and outcomes. Section 4 provides a summary and conclusions.

2. Theoretical Framing: Civil Conflict Dynamics, Third Party Interventions, and Resilience

2.1 Civil Conflict Dynamics

As noted above, research on violent civil conflict has focused primarily on conflicts involving the state as one of the actors. These studies of violent civil conflict are primarily

based on statistical databases that record incidents of various types of insurrections against the state (insurgencies, civil wars, revolutions; ethnic wars of separation and/or self-determination); or one-sided violence (mass murders and terrorism) against noncombants. Rape and domestic violence are excluded from most databases, even when used as instruments of war (Fearon and Laitin 2003, Collier, Hoeffler et al. 2005, Collier and Sambanis 2005, Sharp and Paulson 2005, Goldstone, Bates et al. 2010). Incidents of intercommunal, nonstate, armed civil conflict have recently begun to be studied collectively by the Human Security Report Project. As seen in Figure 3, intercommunal and other conflicts that do not involve a govenrment increased by more than 100 per cent from 2007 to 2008, primarily in Sub-Sahara Africa(Mack, 2011). These trends notwithstanding, the focus of this paper is on armed civil conflict involving the state as one of the combatants. Results are extensible to nonstate actors with some modifications.

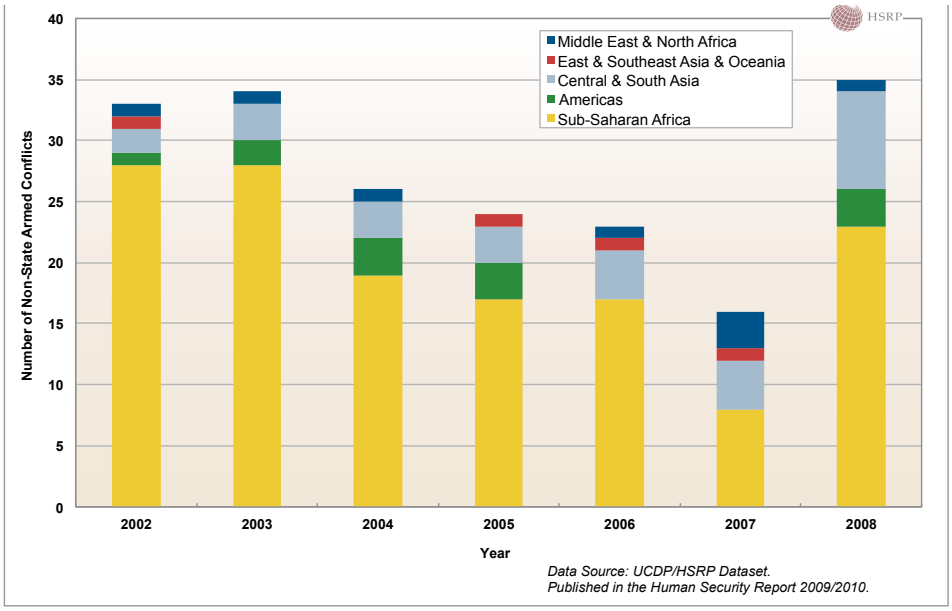

Figure 3 Non-State Armed Conflicts

Armed intrastate civil conflict is associated primarily, though not exclusively, with oppressive and/or weak regimes, in which rival parties employ violent methods of coercion, causing a myriad of threats to the security and well-being of combatants and noncombatants alike. These security concerns include personal and group safety and well-being, erosion of civil society, opportunities of safe haven created for terrorists, incidences of brutality, proliferation of weaponry, and spill-over into neighboring states (Doyle & Sambanis, 2006; Hewitt,

Wiklendfeld, & Gurr, 2012; Stathis N. Kalyvas, 2006; Trumbore, 2003). Individual, mass, and elite incentives shape the conflict, during which mechanisms of brokerage, identity shift, radicalization, and convergence can create new actors and identities, and can transform institutions (McAdam et al., 2001).

A *conflict syndrome* may develop as contentious interactions (1) exacerbate endogenous grievances and the conditions (economic, social political) that provoke them, and (2) engage with a broader set of exogenous actors who reinforce and legitimate antagonistic claims, supply resources to prolong and/or escalate conflict, or even become party to the conflict themselves. Once developed, a conflict syndrome is perpetuated through reinforcing feedback between radicalization dynamics, government repression and popular mobilization, and increasing levels of brutality and militarization. These phenomena erode security interests and raise humanitarian concerns far beyond the borders of the state in which the conflict occurs motivating third party interventions. The security environment will be shaped by the various choices that actors at different levels make to protect themselves from perceived threats and to pursue their primary values.

Research on the initiation of armed intrastate civil conflict is supported by several country-level statistical data bases that track the onset of conflict since WW II, conditions under which they occurred, parties to the conflict, duration, and casualties. The literature based on these datasets has traditionally explained the onset of violent civil conflict by either economic factors and resource moblization (Collier & Hoeffler, 2004; Fearon & Laitin, 2003; Sambanis, 2002), political opportunity, regime type, and institutional strength (Goldstone et al., 2010; Raleigh & Hegre, 2005) or ethnic/cultural grievances (Gurr, 2007; Reynal-Querol, 2002). Competing models suggested a diversity of additional predictive factors for armed civil conflict that included income per capita, infant mortality, regime type, mountainous terrain, population size, age stucture, ethnic polarization, political discrmination, neighboring border conflicts, and resource endowments. As will be discussed below, for this research I adopt a fused version of the Collier-Hoeffler "Greed and Grievance" model, as suggested by (Collier & Sambanis, 2005), modified to incorporate Goldstone's more recent findings on regime strength and letigimacy.

While causal mechanisms for the onset of civil conflict are still somewhat conteseted in the literature, there is general agreement that once initiated, conflict escalates through positive feedback loops between repression, polarization and factionalism, social and economic

deterioration, and brutality (intensity of violence) and militarization (Sambanis, 2002). Civil war mortality rates are strikingly high compared to interstate war. Ten out of the thirteen deadliest conflicts in the nineteenth and twentieth century were civil wars, and major violence was a feature of 68% of civil wars, compared to 15% of interstate wars. Moreover, atrocities in civil war victimize noncombatants with excessive acts of brutality and incidences of fratricidal violence are frequent (Stathis N. Kalyvas, 2006). There is an instrumental logic to this violence that can only be understood at the micro-level, depending on actors' control of territory (and resultant ability to provide or deny security to a population), control of information (and the resultant ability to effect collaboration or defection by the population), and leadership structures within organizations (S. N. Kalyvas, 2012; Weinstein, 2007). Government and opposition forces are equally likely to commit extreme acts of violence against noncombatants, with patterns of violence -- selective versus indiscriminate -- driven by mesa-level and micro-level parameters of local action "on the ground." Mesa-level empirical studies, using data from 52 primarily Western countries during the years 1973 – 1979, have additionally shown collective violence to vary as a cubic, non-monotonic "N" shaped function of repression, where a strong military infrastructure deters collective violence but the combination of an extremely repressive regime with a weak military infrastructure tends to encourage violent backlash (Ortiz, 2007).

The intensity and brutality of violence impact the duration and spread of civil conflict. Higher levels generate new grievances, degenerate institutional capacity (political, economic, social) to ensure security and well-being, and result in increased militarization of society, producing yet more grievances and opportunism in the process. This cycle may take years to break, and often breeds new conflicts. Such was the case in Ethiopia, where opposition forces were able to acquire necessary weaponry to rebel against the government by pilfering from arms meant for controlling violence in neighboring Eritrea (Hewitt et al., 2012). Micro-level data on violence in West and Central Africa from 1960 – 2004 traces the impact of local conditions – such as grievances generated by previous battle events, and historic locations of rebel group strongholds – on explaining the diffusion and contagion of violence within states and across borders (O'Loughlin & Raleigh, 2008; Ortiz, 2007). The twin processes of diffusion and contagion can be ideological as well as material, as exemplified by the conflicts started between 2004-2008. Twenty-five percent of these were associated with Islamic political violence; and

four of the five deadliest (Iraq, Afghanistan, Pakistan, Somalia) involve Islamic insurgents (Hewitt, 2010).

The duration of civil conflict is correlated with potential economic payoffs during conflict (rebellion-as-business) and with military optimism preventing the recognition of mutually advantageous settlements (Collier et al., 2004). The longer the conflict lasts, the higher are additional human security costs due to increased criminal activity, unorganized violence (e. g., food riots), nonviolent causes of mortality (disease, starvation), non-fatal injuries, disabilities, sexual violence, psychological trauma, displacement, and loss of property and livelihood (Lacina & Gleditsch, 2005). These additional costs to human security reduce resiliency of noncombatants and generate conditions that increase the likelihood of conflict recurrence, as noted by (Walter, 2004). Walter argues that conflict recurrence depends not so much on the conditions of previous conflicts, but on two key incentives for joining rebel groups in post-conflict settings: degree of individual hardship or severe dissatisfaction with one's current situation, and the absence of any nonviolent means for political change.

In summary, anocratic regimes with weak democratic institutions and high degrees of factionalism (which reduce perceived legitimacy) are at high risk for violent civil conflict onset. Once initiated, armed civil conflicts tend to escalate and are difficult to terminate due to dynamics that include (1) radicalization and recruitment processes employed to mobilize support, (2) generation of new grievances through brutalization against noncombatants for strategic control of territory and information, (3) the exacerbation of pre-existing grievances by deteriorating economic and social conditions, (4) diffusion and contagion of the conflict into the surrounding regions, and (5) reduced resilience and erosion of human security among noncombatants. These same dynamics suggest levers for intervention strategies to increase the likelihood of sustainable terminations.

2.2 Intervention Dynamics

At the highest level, international security perspectives shape theories of motivations and justifying interests for third party interventions in civil conflict. Realists and institutionalists provide a top-down, structural approach to the development of security interests based on material capacity. Broadly speaking, in the realist school, the security environment is shaped by unitary actors at the state level competing in an anarchical system for a dominant (or at a

minimum, balanced) position of power, and the will to use that power coercively in order to reduce existential threats to state level interests (one's own or one's allies and/or partners) that include losses to territorial integrity, access to vital economic resources, degradation of defensive capabilities, and the empowerment of new or existing adversaries (Jervis, 1989, 1998; Mearsheimer, 2001; Waltz, 1979). In contrast, the structural institutionalist perspective is concerned with maintaining cooperative institutions within the anarchical international system that ameliorate discord and distrust, and enable the pursuit of mutual interests with reduced transaction costs through transparent, reciprocal, and interdependent arrangements that operate under a framework of accepted norms of behavior (Axelrod & Keohane, 1985; Grigorescu, 2003; Levy, 1983; MacCormick, 1998). Under both of these schools, the international security environment is impacted by intrastate civil conflict through material mechanisms, which include of contagion of violence, militarization and arms build-ups, loss of critical resources, disruption to global services, and formation of powerful new adversaries (to oneself or one's partners and allies). Both of these schools lend themselves to a high-level, equation based system dynamic model approach for analysis.

Liberal and constructivist schools provide a bottoms-up account of the formation of the security environment, accounting for the influence of individual actors in domestic society on the security interests and behaviors of states within the international system. Liberalists challenge realist claims that states are the primary actors in the international system with unitary interests. States choices regarding security interests reflect (1) competition of individuals and private groups (e.g., civil society organizations) within their domestic society that organize collectively to promote rational, risk-averse, differential interests under constraints imposed by material scarcity, conflicting values, and various social influences; and (2) constraints imposed by preferences of other states with whom they are interdependent (Moravcsik, 1997). While liberalism provides a strong foundation for democratic peace theory (Mousseau, 2003), which is the basis for democracy promotion as a US national security policy, it also suggests additional mechanisms for generating conflict. Under liberalism, intrastate conflict spawns international conflict when (1) domestic conflict results in coercive, revisionist demands at the international level, driven by underlying, socially grounded preferences to which other states are not willing to submit, or (2) rent-seeking, log-rolling coalitions of insulated, political elites become empowered. Weak or partial democracies are most susceptible to the latter mechanism

(Goldstone et al., 2010; Huth & Allee, 2002; Mansfield & Snyder, 2007; Moravcsik, 1997; Roland, 2006). Clearly, the liberal school is most amenable to agent based modeling of behavioral choices made by potential combatants under constrained resources to generate system dynamics for analysis of justifying interests and evaluation of third-party interventions.

A constructivist view of the security environment does not supplant liberalism, realism, or institutionalism, but complements these perspectives by considering formulations of state interests other than material (Katzenstein, 1996). The constructivist view provides a social psychological explanation of state interests formed by norms, identities and culture in recursive interactions between domestic actors within a state, and the broader international security environment (Jepperson, Wendt, & Katzenstein, 1996; Wendt, 1992). This view partially explains the continued survival of fragile states - in spite of ongoing civil conflict, corrupt governments, weak institutions (e.g., Sub-Saharan Africa) - in terms of the evolved norm of juridical sovereignty among the international community, and provides foundations for the evolving international norms of humanitarian intervention. These norms and the acceptable means by which they are carried out are socially constructed by consensus, and evolve with changes in the identities of states, their interests, and social interactions among states in the international community, including challenges to consensus. This school of thought is best represented through agent based modeling of the evolution of norms by interaction between actors in the international community and domestic actors.

External interventions driven by all of the above schools of thought occur frequently in civil wars, and the longer the war the more likely the intervention. However, in doing so, interventions can lengthen the expected duration of the conflict, regardless of nature of the intervention (economic and/or military; partial and/or impartial). One explanation is that this prolongs a war that is reliant on resources provided by popular local support, which would otherwise run out (Doyle & Sambanis, 2006). In other cases, the power parity and/or international pressure introduced by interventions may hasten the end of violence.

Absent military engagement, the most prevalent types of third party interventions in civil conflict are: sanctions, diplomacy (mediation), peace operations, economic development and humanitarian aid, and capacity building. Sanctions invoked to coerce an end to civil conflict are predominantly a post-Cold War phenomenon (Figure 4). The UN Security Council used sanctions extensively during the 1990s in attempts to curb human rights violations (Yugoslavia,

Rwanda, and Somalia), restore a democratically elected government (Haiti) and end intrastate civil violence (Angola, Sierra Leone, Ethiopia, and Eritrea). These sanctions had only limited success in achieving their objectives, and in many cases, caused increased human insecurity for noncombatants (and decreased resilience) in the process.

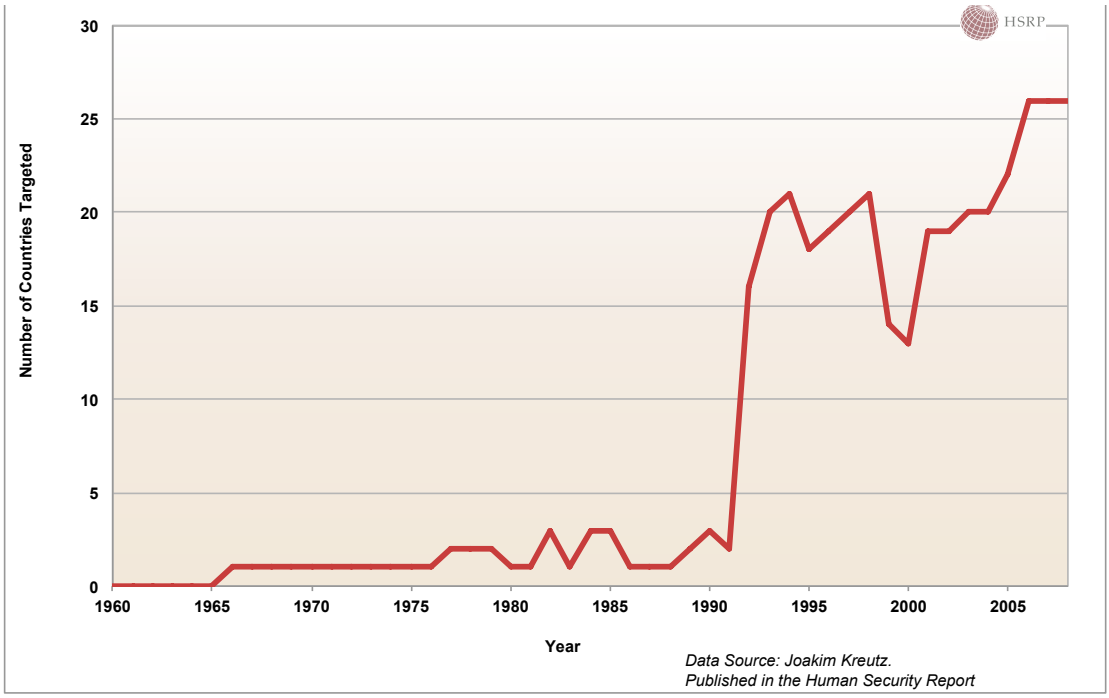

Figure 4 Number of Countries Experiencing Multilateral Sanctions1960 - 2008("Human Security Report 2009-2010: The Causes of Peace and the Shrinking Costs of War," 2011)

Mediation was mostly absent in the armed civil conflicts of the 1970s and 1980s, but increased dramatically with the end of the Cold War (Karl De Rouen & Bercovitch, 2012). However, these efforts have been met with limited success. Analysis of the International Conflict Mediation Dataset shows that almost two-thirds of all mediated peacemaking efforts fail to produce a peace agreement, and of those that were reached in civil wars between 1945-2004, almost fifty percent failed to last more than 8 weeks (Gartner, 2012). The effects of mediation are not included in this research effort.

As evidenced previously in Figure 2, the end of the Cold War removed many of the geopolitical constraints on the use of UN peacekeeping forces, which have been increasingly called upon for complex operations with greatly expanded mandates in civil conflicts

(Binnendijk & Cronin, 2009). As used here, peacekeeping encompasses both consent-based and enforcement missions for the purpose of humanitarian intervention in conflict and for supporting conflict settlements. (Fortna, 2004) distinguishes peacekeeping operations among four types: unarmed observation missions (e.g., UNAVEM II in Angola in 1991 and MINURSO in the Western Sahara), lightly armed inter-positional missions that serve to separate forces, create buffer zones, and disarm military factions (e.g., UNAVEM III in Angola in 1994); multidimensional missions comprised of military and civilians that, in addition to the roles played by observers and inter-positional missions, engage in institutional capacity building (e.g., UNTAG in Namibia and ONUMOZ in Mozambique), and peace enforcement missions involving substantial military forces (e.g., UNAMSIL in Sierra Leone, AMISOM in Somalia, and NATO missions in Bosnia).

Utilizing hazard analysis of almost 60 civil wars between 1989 through 1999, Fortna argues that peacekeeping missions are effective policy tools for increasing the likelihood of sustainable peace, even in the most difficult cases. Her hypothesized causal mechanisms are primarily political and economic rather than military – they work through (1) changing incentives of the combatant parties; (2) providing parties with information about each other's intentions; (3) preventing and managing violent incidents; and (4) preventing either side from hijacking political processes during transitions to peace. Fortna's work is complimented by event history analysis of (Beardsley, 2012), who shows that UN peacekeeping missions help to contain conflict and reduce its duration by addressing problems related to transnational movement of and support for insurgencies. This is in contrast to military interventions in support of one party, which tends to increase conflict duration.

Considering the role of economic factors for generating conflict, it is logical to assume that interventions intended to improve economic factors should reduce conflict, all else being equal. Yet the relationship between economic development and humanitarian aid and civil conflict dynamics is complex. (Collier et al., 2003) have observed,

> *Economic development is central to reducing the global incidence of conflict; however, this does not mean that the standard elements of development strategy - market access, policy reform, and aid- are sufficient, or even appropriate to address the problem…development strategies should look different in countries facing a high risk of conflict, where the problems and priorities are distinctive. In Bujumbura, (Burundi), some policies that are not normally part of development strategy affect the risk of conflict, such as the presence of external peacekeeping forces, the tendency toward*

> *domestic military expenditures, and the design of political institutions. In designing a strategy for risk reduction a useful approach is to view all the interventions that significantly affect risk in an integrated way. For example, different interventions are most effective at different phases, and so may best be sequenced. Because different actors who are not used to working together determine the interventions, to date this has not been common practice.*

To illustrate this point, while (Busse & Gröning, 2009) found that aid has a negative impact on governance, (Tavares, 2003) shows statistically that foreign aid decreases corruption. In studying the withdrawal of foreign economic aid, (Nielsen, Findley, Davis, Candland, & Nielson, 2011) find that foreign aid shocks (such as withdrawal of aid) increase risk of violent conflict, while (de Ree & Nillesen, 2009) find that increasing aid flows tend to decrease conflict duration.

In light of these apparent contradictions, (Tschirgi, Lund, & Mancini, 2010) argue that "the range of factors that can influence the interplay between security and development is not only very broad but also contextually based." Even so, they present three broad conclusions from analysis of seven case studies (Yemen, Somalia, Guinea-Bissau, Namibia, Guyana, Tajikistan, and The Kyrgyz Republic): (1) while structural development factors pose conflict risks in each of the cases, there is no consistent pattern that easily lends itself to uniform policy across different contexts; (2) political uncertainty and instability emerge as causes (rather than consequences) of development failures and insecurity and so provide a key to their remedy; and (3) external factors – both regional and international – have far-reaching influence on a country's development and security prospects and require solutions at both global and local levels. These conclusions strongly suggest the use of multi-level analysis, considering both structural factors (through system dynamics modeling) and individual agency and choice (through agent based modeling) for examining potential intervention policies.

Humanitarian aid delivered by third parties to noncombatants in civil conflict can have similarly complex and ambiguous impacts. Aid can impact conflict through unintended resource transfers to combatants as well as the intended noncombatant recipients. Citing the experiences of aid providers in war-torn societies, (Anderson, 1999) shows that international assistance - even when it is effective in saving lives, alleviating suffering, and furthering sustainable development – may also reinforce divisions among contending groups. She

suggests designs based on sequencing for more effective results – an approach that lends itself to system dynamics modeling of feedback loops with time delays.

2.3 Resiliency as a Framework for Analysis of Conflict Interventions

Resiliency research evolved from empirical observations of ecosystem dynamics in the 1960s and 1970s, as interpreted in mathematical models to develop adaptive management approaches to ecosystem change (Holling, 1973). The historical focus on ecological systems has been extended to integrate social dimensions and successfully applied to policies for disaster recovery in physical, biological, economic, and social systems (Adger, Hughes, Folke, Carpenter, & Rockström, 2005; Allen, Gunderson, & Johnson, 2005; E. M. Bennett, Cumming, & Peterson, 2005; Brooks, Neil Adger, & Mick Kelly, 2005; Cumming et al., 2005; Folke, 2006; Gallopín, 2006; Holling, 2001; Manyena, 2006; Pelling & High, 2005; Smit & Wandel, 2006; Steinberg, Santella, & Zoli, 2011; Vugrin, Camphouse, Downes, Ehlen, & Warren; Vugrin & Turnquist, 2012; Williamson, Hesseln, & Johnston, 2012) (Rose & Wei, 2012). Key findings in the resiliency literature are that (1) there are multiple possible outcomes (new equilibrium states, or basins of attraction) to which a system may evolve in response to a mix of gradual and abrupt disturbances, and (2) these outcomes tend to fall into one of three categories, depending on the capacity of the system: vulnerable (having lost adaptive capacities); adaptive (whereby resilience is collectively achieved through existing structures); and transformative (whereby fundamentally new systems are created in response to untenable conditions).

As noted earlier, resiliency as a measure of the state of a system has yet to be applied to conflict analysis. In this work, I map the three categories of outcomes to reference and simulated behaviors of key stocks and variables. Vulnerable outcomes (no resiliency) correspond to falling values of individual or system level stocks; adaptive outcomes correspond to oscillatory patterns that reach quasi-equilibrium; and transformative outcomes result from structural adjustments to tipping points.

2.3 Conceptual Model

The causal loop diagram in Figure 5 integrates the key features of the theoretical foundations of civil conflict and intervention dynamics discussed above. Economic factors driving both greed and grievances are fused at a systems level to drive conflict and are integrated

with levels of violence to consider overall human security.[6] Civilian resiliency is measured by considering the behavior of the stock *human security;* government resiliency is measured by considering the behavior of the stock*, government control;* rebel resiliency is measured by considering the behavior of the stock *rebel control*, and system resiliency is measured by considering the behavior of the stock *conflict violence*. The auxiliary variables in Figure 5 provide entry points for considering contextually determined magnitude, direction, and time frame of impact of intervention vectors on these stocks. For example, the variable *state resources* may be impacted negatively by sanctions in the short term with declining effect over the long term; *private enterprise* may be impacted positively in the long term by development aid; *human capacity* may be impacted positively by humanitarian aid in the short term, but switching to negative impact in the long term; *government services* may be impacted positively by peacekeeping operations in the short and long term; *rebel funding* may be impacted negatively or positively by humanitarian and development aid in both the short and long term depending on the context and implementation vectors; and *arms availability* may be impacted negatively through sanctions in the short term with declining long term effects as alternative sources are found.

Table 1 contains statistics on the causal loops for key stock variables in Figure 5. Human Security is influenced by eighteen different causal loops with lengths varying from five to ten, of which eleven are positive reinforcing loops and eight are negative balancing loops. The relative strength of these loops hinge on the perceived opportunity cost of violence, which is best modeled through agent behavior based on in individual and small group preferences. Stock of *Government Control* involves twenty-five loops, of which fifteen are positive reinforcing loops and ten are negative balancing loops, depending on contextual parameters. In particular, the direction of the impact of *state military capacity* on services provided depends on context-driven government choices – in particular whether or not to use state military capacity to ensure the

[6] Here I adopt the definition of security provided by (Baldwin, 1997), which is "the absence of threats, or low probability of damage to, acquired values." Different schools approach this question from different perspectives, depending on the level of the unit for whom security is obtained (individual, state, or international system), the values involved (territorial integrity, political independence, economic development, peace of mind/absence from fear), and the nature of the threat (military, political, economic, ideological, physical) The security environment will be shaped by the various choices that actors at different levels make to protect themselves from perceived threats and to pursue their primary values.

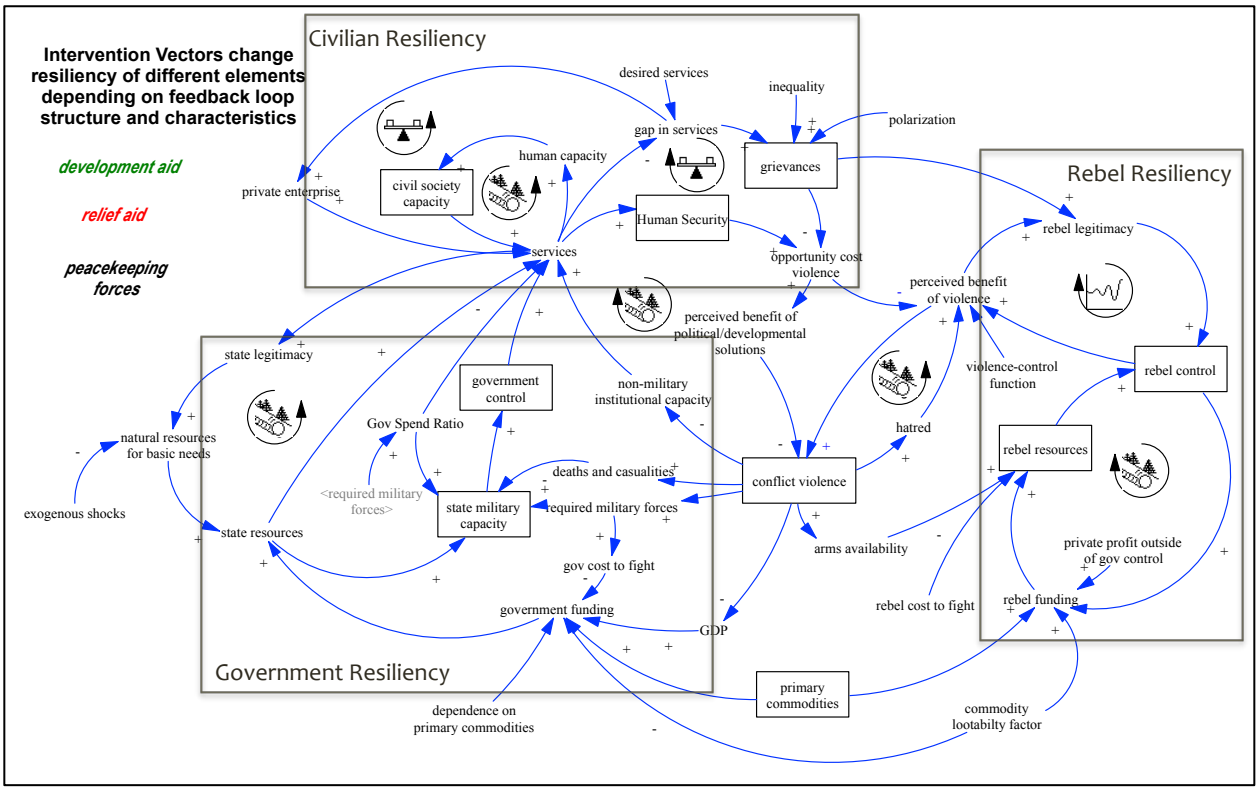

Figure 5 Causal Loop Diagram of Fused Collier-Hoeffler Model of Greed and Grievance (Economic Factors) in Civil Conflict Dynamics

Table 1. Statistics on CLD (Figure 5) of Fused Collier-Hoeffler Model of Civil Conflict

Stock	Number of Causal Loops Polarity: Positive	Number of Causal Loops Polarity: Negative	Loop Lengths (MEDIAN, AVE)
Human Security	11	8	5 - 10 (7, 7.5)
Government Control	15	10	5 - 12 (8.8, 9)
Rebel Control	11	1	2 - 12 (7.7, 9)
Conflict Violence	33	13	2 - 12 (8,8)

viability of government infrastructure capacity to provide services. Here, a positive effect is assumed. Should that not be true, the polarity of the causal loops would switch accordingly. Ten of the *Government Control* loops involve *Human Security*, fourteen others involve *gap in*

services, and all loops involve *opportunity cost of violence.* As a result these, variables should provide highly leveraged mechanisms for intervention impacts on *Government Control*.

The stock of *Rebel Control* involves twelve loops; of which eleven are positive reinforcing loops and only one is a negative balancing loops. This reflects the fact that, in the model, rebels do not have to provide services to achieve legitimacy to the same degree as the government, and are not held accountable for pre-existing grievances that triggered the conflict.[7] However, there is an indirect link through *perceived benefit of violence*, which is involved in every causal loop influencing *Rebel Control*. All else being equal, rebel violence may most easily and quickly be limited through depletion of *rebel resources*, since there is little alternative balancing capacity in the system. As discussed, however, interventions may change loop polarities, direction, and time scales, turning some positive feedback loops into balancing loops.

The stock for Conflict Violence, which is attributed to be a measure of system resiliency, involves forty-seven loops, with lengths varying from two to twelve, and integrating feedback effects from civilian, government, and rebel resiliency loops, which in turn are driven partly by individual agent choices and partly by system stocks and flows. Thirty-three of these are positive – driving conflict escalation – while thirteen are balancing loops. Analysis of system resiliency seeks to understand the limits to conflict escalation in the long term, and whether or not these limits result in adaptive behavior that may sustain conflict indefinitely, in a transformed system with new dominating structures, or in overshoot and collapse of the system with no residual capacity of either side to provide services. In order to provide actionable insight for policy makers, this analysis requires that one systematically explore how delivery mechanisms through different intervention vectors affect individual resiliency of actors (government, civilians, rebels) and the integrative, system level result.

2.4 Hypothesis Generation

Using principles for stability in dynamical systems, the CLD in Figure 5 provides guidance for generating hypotheses for the mechanisms to effect resilience at various levels through policy interventions. These principles from system dynamics are considered along with theoretical

[7] Note that the longer the conflict, the less valid this modeling assumption may be, as rebel violence generates new grievances. The effect of additional, conflict-generated grievances can be incorporated through an additional auxiliary, time-dependent variable that feeds into the variable, *perceived benefit of violence.*

foundations to generate the following hypotheses regarding intervention policies. These hypotheses can be tested through a simulation model, as discussed in the next section.

H1: Persistent, low-intensity conflict obtains as a quasi-equilibrium state of adaptive resilience when both sides of the conflict can sustain equivalent adaptive capacities relative to each other within similar time and spatial domains, so that conflict escalation is moderated. For example, a possible explanation of research findings of Collier et al. (2004) are that persistent rebellion is incentivized by pay-off structures that are sustained by conflict yet at the same time restrain too much destructive escalation. If resources are introduced into the system through time-varying interventions an imbalance will occur. The CLD in Figure 5 suggests that a resource imbalance that favors the rebels will have a stronger effect, all else being equal, than if the same resource imbalance accrues to the government.

H1.1 All else being equal, if resource imbalances are triggered through humanitarian interventions that in turn spawn co-optation by the combatants, *human security* will be reduced, even if some resources are used to improve *services* and *human capacity*. This will tend to increase conflict.

H1.2 Introduction of peacekeeping forces (which cannot be co-opted) to increase *human security* simultaneously with humanitarian aid (which may be co-opted) will reduce instabilities caused by the additional resources. The relative timing of delays from the two interventions in impacting the *opportunity cost of violence* will determine how strong the balancing effect is.

H2: Oscillatory patterns of conflict occurrence obtain over time as non-equilibrium states of adaptive resilience when the antagonists in the conflict employ different adaptive capacities and strategies to affect *opportunity cost of violence* over time and spatial domains.

H3: When none of the actors have access to adaptive capacities (e.g., renewable resources), the relatively stronger wins in the short term, but a state of vulnerability is obtained whereby new actors may emerge to re-ignite conflicts in a failed state, as *grievances* will continue to accumulate and *human security* will erode. Such a situation is likely to be characterized by overshoot of violence and collapse of a population base of support for either side. In this case, the introduction of development and humanitarian aid interventions may increase adaptive capacities of the combatants over those of the noncombatants. In the absence

of peacekeepers or the strengthening of *civil society*, the likelihood of conflict recurrence increases, as for H1.

H4: Equilibrium outcome of third-party interventions, if they exist, will be directly related to the time scale of capacity delivery, and how they change (1) absolute capacities of the actors in the short term and (2) relative adaptive capacities of system structures in the long term, with longer-term dynamics being driven according to the first three hypotheses. That is to say, shorter term, local, path-dependent behaviors obtain from individual agency and interact with longer term system dynamics driven by structural considerations to impact ultimate resiliency outcomes.

3. Hypothesis Testing through Simulation Modeling

A simulation model is desired, based on the conceptual model, that enables one to (1) identify factors that contribute to both civil conflict duration and to socio-ecological resiliency and explore how those are distributed across systems with persistent conflict; (2) study which actors in conflict are made more resilient by interventions in the short (<1 yr) and long terms (>5 yr); (3) develop and test hypotheses relating intervention policies to system resiliency outcomes characterized as *vulnerable, adaptive, and transformative*, and (4) recommend intervention policy options that increase the likelihood of robust and timely terminations of civil conflict. The model should illuminate the relationship between capacity development of different actors during conflict, resilience, and system-level outcomes; how interventions change resilience as a result at both micro and macro levels, and the characteristic time scales necessary for observing "final" outcomes in terms of resilience (if such finality is likely to exists).[8] Such a model is ideally realized by combining agent based modeling and system dynamic models to explore hypothesized causal mechanisms of multi-level system responses to exogenous interventions.

(Choucri et al., 2007) has previously developed a model of insurgency in a society, using a combination of system dynamics and agent based modeling to examine how agent choices to join the rebellion or not impact overall state stability (Figure 6).

[8] See (D. S. Bennett, 2008) and (E. M. Bennett et al., 2005) for discussion of time scale effects.

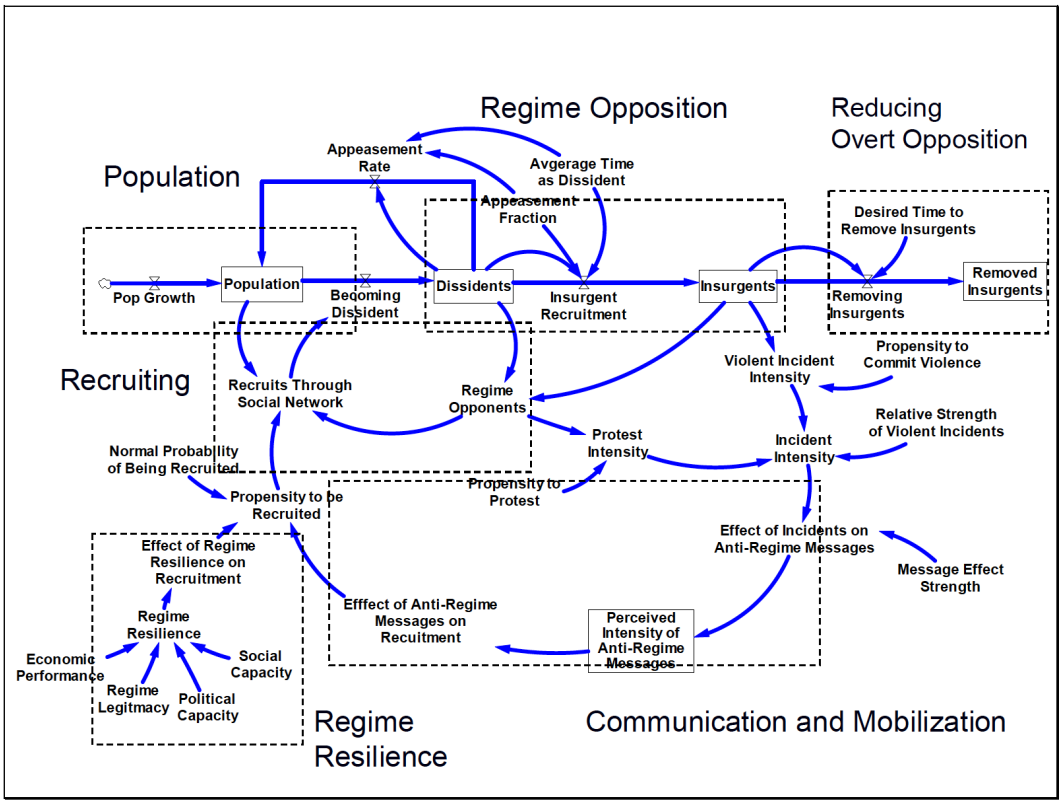

Figure 6 (Choucri et al., 2007) Conceptual Model (Simplified) of Insurgency Activity and Recruitment

In this model, a state is assumed to be stable to the extent that its resilience (capabilities) is greater than the load (or pressures) exerted upon it. People in the population are treated as agents whose states change (from population to dissidents to insurgents to removed insurgents) according to flow rates determined by behavior choice models with inputs from variables calculated through equation-based system dynamics. Variables in the system dynamics model, in turn, are increased or decreased by changing levels of the population in each agent state. While the Choucri model draws on similar theoretical foundations discussed elsewhere in this paper, it is limited in that (1) it treats economic performance, government social and economic efforts, regime legitimacy, and propensity to commit violence parametrically, rather than endogenously derived; (2) it focuses on rebel messaging as a primary recruitment tool, rather than instrumental violence and its impact on perceived human security; (3) pool of potential recruits is unlimited, and does not account for the exit of the noncombatants (potential recruits) from the system through mechanisms such as displacement and mass violence; (4) it does not provide for conflict escalation through militarization and other impacts of security erosion; (5)

the model boundary precludes the introduction of interventions through exogenous parties; and (6) the model only considers capacities and resilience of the regime (and not the insurgents) as dynamic variables. [9]

In spite of its limitations, the Choucri model provides a starting point from which to proceed to examine intervention impacts on resiliency according to the conceptual model in Figure 5.[10] The benefits of doing so include: (1) programmed connections between agent based modeling and the system dynamics model are at the appropriate scale that can be easily modified to capture the additional desired dynamics; (2) the higher-level model from which Figure 6 is derived accommodates many more of the endogenous dynamics desired, consistent with the theoretical foundations discussed above; (3) the Choucri model is formulated so as to specifically measure resilience as a function of capacity, system loads, and agent choices; and (4) the Choucri provides a tested and vetted baseline for model verification purposes from which incremental changes and steps can be made.[11] Figure 7 presents a modified version of the Choucri insurgency model that addresses some of the limitations noted above.

In the modified Choucri model developed here and shown in Figure 7, intensity of anti-regime messaging as a stock driving recruitment has been replaced by a stock measuring the level of perceived human security threats. *Economic performance, social capital*, and *political capacity* of the regime are endogenously derived variables impacted by *violent incident intensity* and *population level*. *Regime legitimacy* is endogenously from an initial condition, impacted by *perceptions of human security gap*. A stock of *displaced persons* has been added, which may deplete the population pool from which to draw recruits and provide resources to the government. For simplicity, displacement mechanisms are currently considered to include internal displacement and refugees to external camps. Some fraction of the displaced may, in turn, become dissidents. The stock of *human security threats* drives a new variable, *perceived human security gap*, which impacts both recruitment and displacement. As a first

[9] Choucri et al recognize that economic performance, state institutional capacity, and investments in security are endogenous to the system, but for simplicity sake and clarity in model building, chose to treat these variables parametrically in the first rendition of the insurgency model, and to drill down instead on the dynamics effected by rebel messaging on regime resilience.

[10] In doing so, one must associate like variables between models, such as political capacity and propensity for violence in Figure 6 with military capacity and perceived benefit of violence, in Figure 5.

[11] Choucri et al developed their model for DARPA, and reportedly conducted verification and calibration tests according to DARPA specifications.

approximation, the impact is modeled through agent choices, based on probability distributions around the propensity to be recruited or displaced, mimicking the original Choucri model.

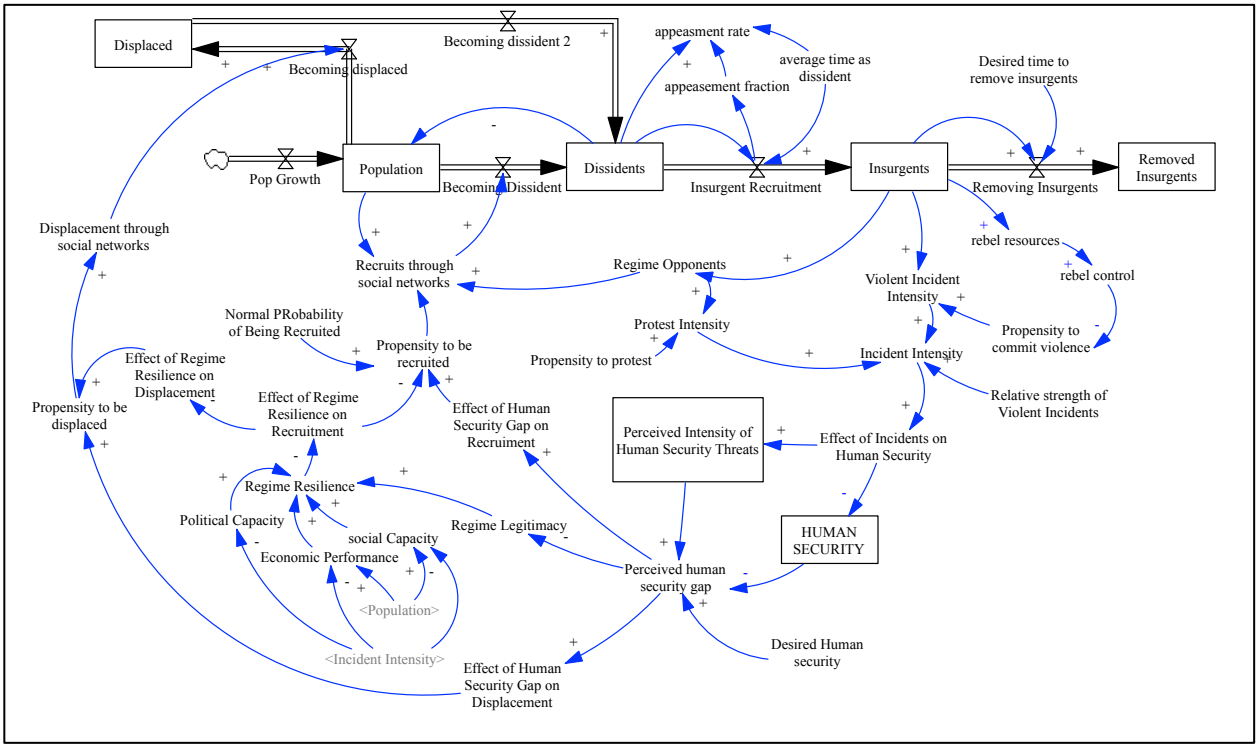

Figure 7 Modified Choucri model of insurgency dynamics to incorporate endogenously derived variables and stocks of human security and displaced persons

The stock from Figure 5, *government control*, is now represented as *regime resilience* in Figure 7. *Rebel control* and *human security* approximate rebel and civilian resilience as before, and the stock, *conflict violence*, is represented as *incident intensity*. Other variables and loops from Figure 5 (such as civil society and human capacity) are left out of the simulation model in Figure 7 so as to build the simulation model up incrementally. Their effects can be contextually specified through other variables such as, *effect of incident on human security*. However, these can be added at a later time as endogenously derived, dynamic effects.

Third party interventions are introduced into the modified model shown in Figure 7 through the variables, *effect of incidents on human security, propensity to be recruited and propensity to be displaced, propensity to commit violence,* and *regime resilience*. However, the model in Figure 7 does not account fully for factors impacting resilience of insurgents, nor does it provide mechanisms for aid interventions to be co-opted. To holistically address the potential

effects of interventions on conflict dynamics that more closely approximates the conceptual model in Figure 5, one must add a mirror module for *insurgent resilience*, containing analogous variables to those for *regime resilience* (e.g., *economic performance, political capacity, social capacity*, and *legitimacy*). These variables can then be associated with the hypothesized mechanisms (such as co-optation and competition) by which interventions impact resilience of all actors in the system, and the system as a whole.

Contextual conditions are introduced through

- User-enabled parametric variation of initial conditions as in the original Choucri model
- User-enabled changes in polarities of certain auxiliary variables, such as
    - The effect of *state military capacity* on *services* provided by the government
    - The effect of regime *resilience* on *Propensity to be displaced*
- Variations in the conversion functions used in the model (e. g., *economic performance* to *regime resilience*).

The original Choucri model was reportedly calibrated to case studies using field data, allowing for parametric variation of initial values for government supporters, dissidents, and insurgents; certain delay times, regime social and economic efforts, contact rate between agents, and population birth rates. This modified model will be calibrated through optimized comparison of results of stochastic analyses to field data from case studies of the ongoing conflict in Somalia (as an instance of adaptive resilience resulting in recurring conflict) and Burundi as an example of an apparently transformed conflict. Finally, using stochastic analysis, fitness landscapes for state stability outcomes based on intervention parameter variations and response likelihood functions for agents' choices will be generated. These fitness landscapes, in turn, enable mapping of policy design options to desired resilience outcomes.

4. Summary and Conclusions

Policy makers seek multi-level systems approaches for designing effective interventions in civil conflict that incorporate a resilience framework. A theoretically grounded framework, conceptual model, and simulation approach has been introduced that links micro behaviors

through agent based modeling with macro behaviors and resilience of the conflict system. The micro-level behaviors are driven by contextually based perceptions, while the macro level dynamics are driven by contextually based, goal-gap structures and conversion functions to determine flow rates. The conceptual model uses human security, government control, rebel control, and conflict violence as indicators of different levels of resilience. This structure allows policy makers the flexibility to introduce interventions at multiple levels – in accordance with different perspectives of international security (realism, liberalism, institutionalism, and constructivism) as well as to test theoretical and operational hypotheses. General system dynamic principles can be applied to the conceptual model (such as how to stabilize system behavior through feedback loop modifications) to generate hypotheses for testing. These hypotheses can then be tested in the simulation tool. Targeting and sequencing of the more robust policy designs can be fine tuned through this simulation tool.

The simulation model is under development and when complete will be calibrated to case studies based on long term conflicts. Four hypotheses regarding the impact of interventions on resiliency of different actors have been presented that will be tested in calibration simulations. Subsequent enhancements to the model may include more detailed economic models with civil society as an additional actor providing services to increase human capacity and reduce grievances.

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