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Min Young Park March 30, 2017

# The Numbers behind Peacekeeping Missions: Sustaining Peace After Civil Conflicts

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a thesis submitted to the Faculty of Emory College of Arts and Sciences
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Abstract

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This article examines how the robustness of peacekeeping operations and third parties influence post-war peace. Previous studies have found that peacekeeping decreases the chances of war re-occurring, but it is still unclear as to what "mission qualities" yield successful peacekeeping missions and facilitate peace. In this study, I hypothesize that: (1) more peacekeepers to civilians and conflict area decrease the chance of war re-occurring and (2) peacekeeping mandates with humanitarian purposes and more international non-governmental organizations per capita increase the length of postwar peace. Using survival analysis, I quantitatively analyze the aftermath of fifty-three civil conflicts. The results of my study indicate that a higher ratio of peacekeepers to civilians, more international non-governmental organizations per capita, and humanitarian purposes decrease the chance of war re-emerging.

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**Introduction**

Recently, interstate and intrastate conflicts have increased (Melander, Wallensteen, and Oberg 2003). Why are the number of conflicts rising and, perhaps more importantly, what can third parties do to help resolve them? This paper examines third party peacekeeping in post-conflict countries and its influence on long term peace. Specifically, this paper asks: how does the robustness of peacekeeping operations, scope of their mandates, and international non-governmental organizations (INGOs) affect the long-term peace following civil conflicts? Although mediation and negotiation powers are distinct trademarks of third parties (e.g. third party mediators and negotiators), I am not examining the mediation or negotiation stage. Rather, I examine the last phase, abiding by the agreement, and the influence of third-parties and peacekeeping on cooperative behavior. Understanding the different dimensions of third parties and peacekeeping may explain why some conflicts transition to long-term peace, and why violence re-occurs in other cases, accompanied by economic, political, and human costs. I hope that the findings of this paper contribute to the existing peacekeeping literature, and help craft successful peacekeeping missions.

Generally, peacekeeping operations are neither meticulously planned nor extensively well-funded. In fact, "Peace operations are usually improvised and ad hoc; they are too often planned at the last minute and are perennially understaffed, underfunded, and underequipped" (Fortna 2008, 76). However, previous research has found that peacekeepers make a "positive difference" by increasing the chance of peace lasting in the region through the following mechanisms: reducing aggression by raising the costs of war, lowering the security fears of warring parties, reducing uncertainty, and preventing miscommunication (Fortna 2008, 76; Mattes and Savun 2009, 738; Mattes and Savun 2010, 511). The demonstrated importance of peacekeeping, but the "under-supported" nature of the mission, raises the question of how many

peacekeepers third parties need to deploy and what the mandate should include to facilitate peace. Therefore, this paper aims to suggest policies that can help form more "successful" peacekeeping missions- missions in which peacekeepers "do their jobs, go home, and leave lasting peace in their wake" (Fortna 2008, 111).

Conflict resolution scholars acknowledge that conflicts themselves are "inevitable in social life" (Zartman and Touval 2007, 446). However, conflicts become problematic when parties employ violent tactics to advance their goals.[1] "Civil conflicts, or intrastate conflicts, have devastating repercussions for citizens of a country, neighboring countries, and the international system. In response to these conflicts, conflict resolution aims to prevent, minimize, if not terminate, the death and destruction that ensues.

On a regional level, neighboring states have interests in fully resolving conflicts because the chaos can "spill over" into their territory, or fear that the local conflict may expand and draw in powerful external actors" (Zartman and Touval 2007, 440). For instance, Boko Haram has undermined the economic stability of local businesses in Chad, Niger, and Cameroon and killed thousands across borders. These damaging repercussions can occur at the international level, where conflicts hinder economic efficiency and contradict international standards of peace and global order. Therefore, the challenge for effective conflict resolution is to prevent the continuation of violence and protect human lives.

## Literature Review

### How Civil Wars End: Nature of Conflicts and Pre-Negotiation Theories

Within the conflict resolution literature, theories about how civil wars end are categorized into what part of the conflict they address: the nature of the conflict, pre-negotiation stage, and

[1] Although belligerents use "terrorism" in some of case studies, I do not focus on "terrorist groups" per se. Instead, I use the phrasing "armed group" or "violent group" to refer to combatants of a conflict.

the post-negotiation stage (i.e. abiding by the agreement phase). Academics that fall into the first set of theories, nature of conflict, often cite the structural nature of the war as reasons to why peace is harder to achieve in some conflicts over others. For example, conflicts "over issues tied to their identities [ethnic or religious]" have greater challenges in "reaching a compromised settlement" than those fighting against "negotiable political or economic issues" because emotion and symbolic manipulation exacerbate grievances (Walter 2002, 12; Kaufman 2006, 47; Crenshaw 2007, 72). Therefore, emotions generated from a conflict are more powerful than rational thought or considerations. In more extreme cases, symbols or myths tied to ethnic or religious identity further aggravate emotions, and in doing so, create deeper security concerns and hostility, motivate individuals to take up arms, and lead to an escalation of violence (Kaufman 2006).

Scholars in the second camp believe peace is more likely to succeed if pre-negotiation conditions are at favorable circumstances for negotiations, such as "economic, military, or political conditions" that could "encourage combatants to initiate negotiations" (Walter 2002, 7). When costs of fighting increase to the point where they negatively influence the combatants' perception of "military victory," the thought of a "military victory becomes less attractive," and combatants begin to seek a solution through political means (Walter 2002, 8; Bercovitch and Simpson 2010, 82). In the case of Angola, parties signed the Bicesse Peace Accords when there were "heavy military losses on both sides," and "both parties faced severe food shortages" that "forced them to agree on a cease-fire arrangement along the food transportation routes," along with "fundamental principles for establishment of peace for Angola" and "concepts for resolving the issues still pending between the Government and UNITA; and the Protocol of Estoril" which

laid out the framework for elections, military monitoring, security, and more (Bercovitch and Simpson 2010, 82 and Peace Accords for Angola).

The balance of power also influences the likelihood of peace; Walter states, "the more equally matched combatants are on the battlefield, the more likely they are to end their war in a negotiable settlement" (Walter 2002, 15). Two main factors shape the balance of power: battle outcomes and information about the two warring parties. If there is a military victory on behalf of the belligerent, it is likely that the group will "raise its war-termination offer (demand more), but following a combat defeat, a belligerent will lower its war-termination offer" (Reiter 2009, 16). Bargaining shifts fall under the larger paradigm of the Bargaining Model of War. This model demonstrates how "uncertainty about the power and intentions" and the inability for states to make "binding commitments to each other" influences the outbreak of war, or the continuation of war (Reiter 2009, 2-3). For example, if one party is certain that its adversary is suffering heavy battlefield losses, it may re-attack in hopes its enemy gives up.

**How Civil Wars End: Post-Negotiation Theories**

Although evidence supporting the previously mentioned theories is significant, these models fall short of explaining why even "signed bargains fail to bring peace" and why conflict re-emerges (Walter 2002, 14). Walter argues that warring parties tend to "avoid" or abide by negotiated settlements because implementing them would require "them to relinquish important fall-back defenses at a time when no neutral police force and no legitimate government exist to help them enforce the peace" (1997, 337). Therefore, as long as both groups operate under conditions of vulnerability and temptations of preemptive strikes, they "prefer to continue fighting" rather than settle for or abide by a political agreement (1997, 339).

Walter's suggestion of using third parties is rooted in the credible commitment and information problems of the Bargaining Model of War. The Bargaining Model of War

demonstrates how commitment and information problems increase the chances of war, or in this case, war re-occurrence. Logically, when deciding whether to abide by a peace agreement, the best individual outcome is for each party to act in their own self-interest, even if it means risking the collective interest and derailing the chances of cooperation. For example, if belligerents sign a peace agreement, it is tempting for one party to take advantage of the moment by attacking while the other party's guard is down.[2] Consequently, one party could win by restarting the war and defeating its opponent via military victory, but the other would lose the war. Alternatively, if both parties decide to abide by the agreement, they need to uphold the peace agreement via compromise. Naturally, the dilemma is whether an individual should commit to a compromise rather than trying to "win it all." Similarly, war is more likely to occur or reoccur as uncertainty increases. The Bargaining Model of War also demonstrates that lack of information about an adversary causes uncertainty (i.e. unsure whether they are mobilizing or planning to re-attack), and as uncertainty increases, the chances of war increase because a belligerent is likely to make hawkish decisions out of fear.

When applying this puzzle to civil conflicts, we can think of long-term peace as a form of "cooperation." One way to encourage cooperation after civil wars is to use third party enforcers that "step in to guarantee [not just mediate] the terms [of an agreement]" and verify information to reduce uncertainty, "only then does cooperation become possible" (Walter 1997, 336 and 341 and Mattes and Savun 2010). Therefore, by participating in peace agreements, third parties can lower transaction costs by "guarantee[ing] the safety of the adversaries during the critical implementation phase," and consequently, help alleviate the combatants' concerns of vulnerability and credible commitments (North 1990, Walter 1997, 336 and 341).

[2] At this point in the conflicts, belligerents disarm or stop fighting.

Mechanisms third parties utilize to achieve this include "international security guarantees, provisions for military" and "trade aid, promises of special relationships…prospect of sanctions, or even the threat of force" (Bercovitch and Simpson 2010, 70 and Aall 2007, 480). Additionally, Mattes and Savun's work supports the importance of security guarantees, as their survival analysis generated evidence that third party guarantees reduce the risk of a re-emergence of war by seventy-two percent (Mattes and Savun 2010; Walter 1997; Walter 2002).

However, the Bargaining Model of War is not just about a commitment problem, but also an information problem. Information, or more specifically, information asymmetry, negatively affects the reoccurrence of war because if "parties have private information" they can "suppress or exaggerate [it] in pursuit of a better deal," which can encourage belligerents to mobilize due to "a renewed resort to arms" (Walter 2009, 245; Mattes and Savun 2010, 522; DeRouen and Sobek 2016, 67). One way to balance information asymmetries is "requiring third-party monitoring, making belligerents submit relevant information to third parties, and providing for verification of this information by putting in place verification sites or having third parties gather information independently" (Mattes and Savun 2010, 522). One mechanism that addresses these demands, and minimizes commitment and vulnerability problems, is peacekeeping.

**Theories about Peacekeeping Operations**

In previous studies, peacekeeping troops have shown to reduce civil war reoccurrence in previous works as they play a dual role as a fear-reducing and cost-increasing provisions because of their ability to "disrupt spiral of fear and security dilemmas by reducing belligerents' uncertainty" about each other and "reduce likelihood of aggression by raising the costs of war" (Fortna 2008, 86). Peacekeepers can reduce fear in their everyday tasks, such as "responding to reports of incident and allegation of noncompliance" through "on-the-spot, low-level mediation and arbitration" without letting local problems escalate to violence (Fortna 2008, 97). They can

also impose "physical restraints on the belligerents" as their presence means that "they are likely to be in the way of the aggressor trying to get at its opponent," and they may have a mandate that gives them permission to return fire if attacked (Mattes and Savun 2009, 744). Therefore, the overall purpose of peacekeepers is "designed to lessen the belligerents' insecurity and fear regarding future actions of the opponent by imposing constraints on the opponent's ability to renege on the deal" and monitoring all belligerents, which de facto addresses the commitment and information problems that plague civil conflicts (Mattes and Savun 2009, 738).

Peacekeeping operations reduce the risk of conflict reoccurring because these operations function as a cost-increasing provision. Cost-increasing provisions are modules that "make it less likely that the belligerents prefer to resume their military campaigns, even if they expect that the other side may renege on the peace deal" because doing so leads to costly consequences (Mattes and Savun 2009, 738). For example, if "peacekeepers are injured or possibly killed, the international community may react harshly, for example**,** by restricting foreign aid" (Mattes and Savun 2009, 744).

Furthermore, there are tangible incentives for belligerents to cooperate with peacekeepers. Depending on the scope of the peacekeeping mandate, peacekeepers can undertake "civil engineering projects…deliver basic humanitarian aid…and substantial numbers of jobs (for drivers, maids, translators, secretaries, and so on)," which suggests that it is not in the belligerents' interest to attack peacekeepers in the first place (Fortna 2008, 91).

Past studies indicate that "UN peacekeeping is an effective mechanism for solidifying the stability of post-civil war environments" (Hultman, Kathman, Shannon 2016, 245). However, the United Nations is not the only political entity that uses peacekeeping operations. Other groups such as the European Union and League of Arab States (LAS) also have peacekeeping operations

in Afghanistan and Syria respectively. However, most research does not include peacekeeping outside the UN. Therefore, to paint a more holistic picture of the effects of peacekeeping operations, this study analyzes conflicts with and without peacekeeping missions, conducted by the United Nations and other political entities, from 1945-2016.

*Theories about International Non-Governmental Organizations*

International non-governmental organizations (INGO) are another type of third party that may dispel uncertainty between belligerents by transmitting information and promoting peacebuilding.[3] Although prior studies have not examined the influence of INGOs per capita on postwar peace, a recent paper published by Wilson et al. has found that INGOs with conflict resolution missions (CMOs) are associated with peace. While my paper does not examine CMOs, Wilson et al.'s findings applies to INGOS in that both institutions can lower hostilities using the same mechanism: local citizen networks and international elites (Wilson et al., 2016).

**Theoretical Framework**

This paper operates within the theoretical perspectives of the credible commitment and information problems of civil wars. The credible commitment theory postulates that "civil war negotiations rarely end in successful peace settlements because credible guarantees on the terms of the settlement are almost impossible to arrange by the combatants themselves" (Walter 1997, 335). Peace settlements are difficult to arrange without third-parties because these settlements require combatants to relinquish their defenses and arms with "no neutral police force and no legitimate government exist to help them enforce the peace" (Walter 1997, 339). The logic of the credible commitment argument revolves around the presence or absence of a third party guarantees and what it offers (i.e. information sharing mechanisms or humanitarian aid) to

[3] For several cases, data for INGOs is not available for certain years. The data was replaced with the next available number in the following year.

encourage cooperation. The logic of the information problem is that information asymmetries can lead to a re-instigation of civil wars because suppressing or exaggerating information leads to further uncertainty about both belligerents, consequently raising the benefits of re-mobilizing for war instead of transitioning towards peace.

Peacekeeping may help solve credible commitment and information problems. In this paper, peacekeeping operations operate as a fear-reducing and cost-increasing provision for civil conflicts, but also a partially understood complex mechanism necessitating further study of what makes it successful. Furthermore, the paper examines the influence of humanitarian purposes in peacekeeping missions - a factor previous studies have not analyzed before- and INGOs per capita in facilitating post-war peace. Therefore, the goal of this paper is (1) to fill what is missing from the peacekeeping literature and (2) to offer implications to aid the policy-making community for efficient and successful peacekeeping intervention.

**Hypotheses**

*Hypothesis 1: The greater the ratio of peacekeepers to the population under conflict, the longer peace lasts.*

The rationalist argument suggests that larger peacekeeping ratios means more civilians are adequately protected. Similarly, belligerents are less "motivated to return to open hostilities" with a "deployment of ever larger number of troops" (Hultman, Kathman, Shannon 2016, 237). In a 2009 study, the Ford Institute concluded that the "size of a force clearly matters in terms of civilian protection" (Reich 2009, 10). However, seeing as the study only analyzed the ratios of peacekeepers in the African continent and not how they could impact long-term peace, my study includes a wider range of civil wars inside and outside the African continent (Reich 2009).

Additionally, I only use military peacekeepers in my ratio calculations because direct civilian protection does not involve civilian peacekeepers.[4]

*Hypothesis 2: The greater the ratio of peacekeepers to the conflict area, the longer peace lasts.*

A rationalist argument suggests that a larger ratio of peacekeepers to a smaller conflict area means better patrolling and management of the conflict. Like Hypothesis 1, I only include military peacekeepers in my ratio calculation because civilian peacekeepers do not directly protect civilians against external aggression.

*Hypothesis 3: If a mission mandate includes humanitarian purpose, peace lasts longer.*

I hypothesize that the inclusion of humanitarian purpose decreases the chance of war reoccurrence because it incentivizes warring parties to cooperate with peacekeepers for personal gain, and therefore, I consider humanitarian purpose as a form of a "third party guarantee." Additionally, humanitarian projects offer an opportunity to build rapport and support between peacekeepers and combatants. Ultimately, if my data supports my hypothesis, third parties should construct peacekeeping missions with "wider" purposes to include humanitarian projects.

*Hypothesis 4: The greater number of international non-governmental organizations per capita within a country, the longer peace will last.*

By relaying information and promoting peacebuilding, INGOs can alleviate uncertainty between belligerents and utilize local citizen networks and international elites to aid peacekeeping efforts.

**Data and Methods**

My research examines the influence of peacekeeping and third parties on long-term peace of civil conflicts. This paper seeks to answer the question: how does the robustness of

[4] Civilian peacekeepers exclude civilian policeman; ergo, "civilian peacekeepers" are peacekeepers that do not use force in their everyday tasks.

peacekeeping operations and international non-governmental organizations affect the long-term peace of civil conflicts? To identify a list of conflicts, I adopt the Correlates of War's (COW) definition of a conflict: "(1) it produces at least 1,000 battle deaths each year, (2) the central government is one of the principal parties, (3) there is effective resistance by both sides to the conflict, and (4) it occurs within the recognized boundary of a state" (Mattes and Savun 2010, 517; Walter 1997, 343).[5] Additionally, I only examine conflicts that end in negotiated peace settlement, not in military victories or "imposed settlements" because conflicts with negotiated peace settlements and truces are more likely to fall obstacle to credible commitment, information asymmetry, and vulnerability problems; furthermore, military victories do not have any significant impact "on postwar peace" (Mattes and Savun 2010, 517; Walter 2009, 257; Hartzell 2016, 123).

In this paper, the definition of negotiated peace settlement is "a negotiated settlement that brings together representatives of the opposing groups" which contains a "form of war-ending bargain directly address[ing] how power is to be distributed and managed a post war state" (Hartzell and Hoddie 2007, 5). Negotiated truces are "means of securing an end to violent conflict," but differ from peace settlements because they "focus on the process and modalities of ending violence in the short term," and rarely "address the challenging question of how power is to be exercised in the postwar state and by whom" (Hartzell and Hoddie 2007, 7).

My case selection models Mattes and Savun's paper on information, agreement design, and civil war settlements (2010). In their work, Mattes and Savun focus on conflicts post World War II that met the COW conflict definition. Modeling Hartzell and Hoddie, they take forty-nine cases ended in negotiated in settlements or truces from 1945 to 1998 from 103 civil conflicts

[5] Given the COW definition, this paper does not analyze intercommunal (non-state) conflicts or one-sided conflicts.

(Mattes and Savun 2010, 517; Hartzell and Hoddie 2007, 6-7). In addition to these forty-nine cases, Mattes and Savun add five more cases that occurred between the 1990-2004, "Angola 1998–2001, Liberia 2003, Philippines 2000, Sudan 1983–2002, and Burundi 2000–2002" (2010, 517). For my own research, I add two more cases that ended after 2002, FARC 1964-2016 and South Sudan 2013-2015, for a total of fifty-three cases.[6]

My unit of analysis is a civil conflict that implemented negotiated peace settlement anytime from 1946 until 2016. My cases include situations in which third parties deploy peacekeepers, where there are no peacekeepers, scenarios where belligerents maintain peace, and when they do not. My independent variables are two facets of the strength of peacekeeping operations, humanitarian purposes in mission mandates, and international non-governmental organizations. The Mullenbach's Third-Party Peacekeeping Missions dataset provides data on peacekeeping troop numbers and humanitarian purposes, the World Bank data provides information on national population, the Centre for Study of Civil War and Peace Research Institute in Oslo provides data on conflict zone radiuses (PRIO), and the Smith and Wiest provides data for INGOs per capita (2012).

To calculate the ratio of peacekeeping forces to national population, I divide the national population at the time of peacekeeping deployment by the number of military peacekeepers. To calculate the ratio of peacekeeping forces to geographical region, I use the conflict site radius as listed on the Conflict Site dataset to calculate conflict area, and divide this by the number of military peacekeepers sent to the region.[7]

[6] The total number of cases for this study is fifty-three instead of fifty-six because the data received from Mattes and Savun listed fifty-one cases instead of the estimated fifty-four; this is probably because they condensed multiple belligerents in one conflict into one case.
[7] The conflict area for South Sudan was not in the original dataset and therefore was calculated independently.

To calculate humanitarian purposes and INGOs per capita, I check if the Mullenbach coded a certain mission as having a humanitarian purpose. In the analysis, I code humanitarian purpose using binary variables: "1" and "0." Similarly, missions coded as a "1" have a humanitarian purpose in their mandate, and "0" if otherwise.

The dependent variable in my study is the duration of peace (in months) after belligerents sign a peace agreement. Peace is "broken" if "belligerents become embroiled in another civil war," as identified through the Uppsala Conflict Data Project (UCDP) dataset, or if one or both parties denounce the agreement (Mattes and Savun 2010, 517). If a civil war with the same combatants exist after the signed peace agreement date, then the date in which this conflict begins is the day that peace ends. The Uppsala Conflict Data Program's contains data regarding peace agreements, and I use historical sources to confirm (Högbladh 2011).

My paper includes the following control variables: if the conflict has ethno-religious ties *(issue)*, number of battlefield-related deaths *(lncondeaths)*, life expectancy *(lifeexphh)*, duration of the previous war *(lndur)*, power-sharing agreements *(psindex)*, third party guarantees *(guarantee)*, information sharing mechanisms *(infoindex)*, and polity *(polity)*. These variables control for problems of endogeneity, or "background factors" that would cause spurious relationships, but I also test them for their individual impact on the dependent variable (Mattes and Savun 2010; Hartzell and Hoddie 2007).

The analysis includes ethnic wars to account for Kaufman's Ethno-symbolism theory: conflicts with ethnoreligious ties are more difficult to resolve because emotions and symbolic manipulation exacerbate difficulties and grievances (Walter 2002, 12; Kaufman 2006, 47; Crenshaw 2007, 72). I code civil wars fought over ethnic issues as a "2," a "1" if "the war had some ethnic component," and a "0" if there was no ethnic component whatsoever (Mattes and

Savun 2009, 751). Additionally, studies by Mattes and Savun confirm that ethnic wars had a higher "hazard rate," or higher risk of war re-emerging after a peace agreement (Mattes and Savun 2009, 754). Given these previous studies, I hypothesize that this relationship remains the same for this paper (Mattes and Savun 2009, 754).

Severity of previous wars and economic development is also tested by Mattes and Savun. They expect that the higher the costs of the previous war, the higher the chance of war reoccurring (Mattes and Savun 2009, 754). To decreased the effect of possible outliers, I log the number of battle-related death. Data for battle-related deaths comes from the UCDP dataset. Another variable I test is economic development; Mattes and Savun found that higher "economic development at the end of the war" led to longer peace (2010, 519). They explained this theory by stating that "the more developed a country is, the more job opportunities exist for former belligerents and the more successful and quick postwar reconstruction" (Mattes and Savun 2010, 519). I measure socio-economic development by using life expectancy at birth when the war ends. [8] [9]

I control for the duration of the conflict because the variable has proven to positively influence peace duration (Cronin 2009; Mattes and Savun 2010). Belligerents of long running conflicts may have a higher level of resolve for settling the conflict through political means because they have exhausted the military route. Therefore, combatants of longer lasting conflicts are more committed to peace agreements than belligerents of newer conflicts who believe there

[8] For two cases, data for life expectancy is not available for certain years. To make up for this, I replaced the missing data with the next available number in the following year.

[9] GDP per capita was ultimately not included because of collinearity problems and gaps in data (see data documentation). To have a standard of comparison, I decided to use life expectancy, instead of maternal mortality, for my socioeconomic indicator so I could compare it to Mattes and Savun's life expectancy outcomes. However, future analysis should test maternal mortality.

is "unfinished business" left on the battlefield. I measure conflict duration by logging the months a country is in conflict.

My study also controls for power-sharing agreements because of its significance in previous studies. Power-sharing agreements are a type of peace agreements that dictate how combatants can share state power. These agreements function as a mutual "guarantee" or contract that prevents "either the government or the rebels" from "exclud[ing] their adversaries from making decisions in these areas," and "ensur[ing] domestic groups that they will not become victims of discrimination and violence in the new state" (Mattes and Savun 2009, 719 and 740). There are four dimensions of state power accounted for in the analysis: political, territorial, military, and economic power sharing (Hartzell and Hoddie 2007, Harzell 2016). A "0" detonates a peace agreement with no power sharing elements, and a "4" stands for a peace agreement containing all power-sharing tenants.

I also control and test for third-party guarantees to reduce issues of endogeneity. Previous studies by Walter suggest that third-party guarantees reduce commitment problems and security concerns of civil conflicts (Walter 1997, Walter 2002). The definition of "third party guarantees" is a promise to "intervene [by third parties] should the parties renege on the agreement" or if a "peace enforcement mission is deployed" (Mattes and Savun 2010, 511).[10]

In the Bargaining Model of War, the likelihood of war increases as uncertainty increases. Similarly, in my analysis, I control for information sharing mechanisms that could lower uncertainty between parties regarding parties. To do this, I model Mattes and Savun by examining the mandate and coding for whether there are provisions for third parties to monitor belligerents, if warring parties need to submit military information to third parties, and if there is

[10] Peacekeeping forces are different than peace enforcing missions. The latter allows for military force while peacekeeping usually does not.

a "verifying" component for the information submitted. If all tenants of information sharing are present, I code it a "3," if there are only two provisions it is a "2," and so on. If peacekeepers do not monitor, receive information from belligerents, verify information, or if there no peacekeepers at all, I code the situation as a "0."

Lastly, I code for polity. I include polity in the analysis because the regime type plays an active role of whether civil wars occur (DeRouen and Sobek 2016, 59). When faced with domestic opposition, states can either accommodate or repress citizens depending on the tools, capacity, and beliefs of the existing system (DeRouen and Sobek 2016, 59). To accurately capture this, I record the polity score of each state five years before the conflict occurs.

To analyze my data, I use a quantitative approach because the research question seeks to understand the effects of causes rather than the causes of effects. For the statistical analysis, I utilize a set of models called survival models. Like the name implies, these models examine the length of time until an event occurs, or in this case, the end of peace. The tables below present the hard data with standard coefficients and ratios known as a "hazard rates." A hazard rate is a coefficient that is "interpreted relative to 1" (Fortna 2008, 104). Ratios below 1 mean the "variable is estimated to reduce the hazard," while ratios greater than 1 increase the hazard (Fortna 2008, 104). For example, a study done by Page Fortna generated a hazard ratio of 1.24 for an identity war, consequently suggesting that conflicts with identity cleavages (i.e. two sides are of different ethnicities, religious identities, etc.) increase war re-occurrence by twenty-four percent (Fortna 2008, 106).

My hypothesis establishes causality if the ratios of peacekeepers to conflict area, national population, humanitarian purposes, and INGOs are significant and lead to longer-lasting peace. My hypothesis is falsifiable if the null hypothesis is true, or if the z value suggests peace lasts

longer in conflicts that have no peacekeeping missions, or with peacekeeping missions with the opposite characteristics of what I predicted. To provide a standard of comparison, I replicate Mattes and Savun's model with my fifty-three cases and compare them to my findings. Below, the first column contains the results from the Mattes and Savun's study, the second column shows the results from my study as expressed in coefficients, and the third column expresses the same results in change in hazard rates.

**Results**

**Table 1 Cox Proportional Hazards Model of Civil War Settlement Stability, 1945-2016**

| *Variable* | *Replicated Data of Mattes and Savun* | *Min's Data (Coefficients)* | *Min's Data (Hazard Percentages)* |
|---|---|---|---|
| Power-Sharing Provisions | -0.412 | -0.291 | 25% decrease |
| | (-0.3) | (-0.35) | |
| Third-Party Guarantees | -0.821 | -1.27 | 72% decrease |
| | (-0.72) | (-1) | |
| Information Index | -0.394 | -0.737* | 52% decrease |
| | (-0.25) | (-0.38) | |
| Ethno-religious Issues | 1.093*** | 0.700* | 101% increase |
| | (-0.37) | (-0.39) | |
| Battlefield Deaths | 0.414** | 0.498* | 65% increase |
| | (-0.17) | (-0.26) | |
| Conflict Duration | -0.429** | -0.828** | 56% decrease |
| | (-0.2) | (-0.41) | |
| Polity | -0.082 | -0.153 | 14% decrease |
| | (-0.05) | (-0.13) | |
| Life Expectancy | -0.076*** | -0.074* | 7% decrease |
| | (-0.02) | (-0.04) | |
| **INGOs per capita** | | **-0.004** | **0.41% decrease** |
| | | **(-0.01)** | |
| **Ratio of Peacekeepers to Area** | | **0.001**** | **0.11% increase** |
| | | **0** | |
| **Ratio of Peacekeepers to Population** | | **-0.00013**** | **0.02% decrease** |
| | | **0** | |
| **Humanitarian Purpose** | | **-1.046** | **65% decrease** |
| | | **(-1.08)** | |
| N (cases) | 53 | 52 | |
| * p<0.10 | ** p<0.05 | *** p<0.01 | |

**Analysis**

The table above shows the results of my survival analysis. A positive coefficient or a hazard percentage increase indicates an increased risk of a renewed civil war. A negative coefficient or a hazard percentage decrease indicates a decreased risk of violence reoccurring.[11]

The first column focuses on Mattes and Savun's original variables: information mechanisms (uncertainty-reducing provisions), power-sharing provisions, third-party guarantees, life expectancy, polity, ethnic issues, costs of previous war, and duration of previous war. The data suggests that wars with ethnoreligious characteristics and higher battle-related deaths significantly increase the chance of peace failing post-agreement. Although this is consistent with Mattes and Savun's original paper, they differ from Mattes Savun's original results in that the original p-value changed so it was less significant.

In the same column, longer lasting conflicts and states with higher life expectancies have longer-lasting peace which also supports Mattes and Savun (2010). These findings are significant and support the mechanisms mentioned in the literature review. Additionally, power sharing provisions, third party guarantees, information mechanisms (i.e. uncertainty reducing mechanisms), and more democratic governments also lower the chance of war reoccurring, but these results are not statistically significant.

Column 2 and Column 3 represent my own analysis. To yield these results, I ran Mattes and Savun's basic model, included their variables (as previously mentioned above) and added the other variables: ratio of peacekeepers to area, ratio of peacekeepers to national population, humanitarian purposes in peacekeeping missions, and number of international non-governmental

[11] The original tables containing the z-values are found in Appendices section.

organizations per capita in the country. To assess the significance of my findings, I examined the "z" value, the sign of coefficient, hazard rate, and the p-value.

The "z" value for my first independent variable suggests that a higher ratio of peacekeepers to national population significantly lowers the chance of war reoccurring; this supports Hypothesis 1 and previous studies conducted by the Ford Institute (Reich 2009). [12]

However, the z value for my second independent variable suggests that a higher ratio of peacekeepers to conflict area significantly increases the chance that war reemerges. This is the opposite of what I predicted in Hypothesis 2. One possible explanation is that a high concentration of military troops in a small area leads to more tension, therefore allowing violence to escalate and the conflict to remerge. Additionally, there is a conceptual problem with the testing of Hypothesis 2. Even though the logic was that more peacekeepers means additional manpower to cover more ground, peacekeepers are not dispersed evenly throughout the conflict zone. Instead, they are usually deployed to one specific area, such as a specific city or province. On the other hand, it is possible that the selection effect yielded a positive ratio for conflict area. Before I finalized by my results, I tested different variables, including total number of military peacekeepers, and found that the total number of military troops decreased the chance of war re-occurring (but not significantly), and therefore, I expected that a negative coefficient would still appear in the ratio.

The two other independent variables, the number of international non-governmental organizations and humanitarian purposes, lowered the chance of war reemerging, but not significantly. Similarly, power sharing provisions, third party guarantees, information sharing

[12] The Ford institute included all peacekeepers in their work, ergo not separating military from civilian peacekeepers.

mechanisms, life expectancy, and more democratic governments also lowered the chance of peace breaking, but not significantly.

When comparing Mattes and Savun's studies to my findings, it is evident that the significance of each factor varies as I include different variables within the model. For example, the only factor that remains statistically significant in reducing war reoccurrence is conflict duration, but the "robustness" of ethnoreligious ties, battle-field related deaths, and life expectancy decrease in the second analysis to the extent that it is no longer statistically significant. Therefore, even though ethnoreligious ties and polity scores are important to consider when resolving conflicts, these factors are no longer statistically significant when we control for the number of troops. The findings of this paper suggest that there are other important factors that need attention, more specifically, factors that promote agency and improvement in conflict resolution and management.

Although there were other variables that were calculated for this analysis (i.e. mean number of military peacekeeping troops, total number of civilian peacekeepers), I did not include them because they were statistically insignificant or caused collinearity (i.e. GDP and life expectation). I checked for problems with collinearity by estimating correlation coefficients for all the independent and control variables which I report in Appendix J.

**Conclusion**

This article explores how the robustness of military peacekeepers can encourage peace post-conflict. Although peacekeeping literature is relatively new within the study of Conflict Resolution, information about peacekeeping mechanisms is understudied. To provide more information on this topic, I conducted an empirical analysis of fifty-three civil conflicts and respective peace agreements between 1945 and 2016. I hypothesized that the strength of peacekeepers of the mission, as measured by the ratio of peacekeepers to population and

conflicts area, humanitarian purposes in mission mandates, and more INGOs per capita would lead to lower chances of war reoccurring. My findings implied that the ratios of peacekeepers to population and conflict area variables are significant, but only the ratio of peacekeepers to population decreases the chance of violence re-emerging- a new finding that could help positively craft future peacekeeping assignments. Conversely, the data indicated that a higher ratio of peacekeepers to land area raises the risk of violence reoccurring, which is the opposite of what I predicted. It is possible that this was an example of "too many cooks in the kitchen spoiling the broth," the data did not accurately express where organizations and states deploy peacekeepers (i.e. peacekeepers are usually put in one city versus the entire conflict zone), or selection bias. Although the numbers disproved my second hypothesis, it would be valuable to have another study examine the relationship between peacekeepers and conflict area with more accurate geographic data and cases. Nonetheless, I hope that the findings of this paper serve as useful information to crafting long lasting peace- peace that can last beyond temporary third party assistance.

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## APPENDIX A: Case List

*Note: This case list is from Mattes and Savun; the last two cases are added for the analysis*

| **ID Number** | **Civil War** |
|---|---|
| 1.1 | Angola 1975-1989 |
| 1.2 | Angola 1989-1991 |
| 1.3 | Angola 1992-1994 |
| 1.4 | Angola 1998-2001 |
| 2 | Azerbaijan 1989-1994 |
| 3 | Bosnia 1992-1995 |
| 4 | Cambodia 1970-1991 |
| 5.1 | Chad 1979-1979 |
| 5.2 | Chad 1989-1996 |
| 6 | Chechnya 1994-1996 |
| 7 | Colombia 1948-1957 |
| 8.1 | Croatia 1991-1992 |
| 8.2 | Croatia 1995-1995 |
| 9 | Dominican Republic 1965-1965 |
| 10 | El Salvador 1979-1992 |
| 11 | Georgia (SO) 1989-1992 |
| 12 | Georgia (Ab) 1992-1994 |
| 13 | Guatemala 1963-1996 |

| | |
|---|---|
| 14 | Guinea-Bissau 1998-1998 |
| 16 | Iraq 1961-1970 |
| 17 | Laos 1959-1973 |
| 18.1 | Lebanon 1958-1958 |
| 18.2 | Lebanon 1975-1989 |
| 19.1 | Liberia 1989-1993 |
| 19.2 | Liberia 1994-1996 |
| 19.3 | Liberia 2002-2003 |
| 21 | Moldova 1992-1992 |
| 22 | Mozambique 1982-1992 |
| 23 | Nicaragua 1981-1989 |
| 24 | Papua New Guinea 1989-1998 |
| 25.1 | Philippines 1972-1996 |
| 25.2 | Philippines 2000-2000 |
| 26 | Rwanda 1990-1993 |
| 27.1 | Sierra Leone 1992-1996 |
| 27.2 | Sierra Leone 1998-1999 |
| 28 | South Africa 1983-1991 |
| 29.1 | Sudan 1963-1972 |
| 29.2 | Sudan 1983-2002 |
| 30 | Tajikistan 1992-1997 |
| 31 | Yemen (AR) 1962-1970 |

| | |
|---|---|
| 32 | Zimbabwe 1972-1979 |
| 33 | Kosovo 1998-1999 |
| 35 | Congo (DRC) 1997-2001 |
| 36 | Burundi 2000-2002 |
| 37 | Morocco 1976-1991 |
| 38 | Indonesia 1975-1999 |
| 39 | Mali 1990-1995 |
| 40 | Djibouti 1991-1994 |
| 41 | Congo (Rep.) 1998-1999 |
| 42 | Costa Rica 1948 |
| 43 | Burma 1963-1980 |
| 44 | Colombia 1965-2016 |
| 45 | South Sudan 12/15/2013-8/1/2015 |

**N = 53**

## APPENDIX B: Data Documentation

1. Started with 51 cases Mattes and Savun in their study.
2. Added following cases → (1) South Sudan (2) FARC- Colombia
3. Added GDP per capita and life expectancy data of news cases (end of civil war) from World Bank
    - Ultimately, only used life expectancy data because too many numbers missing for GDP per capita data and co-lineation problems (see substitute data below)
4. Added battlefield-related deaths by using battle field deaths UCDP dataset for 2 new cases
    - Used "best estimate"
5. Calculated peace duration if peace failed
    - Failure was classified if peace agreement was denounced or violence broke out again (25 or more deaths)
6. Added populations according to World Bank the year peacekeeping troops were deployed
7. Added conflict area that corresponded to each conflict
    - Calculated area by using pi*r^2 and using radius from Centre for the Study of Civil War, PRIO
8. Added number of INGO's per capita (number divided by population) at year the conflict ended
9. Input troop maximum and troop mean from Mullenbach dataset
10. Separated civilian peacekeepers (development, training judges) and military peacekeepers
11. Input number of missions from Mullenbach dataset

12. Input number of missions
13. Input number maximum states in a mission
14. Input mean number of states in a mission
15. Input maximum number of military peacekeepers
16. Input mean number of military peacekeepers
17. Input mediation abilities of peacekeeping troops
18. Input humanitarian purposes of missions
19. Input information index for new cases
20. Calculated population-peacekeeper ratio by dividing population by peacekeepers by peacekeeper year
    - All ratios were cut off by hundredths
21. Calculated area-peacekeeper ratio by dividing conflict area by peacekeepers.
22. Ran analysis of 53 cases with variables used in Mattes and Savun
23. Ran analysis of 53 cases with variables in my dataset
24. Ran dataset using other variables
25. Eliminated variables not primarily testing and ones that had above 30% correlation
    - One exception is made to the 30% correlation limit; see Appendix E

## APPENDIX C: GDP Per Capita Data Substitutions

*(Country/ Missing Year / Substitute)*

COLOMBIA /1957/ 1960

CROATIA / 1992 / 1995

KOSOVO / 1999 / 2000

CAMBODIA / 1991 / 1993

* Chechnya → used Russia for this statistic

*Data not given for Lebanon, Costa Rica, Yemen, Myanmar/Burma, and Laos because lack of data. Substitutions were not made because of the next year available was 30, 12, 20, 20, and 11 years away

## APPENDIX D: INGO Data Substitutions

*(Country Code- COW / Missing Years/ Substitute)*

100/ 1957/ 1960

100/ 2016/ 2001

450/ 2003/ 2001

516/ 2002/ 2001

625/ 2002/ 2001

660/ 1958/ 1960

## APPENDIX E: Conflict Radius Data Substitutions

*(Country Code – COW / Missing Year / Substitute)*

910/ 98/ 96

702/ 97/ 98

600/ 91/89

560/ 91/88

450/ 96/ 95

432/ 95/ 93

100/ 57/ 66

92/ 92/ 91

## APPENDIX F: Life Expectancy Substitutions

*(Country Code – COW / Missing Year / Substitute)*

Colombia / 2017/ 2014

South Sudan / 2016 / 2014

## APPENDIX G: South Sudan Calculations

INGO:

Data for South Sudan using this link http://southsudanngoforum.org/3w/

- 120 INGO's found

Conflict Area:

1. Looked at BBC map and estimated 2/3 of country was affected from 2014 http://www.bbc.com/news/world-africa-25573882
2. Found conflict area https://en.wikipedia.org/wiki/South_Sudan
    - 619,745 km^2
3. Calculated 2/3 of the area in km (619,745*0.66 = **409031km^2** )
4. 409031km^2 is the conflict area.

## APPENDIX H: Stata Codes

```
*DESCRIPTIVES
tab monitor
tab infothird
tab verthird
tab infoindex
tab guarantee
tab psindex
tab issue

*Descriptives in Table 1
sum infoindex
sum psindex
sum guarantee
sum lifeexphh
sum hhpolity5
sum issue
sum lncondeaths
sum lndur


* generating area
gen conarea=  (22/7)*radius^2



***ANALYSIS
stset peacedur, id(id) failure(peacefail)

*** Model in Table 2:
stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh, efron
cluster(ccode) nohr
stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 gdp_pcap, efron
cluster(ccode) nohr
* beginning Min's modified analysis
stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointerpc
conarea, efron cluster(ccode) nohr

stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointerpc
totpk1 totpk2 humpurp, efron cluster(ccode) nohr

*stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointerpc
conarea pkyear1 humpurp, efron cluster(ccode) nohr
```

stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointerpc conarea totpk1 totpk2 humpurp, efron cluster(ccode) nohr

stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointerpc ratiopk1_pop ratiopk1_area statetot humpurp, efron cluster(ccode) nohr

stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointerpc ratiopk1_pop ratiopk1_area ratiopk2_pop sec_mandat humpurp, efron cluster(ccode) nohr
corr ratiopk1_pop ratiopk1_area

stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointerpc ratiopk1_pop humpurp, efron cluster(ccode) nohr
stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointerpc ratiopk1_area ratiopk2_area ratiopk1_pop ratiopk2_pop mediate1 humpurp, efron cluster(ccode) nohr
stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointerpc ratiopk1_area ratiopk2_area humpurp, efron cluster(ccode) nohr
stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointerpc ratiopk1_area ratiopk2_area sec_mandat, efron cluster(ccode) nohr
stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh ratiopk1_area ratiopk2_area sec_mandat humpurp, efron cluster(ccode) nohr
stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh totpk1 totpk2 sec_mandat humpurp, efron cluster(ccode) nohr

stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointerpc ratiopk1_pop ratiopk2_pop humpurp, efron cluster(ccode) nohr

stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointerpc meanpk1 meanpk2 mediate1, efron cluster(ccode) nohr
corr wiikngointerpc statetot mediate1

**Trial Run for Final Analysiss**

*Code for everything
stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointerpc ratiopk1_area ratiopk1_pop sec_mandat totpk1 statetot meanstate meanpk1 mediate1 mediate2 humpurp, efron cluster(ccode) nohr
corr psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointerpc ratiopk1_area ratiopk1_pop sec_mandat totpk1 statetot meanstate meanpk1 mediate1 mediate2 humpurp

*Min's Final Data Analysis

```
stcox psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointe~c
ratiopk1_area ratiopk1_pop humpurp, efron cluster(ccode) nohr

corr psindex guarantee infoindex issue lncondeaths lndur hhpolity5 lifeexphh wiikngointe~c
ratiopk1_area ratiopk1_pop humpurp
```

## APPENDIX I: Data correlation check

| | psindex | guaran~e | infoin~x | issue | lncond~s | lndur | hhpoli~5 |
|---|---|---|---|---|---|---|---|
| psindex | 1.0000 | | | | | | |
| guarantee | 0.0432 | 1.0000 | | | | | |
| infoindex | 0.1008 | 0.1900 | 1.0000 | | | | |
| issue | 0.0704 | -0.0637 | 0.0162 | 1.0000 | | | |
| lncondeaths | 0.0332 | -0.0486 | 0.1425 | -0.0903 | 1.0000 | | |
| lndur | 0.1619 | -0.2413 | 0.2011 | -0.0609 | 0.6135 | 1.0000 | |
| hhpolity5 | -0.0613 | -0.0092 | 0.0060 | -0.1296 | -0.2262 | -0.2728 | 1.0000 |
| lifeexphh | -0.0491 | 0.0190 | 0.1102 | 0.0566 | 0.0455 | 0.0035 | 0.1841 |
| wiikngoint~c | -0.1164 | 0.0001 | -0.0454 | -0.0254 | -0.2433 | -0.2514 | 0.0749 |
| ratiopk1_a~a | -0.2866 | -0.1413 | -0.1048 | 0.1258 | 0.0395 | 0.1833 | -0.1891 |
| ratiopk1_pop | -0.2194 | 0.1293 | -0.1117 | -0.0329 | 0.2015 | 0.2675 | -0.1518 |
| humpurp | -0.0219 | 0.2685 | 0.1107 | 0.1110 | -0.1007 | -0.1731 | 0.0071 |

| | lifeex~h | wiikng~c | r~1_area | ra~1_pop | humpurp |
|---|---|---|---|---|---|
| lifeexphh | 1.0000 | | | | |
| wiikngoint~c | -0.0177 | 1.0000 | | | |
| ratiopk1_a~a | -0.1328 | -0.0989 | 1.0000 | | |
| ratiopk1_pop | 0.1105 | -0.1423 | 0.2174 | 1.0000 | |
| humpurp | -0.1686 | 0.2971 | -0.1204 | -0.1458 | 1.0000 |

## APPENDIX J: Replication of Mattes and Savun Model with Additional Cases

Cox regression -- Efron method for ties

| | | | |
|---|---|---|---|
| No. of subjects | = 53 | Number of obs | = 53 |
| No. of failures | = 18 | | |
| Time at risk | = 6256 | | |
| | | Wald chi2(8) | = 45.75 |
| Log pseudolikelihood | = -48.884707 | Prob > chi2 | = 0.0000 |

(Std. Err. adjusted for 40 clusters in ccode)

| _t | Coef. | Robust Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| psindex | -.4118693 | .2975959 | -1.38 | 0.166 | -.9951466 | .171408 |
| guarantee | -.8210313 | .7159703 | -1.15 | 0.251 | -2.224307 | .5822448 |
| infoindex | -.3942552 | .2517298 | -1.57 | 0.117 | -.8876365 | .0991261 |
| issue | 1.092631 | .3738514 | 2.92 | 0.003 | .3598959 | 1.825366 |
| lncondeaths | .4139014 | .174412 | 2.37 | 0.018 | .0720602 | .7557426 |
| lndur | -.4293174 | .1970589 | -2.18 | 0.029 | -.8155457 | -.0430891 |
| hhpolity5 | -.0815623 | .0541504 | -1.51 | 0.132 | -.1876951 | .0245704 |
| lifeexphh | -.0757602 | .0237826 | -3.19 | 0.001 | -.1223733 | -.0291471 |

N= 53

## APPENDIX K: Park's Variables with Coefficients

Cox regression -- Efron method for ties

| | | | |
|---|---|---|---|
| No. of subjects | = 52 | Number of obs | = 52 |
| No. of failures | = 17 | | |
| Time at risk | = 6233 | | |
| | | Wald chi2(12) | = 43.13 |
| Log pseudolikelihood | = -38.347788 | Prob > chi2 | = 0.0000 |

(Std. Err. adjusted for 39 clusters in ccode)

| _t | Coef. | Robust Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| psindex | -.2908548 | .3502465 | -0.83 | 0.406 | -.9773253 | .3956156 |
| guarantee | -1.269863 | 1.002688 | -1.27 | 0.205 | -3.235097 | .6953698 |
| infoindex | -.7372399 | .3815794 | -1.93 | 0.053 | -1.485122 | .0106419 |
| issue | .6995844 | .3937674 | 1.78 | 0.076 | -.0721855 | 1.471354 |
| lncondeaths | .4981591 | .2588592 | 1.92 | 0.054 | -.0091957 | 1.005514 |
| lndur | -.8284885 | .4104333 | -2.02 | 0.044 | -1.632923 | -.024054 |
| hhpolity5 | -.1526082 | .1269429 | -1.20 | 0.229 | -.4014117 | .0961954 |
| lifeexphh | -.0739107 | .0377755 | -1.96 | 0.050 | -.1479493 | .0001279 |
| wiikngointe~c | -.0041084 | .0067721 | -0.61 | 0.544 | -.0173815 | .0091648 |
| ratiopk1_area | .0010687 | .00051 | 2.10 | 0.036 | .0000692 | .0020683 |
| ratiopk1_pop | -.0001298 | .000054 | -2.40 | 0.016 | -.0002357 | -.0000239 |
| humpurp | -1.046313 | 1.083765 | -0.97 | 0.334 | -3.170453 | 1.077828 |

N=52

## APPENDIX L: Park's Variables with Hazard Rates

Cox regression -- Efron method for ties

| | | | |
|---|---|---|---|
| No. of subjects | = 52 | Number of obs | = 52 |
| No. of failures | = 17 | | |
| Time at risk | = 6233 | | |
| | | Wald chi2(12) | = 43.13 |
| Log pseudolikelihood | = -38.347788 | Prob > chi2 | = 0.0000 |

(Std. Err. adjusted for 39 clusters in ccode)

| _t | Haz. Ratio | Robust Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| psindex | .7476242 | .2618527 | -0.83 | 0.406 | .3763163 | 1.485298 |
| guarantee | .28087 | .2816251 | -1.27 | 0.205 | .0393564 | 2.00445 |
| infoindex | .4784326 | .18256 | -1.93 | 0.053 | .2264748 | 1.010699 |
| issue | 2.012916 | .7926206 | 1.78 | 0.076 | .9303583 | 4.355129 |
| lncondeaths | 1.645689 | .4260018 | 1.92 | 0.054 | .9908464 | 2.733311 |
| lndur | .4367089 | .1792399 | -2.02 | 0.044 | .1953577 | .976233 |
| hhpolity5 | .858466 | .1089762 | -1.20 | 0.229 | .6693744 | 1.100974 |
| lifeexphh | .9287547 | .0350842 | -1.96 | 0.050 | .8624749 | 1.000128 |
| wiikngointe~c | .9959001 | .0067444 | -0.61 | 0.544 | .9827687 | 1.009207 |
| ratiopk1_area | 1.001069 | .0005105 | 2.10 | 0.036 | 1.000069 | 1.00207 |
| ratiopk1_pop | .9998702 | .000054 | -2.40 | 0.016 | .9997643 | .9999761 |
| humpurp | .3512305 | .3806514 | -0.97 | 0.334 | .0419846 | 2.938291 |

N=52