Rearranging the Rubble

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Abstract

Advancements in technology coupled with the perception of a diminished tolerance for casualties have increased the prominence and popularity of aerial bombing as a coercive tool, particularly for the United States. Despite the interest on the part of policymakers, however, there has been little scholarly assessment of these coercive episodes. How successful are such campaigns, and what are the prospects for the future? In this paper, I examine the duration of bombing campaign, exploring what leads to their termination. Why do some campaigns last for a matter of hours while others drag on for decades? To answer this question, I highlight the theoretical significance of the political characteristics of **both** the attacker and the adversary. The empirical findings from duration analysis of the length of bombing campaigns (1917-1999) suggest that a democratic government on either side of the coercive equation increases the likelihood of campaigns ending.

> *"Air power is an unusually seductive form of military strength, in part because, like modern courtship, it appears to offer gratification without commitment," (Cohen 1994, 109).*

Introduction

In the CNN era, the American public's tolerance for casualties, both military and civilian, appears lower than ever before. This distaste for death, in combination with ever-improving technology, has changed the face of modern military engagement. As result, aerial bombing has emerged as an important tool of coercion – one which allows for more control and less risk.

Support for aerial bombing reached a fevered pitched following the 1991 Gulf War. Then Secretary of Defense Dick Cheney noted that "this war demonstrated dramatically the new possibilities of what has been called the 'military-technological revolution in warfare," (quoted in Cohen, 1994). More recently in the 2003 Gulf War, air power also figured prominently in the so-called "Shock and Awe" campaign.

This unabashed support for air power does not go unchallenged, however. Detractors are quick to point out that air power may only be important in support of ground troops, also citing the 1991 Gulf War as a prime example. Pape (1996, 314) concludes his book *Bombing to Win* with the clear assertion that "strategic bombing does not work." Despite such criticism and a cloudy track record for coercive success, air power is one of the foremost instruments of American foreign policy.

If the United States continues to rely heavily on air power, this has interesting consequences for the future of the American military. A powerful air force could be perceived as a way to alleviate the need for a strong army or navy. More interestingly, proponents argue that it could decrease the need for the most powerful states to seek out alliance partners (Pape 1997/8). If in the future we will rely nearly exclusively on air power, it is important to explore the underlying mechanisms of coercive bombing. How do numbers of sorties, Bunker Busters, and Daisy Cutters translate in political costs?

With an eye to examining the coercive mechanisms behind aerial bombing, I explore the factors that affect the duration of bombing campaigns. Successful campaigns tend to last less three years or less, so what causes campaigns to persist past this point? Rather than focusing exclusively on the nature of the objectives targeted, I consider the political constraints and context of both of the adversaries in a given aerial campaign, finding that the regime type of both influences when bombing ceases.

Air Power and Coercion

Coercive pressure in the international system can take the form of military action (such as strategic bombing), economic sanctions, or diplomatic actions. Coercion has been described as "the art of influencing the behavior of others by threats," (Ellsberg 1968). Attempting to employ this influence effectively is at the heart of international relations. as throughout history, states have sought tools of coercion in order to influence the behavior of other states without paying the costs associated with full military engagement. As Schelling (1966, 2) notes, "the power to hurt is bargaining power. To exploit it is diplomacy."

In an ideal coercive episode, a credible and capable threat can modify the behavior of the other state without a single shot being fire (or economic sanctions implemented, etc). Some destructive force may play a role in these campaigns, but coercion is successful if an adversary maintains the power to resist and chooses not to do so (Byman and Waxman 2002). Coercion, therefore, is very appealing to leaders, offering a lower cost way of altering the behavior of other members of the international community. The conditions surrounding coercive episodes are seldom ideal, however.

The coercive process is a dynamic one that involves a series of threats and counter-threats. Since coercive diplomacy relies on the threat of force rather than the use of force to affect the actions of other states (George and Simons 1994), it is important to recognize that the ability to effectively threaten is not equivalent to the ability to actually physically compel an opponent or to punish that opponent. Coercive powers must *convince* their opponents that they can credibly and capably carry out the threat, regardless of the legitimacy of the threat, in order to alter an opponent's behavior. Whether or not threats are credible is not merely a reflection of the threat made in a given crisis, but also of past actions (Byman, Waxman, and Larson 1999).

For coercive strategies to succeed, the adversary must receive the threat, relate it to a course of behavior, and decide whether or not to alter behavior. As result, perceptions are key, and the perceptions of the two sides may be vastly different. For this reason, the limited use of force may be important not only for the direct damage inflicted but also for the psychological impact that these use of force can have on an adversary's perception about future violence (Byman and Waxman 2002).

The threat is only *one* element in a target's calculus. In practice, coercion is not an easy option because it still allows the target to make a choice (Freedman 1998), and that choice is dependent on the adversary's perceptions of the situation as well as other factors which may not be readily apparent to the coercive state, such as domestic pressures against concession. Coercion is particular difficult when the adversary is especially recalcitrant or unpredictable (George and Smoke 1974).

One area where perceptions are key concerns the salience of the issue(s) at stake. The adversary's view of the salience of the issue at stake may not be clear to the coercive power. Assessment of the domestic importance of an issue may be difficult from the outside. Circumstances also exist when a target simply cannot concede because the stakes are too high for individual leaders. Here what is best for a state and what is best for an individual leader may diverge because, regardless of the threat issued or violence imposed, the costs of certain loss of power is too high to contemplate.[1]

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[1] When the state initiating the bombing campaign pushes to the point of "over-coercing" (Byman and Waxman 2002), the leaders of the adversary state may be tempted to "gamble for resurrection" (Goemans 2000).

When assessing the potential costs and benefits for the adversary state, attacking states are nearly always at a disadvantage because they cannot determine *a priori* all the adjustments that a target can make. Despite the advances in targeting technology in recent years, most war economies are tough to crack. These advances have also served to make strategic bombing more expensive than theater air power (Pape 1997/8).

Air Power as a Coercive Tool

Air power has been an important feature of nearly ever major war in the 20^{th} century and has become a significant means of conveying coercive threats. Aerial bombing has been particularly appealing because it allows for military force to be used in discrete and limited ways, signalling resolve without risking the lives of too many soldiers (Byman, Waxman and Larson 1999). Air power is also attractive to policymakers because it allow them to engage the enemy incrementally, rather than the all or nothing of direct combat (Cohen 1994).[2]

Air power is typically used to compel an adversary to change its current behavior, rather than deter future acts (but this distinction is not always clear outside of the nuclear context).[3] Using a compellent threat requires more initiative on the part of the coercive power than a deterrent threat would. Deterrent strategies shift the burden of the first move onto the adversary (Pape 1996). More than deterrent strategies, compellent acts are more direct and more definitive. Since the burden of action rests with the adversary, deterrent threats can be more vague. With compellent threats, all action begins with the initiating (or sender) state, and thus the threat must be more thoughtfully crafted. As a result, compellent strategies work differently. Rather than threatening and waiting to see what one's adversary will do, states hoping to compel must act in order to force their adversary to flinch and change his course of action.

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[2] Despite the appeal of ratcheting up pressure gradually, there is little evidence that this approach to coercion with bombs or sanctions or other means is likely to be effective (Pape 1996; Hufbauer, Schott, and Elliott 1991).

[3] At the most basic level, both compellent and deterrent threats are aimed at convincing an adversary to choose a different policy than it otherwise would.

Strategy choice is critical for the use of air power. Denial strategies of coercion target military resources, whereas punishment strategies target the vulnerability of civilian populations.[4] Denial strategies, which are believed to be more effective, aim to limit a target's ability to take and hold territory (Pape 1996). This aim can be met in several ways – by targeting fielded forces, supply lines, as well as military production sites. When a denial strategy is used, the target must make a choice over whether to engage in battle. Damaging military capability affects an opponent's benefits calculations while punishment is accrued in terms of costs.

The choices for targeted states related to punishment strategies are less clear-cut, since the coercive acts are not as directly tied to the coercive power's aim (Freedman 1999). When a punishment strategy is utilized, a coercive power attempts to impose costs on civilians. This approach to aerial bombing advocates the use air power to break the will and the morale of the targeted public. Italian strategist and early proponent of punishment strategies, Guilio Douhet perceived that the way to manipulate the stress this would create in a society was in terms of a mass-elite division. A "swift social breakdown" could be achieved if elites could be detached from the masses (Freedman 1998). Douhet, in particular, advocated punishing bombing campaigns against urban centers in order to break the morale of the enemy population. Inflicting high costs on civilians would lead to popular uprising against the war and demands for an end to the suffering.[5]

Punishment strategies may also target power grids, sources of water, and other critical resources of an industrialized society. This industrial web idea of punishment aims to damage key choke points in the industrial production of a state. Resultant damage from this type of bombing may also have consequences for the military potential for the state.

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[4] These distinctions are analogous to the nuclear targeting ideas of counter-force versus counter-value targets.

[5] The basic logic behind the use of economic sanctions mirrors this conceptualization of punishment.

Political concerns about collateral damage and human consequences complicate coercion, particularly punishment strategies. Since World War II, moral concerns have been expressed concerning the use of air power against civilians, and as result, air forces have worked to find ways to avoid or minimize casualties – either by improving accuracy or by selecting targets with more discretion (Overy 2001). Punishment targets must have political value, and often such targets also have human value.

States attempting to coerce must consider the possibility that policies aimed at creating civilian strife, such as punishment bombing strategies and comprehensive economic sanctions, may cause strong negative feelings directed toward the coercive power rather than the targeted government (Pape 1996, Byman and Waxman 2000). The presence of foreign intervention takes a domestic issue and transforms it into an international one (Stein 2003). In addition, indirect pressure does not appear to personalize the issues sufficiently to spark resistance on the ground (Pape 1996). The resolve of the German population was not broken by the saturation bombing that occurred at the end of World War II, but instead the strategy backfired, strengthened the German will to hold out against the Allies (Eland 1995), thus lengthening the bombing campaign.

Much of the scholarship on the coercive power of bombing has focused almost exclusively on the targeting decisions made by the attacking states with little consideration given to what happens on the ground where the bombs hit (Pape 1996; Mueller 1998; Warden 1997/98; Watts 1997/98). The social and political context in the adversary state affects how persuasive the coercive influence of bombing can be. Even the targeting decisions themselves, which are often treated as military matters, are influenced greatly by political concerns; Clodfelter (1989) clearly highlights this tension in his assessment of US bombing during the Vietnam war. For this reason, my analysis looks beyond targeting and into the political dynamics of the two states involved in these coercive episodes.

Assessing Aerial Bombing

One of the key challenges of studying coercive episodes is determining what the appropriate rubric to judge success and failure is. Previous assessment of air power offer to two distinct types of evaluation of success. First, how well do bombs destroy targets (combat effectiveness)? Second, and more importantly for the purposes of this study, how well does the destructive power of bombs translate into political goals (strategic effectiveness)? For this reason, evaluating the success and failure of coercive episodes is not a trivial issue.

Pape suggests that "determining the strategic effectiveness of a coercive air campaign requires identifying the causal mechanism by which destruction of a specific target set would change the enemy's political calculations and then discovering whether the sequence of events in a specific case matches this causal chain," (1997/8, 96). Since the goal of strategic bombing is the alteration of political behavior, I focus more heavily on strategic effectiveness rather than combat effectiveness. The number of targets destroyed is only important in relationship to the behavior modification that comes about as result.

Coercive bombing campaigns are designed to alter behavior rather than just destroy particular targets. The demands associated with coercive bombing may vary from small changes in policy (US bombing against Libya in 1986) to unconditional surrender (as with Japan in World War II), but in either case, force is being applied to convince an adversary to change its behavior rather than to cause destruction to such a degree that all other alternatives are removed. In order to compel a shift in behavior, bombs must hit targets that hold value for the adversary's leadership. Successful efforts at compellence will require the discovery of and ability to credibly hit an adversary's *pressure points* (Byman and Waxman 2002). Schelling (1966) notes that if those most affected by coercive policies are not individuals with their hands on the levers of power, coercive efforts may go for naught, regardless of the amount of cost that can be created.

To answer my research question, I consider the relationship between campaign duration and the strategic effectiveness of bombing campaigns. Stam (1996) suggests that war is a process of mutual coercion in which adversaries impose costs on each other to compel concessions. Bargaining continues while bombs are falling and bullets are fired. How do falling bombs affect the coercive process over time?

Predicting Campaign Duration

In 1964, when then Assistant Secretary of Defense McNaughton went to consult now Nobel Prize winner Thomas Schelling about how the US could improve the plans for Operation Rolling Thunder in Vietnam, few clear suggestions emerged. A recent article at Slate.com was critical of Schelling for not having a lot of practical advice for the government in the face of a real rather than theoretical coercive confrontation (Kaplan 2005), but the one piece of advice that Schelling impressed upon McNaughton was that whatever kind of bombing campaign you end up launching, it should not last more than three weeks. It will either succeed by then - or it will never succeed.

There is some degree of truth in Schelling's advice. Successful aerial campaigns end much more quickly than those which fail. The duration of campaigns by outcome are detailed in Table 1. None of the campaigns deemed by Pape (1996) (and those who have since augmented his efforts) as successes last more than 3 years.

[Insert Table 1 about here]

This clear relationship begs the question why do campaigns persist long after any hope of success has past? War is a costly struggle to clarify disagreement between the two sides about the outcome (Wagner 2000). If information is transmitted during a coercive bombing campaign, the length of the campaign serves as a proxy for the amount of information needed to resolve disagreement about the between the two states. Uncertainty appears to diminish after roughly three years, but still many of these campaigns persist after this point. In the Korean War, N. Korea had only five major population centers. After a short period of time, the air force ran out of punishment targets and thus they achieved no perceptible effect on the course of the war (Futrell 1983). What do decision-makers hope to gain by continuing these costly military actions?

In order to understand these persistent campaigns, consideration of the political context of the conflicts is necessary. Recently, a great deal of work has focused on the influence that domestic institutions have on the transmission of information in international crises (Fearon 1994, 1997; Schultz 1998, 1999; Siegal 1997). Unfortunately, the role of domestic institutions has largely been ignored in studies of coercive bombing (Belkin *et al* 2002). Horowitz and Reiter (2001) are the lone exception, but their consideration is limited only to the adversary (target) state. Schultz (1999) demonstrates that the domestic politics of the potential attacker also has a great deal of informational influence on the course of a crisis, leading me to believe that the domestic politics of both states involved in a coercive episode are relevant to the decisions to end bombing campaigns. As a first cut, I focus on the impact of the presence of a democracy on either side of the coercive equation (either as attacker or adversary) on the duration of campaign length.

The motivations of the attacker are more clear cut than those of the adversary. The attacker has already sent a costly signal of his resolve by initiating the bombing campaign, thus risking sunk costs if he is defeated (Fearon 1997). The chance of losing power is increased for leaders who initiate wars in which they are defeated (Chiozza and Goemans 2004), so leaders have to be careful about initiating military action. These risks are not uniform, but vary according to the political system surrounding a given leader. When leadership evaluation occurs regularly through elections, leaders who have crafted failed military policies are more likely to be punished by loss of office by active and influential opposition forces (Fearon 1994).

Democratic initiators have already provided a great deal of information by attacking. Previous studies by Stam (1996) and Bennett and Stam (1996, 1998) tell us that democracies tend to self-select into wars only when they think they can win because risky wars pose too much of a threat to the incumbency of popularly elected leaders. Autocratic leaders may be able to suppress negative public opinion, but democratic leaders cannot effectively repress critical elites without threatening their hold on power.

Bennett and Stam (1996, 1998) also find that democracies tend to self-select into short wars whenever possible. When surveyed, Americans list campaign length (along with number of military lives lost and the risk of civilian casualties – again giving insight into why bombing is a popular choice for military coercion) as one of their top concerns as when the United States should resort to force (*Americans Talk Security #9* quoted in Byman, Waxman, and Larson 1999).[6] While democracies do fight harder (Reiter and Stam 2001), their advantages are short-lived as popular support diminishes sharply as casualty numbers rise (Mueller 1973, Gartner and Segura 1998). After 18 months, democratic leaders become more willing to accept losses and draws as concerns about flagging public opinion increase. While aerial bombing campaigns do not carry the same casualty risks as boots on the ground, I still anticipate that fears about diminishing public support will shorten the campaigns initiated by democratic attackers.

In addition, Schultz (1999) finds that states threatened by democratic attackers are less likely to counter-escalate or resist demands, recognizing that a democracy that issues a coercive threat is likely to be highly resolved. Democracies that initiate bombing campaigns are clearly signalling their true preferences in a way that autocratic attackers cannot, which should also lead to short campaigns.

> *H1: Bombing campaigns initiated by democratic states will be shorter than those initiated by other types of attackers.*

The motivation of the adversary state are less clear. When considering the impact of the regime type of the adversary (or target) state, a plausible case can be made for both longer and shorter campaigns when democratic states are involved. For this reason, I develop two contradictory hypotheses.

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[6] The authors also suggest that Americans are more willing to support longer campaigns when victory is expected than when a lengthy commitment is not expected to have a significant impact. Although not explicitly addressed by the public opinion data they discuss, there seems to be a connection between perceptions about success and failure and "acceptable" timelines.

The domestic politics of the adversary state will influence the amount of political costs that the attacker can levy with an aerial campaign. One source of these costs that is particularly important in the democratic context is public opinion. Democratic leaders must be attuned to the demands of their publics and must constantly curry public favor in order to remain in power (Bueno de Mesquita, Morrow, Siverson, and Smith 1999). This political reality influences the foreign policy behavior of democratic states in a number of ways.

As noted above, there is evidence that democratic states fight shorter wars (Bennett and Stam 1998), in part because public support for war tends to diminish over time. While elites might want to maintain resistance to an attacker's coercive attacks, if the public is suffering hardships due to the bombings, they may pressure their government to concede. In a democratic state, this concern must be more closely considered than it would in a non-democratic state, as leaders who refuse to concede may risk their own incumbency (Bueno de Mesquita, Morrow, Siverson, and Smith 1999). Autocratic leaders can either ignore this type of public outcry or actively repress those who question their foreign policy decision-making. Thus, we can imagine that bombing campaigns will end more quickly when the adversary is a democracy.

> *$H2_a$: The likelihood that a bombing campaign against a democratic adversary will end should be higher than for a non-democratic adversary.*

On the other hand, it is also plausible that democratic governments might not be called upon to concede, as the people rally around their embattled governments (Mueller 1970, Baker and Oneal 2001). Because bombing may affect the every day lives of ordinary citizens, such being the target of such a campaign can be easily manipulated by targeted governments. When leaders can sell themselves to the public as protectors of the state, willing to stand up to bullies in the international system, they are likely to see a surge in popularity. Because democratic governments enjoy a greater sense of public legitimacy, the people may have greater faith in their government and their decision-making. Autocratic leaders do not enjoy this popular connection to their citizenry and are unlikely to experience any rallying (Pape 1996).

If the threat by the attacker is initially resisted, democratic leaders may also be less willing to concede, fearing the audience costs of backing down from a challenge. Fearon (1994) asserts that the state with high levels of audience costs (such as democracies) should be less likely to back down. The threat of punishment from a public that feels that their leaders bailed out is very real for democrats who know that elections always loom in the near future. This threat of audience costs further compounds Chiozza and Goemans' (2003) finding that defeat increases the probability that a leader will lose power. Together, these facts may make concession an unpalatable option to democratic leaders. These two influences together may cause bombing campaigns against democratic adversaries to be longer.

> *$H2_b$: The likelihood that a bombing campaign against a democratic adversary will end should be lower than for a non-democratic adversary.*

Data and Methods

Estimating Aerial Campaign Duration

Addressing the effect of time is an important question as we examine the mechanisms by military costs imposed by bombing are translated into political effects. To do so, I look to identify factors that influence the time until a coercive campaign ends. As a first cut, all campaigns are treated the same regardless of outcome. In this analysis, the dependent variable is simply the time until a coercive campaign ends.

In a secondary analysis, duration analysis is also utilized to examine differences between lengths of successful and failed campaigns.[7] When bombing succeeds, the campaign ends because the adversary alters its behavior in response to the demands of the attacker. When bombing fails, however, no concession is made. These campaigns end because the attacker opts to abandon bombing, perhaps to approach the issue in an alternate manner. Because different decision-makers control these two distinct choices, there is additional information to be gleaned by modeling them separately.

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[7] The coding of success and failure is drawn from Pape (1996).

In every time period, there is some probability that bombing will end in each of these two possible outcomes. In an event history context, likelihood of one of these outcomes constitutes an instance of competing risks (Zorn and Van Winkle 2000; Diermeier and Stevenson 1999; Smith and Zick 1994; David and Moeschberger 1978). To capture this dynamic, I utilize a paired Weibull duration model, examining both how long successful bombing campaigns last as well as failed campaigns. Because of the small size of the number of incidents, I believe that utilizing a Weibull model offers the most effective mode of analyzing the data is most effective (Box-Steffensmeier and Jones 1997).[8]

The dependent variable for each model is the number of months the bombing continued. In the first analysis, the duration of each campaign is predicted. In the secondary analysis, it's a little more complicated. For successes, cases ending in failure are treated as right-censored and vice-versa. Delineating the outcomes incorporates into the empirical model the idea that the decisions about concession are made separately by the two states. Since the two decisions cannot occur simultaneously and are unique, the assumption that the two hazards are independent of each other is appropriate.

Data and Operationalization

The universe of cases is drawn from Horowitz and Reiter (2001), who augment the data collection of Pape (1996), adding 13 new cases to his original 40.[9] The outcome variable – the length of each bombing campaign – is also drawn from this source.[10] These two studies represent the primary efforts at quantitative analysis of the success of aerial bombing. A great deal of additional work exists in the form of case study research, which certainly informs the quantitative work in this vein.

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[8] Similar but not identical results are achieve when performing Cox regression. I opted to present the Weibull results following the advice from Box-Steffensmeier and Jones (1997)about duration analysis for small samples.

[9] As a starting point for some of their augmentation, Horowitz and Reiter draw on Mueller (1998).

Several of the primary indicator variables are also drawn from these data. First, the nature of the sender's demand is likely to influence the likelihood of success in these coercive episodes. In cases where the demands were large and thus the related costs of concession were high, the demand is scored as one. If the attacker demands that a target change either its regime or leadership, then the demand is large.

Not all targets will be influence by strategic bombing in the same manners. Some states are more susceptible to punishment strategies, while others are more likely to be influenced by efforts at denial. Pape rated (and Horowitz and Reiter augmented) the degree to which targets were susceptible to denial strategies. Vulnerability is rated *nil, low, medium, high, or very high* or from 0 to 5. As states become more vulnerable to such strategies, the probability that the coercive effort will be successful increases.

The presence of additional forms of coercion also considered. Following the logic that strategic bombing may be more effective in combination with the use of other forces, an indicator variable is included to capture whether or not ground or naval forces were also engaged in the coercive episode.

Because not all states in the international system are equivalent in power, capabilities must also be taken into consideration. Ideally, a variable measuring the GDP of the parties involved would be included or perhaps even a measure of relative air power. Unfortunately, many of the typically measures of capabilities have not be collected for non-state actors such as the PLO. Because the PLO and other rebel groups have been actively involved (both as attackers and as adversaries) in several of these episodes, an alternate measure is utilized. Although crude, an indicator variable for whether or not the attacker is a major power provides insight into the force being brought to bear in the conflict.

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[10] For the secondary analysis, which also takes into account how the coercive episode ends, the determination of which side concedes is also made by these authors.

Finally, to assess the above hypotheses about the influence of the political circumstances of both the attacker and the adversary states, two indicator variables are included to denote democratic governments on each side. States are considered to be democracies if they are sovereign and have a Polity score of 7 or higher on the combined Democracy - Autocracy scale. Non-state actors like the PLO are considered non-democracies. Summary statistics for all variables are presented below in Table 2.

[Insert Table 2 about here]

Results

The coefficients from the Weibull regression model estimating the duration of all bombing campaigns (in months) are presented in Table 3. Standard errors are clustered by the war in which the campaign occurred, in hopes of combating heteroskedasticity due to changes in military technology.[11]

[Insert Table 3 about here]

In this unified model, the risk of a campaign ending is considered. Positive coefficients denote factors that increase the likelihood of a campaign ending in a given time period. When adversary states are more susceptible to denial strategies, coercive bombing campaigns more likely to end sooner. This result is in line with previous research (Horowitz and Reiter 2001) and not surprising since scholars and policy analysts have posited that denial strategies have a greater probability of coercive influence.

For the purposes of this study, the variables that capture levels of political constraint of both the attacker and the adversary are most interesting. The length of coercive campaigns appears to be influenced by the regime type of both states involved. The presence of a democracy on either sides of the coercive equation increases the likelihood of coercive bombing ending in a given time period.[12]

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[11] All significance tests are one-tailed except for that associated with the variable for democratic targets because no directional hypothesis was specified.

The relationship for regime type of the adversary (or target) is the stronger of the two – both in terms of statistical and substantive significance.[13] Horowitz and Reiter (2001) did not find a statistically significant relationship between adversary regime and the likelihood of success of coercive campaigns, so it appears that the influence of regime type on coercive outcomes may be an indirect one. Here, we see that when the adversary is a democracy, the likelihood that the campaign will end (by concession from either side) is increased. This finding lends support to *Hypothesis* 2_a, that campaigns against democratic adversaries will be shorter than those against other types of adversaries. In this analysis, which does not discern between outcomes, however, we cannot determine whether this difference is due to concession by the adversary state in response to the coercive pressure from bombing or concession by the attacker state in response to a resolved democratic adversary.

The same positive relationship is found for occasions when the initiating state is a democracy. While this relationship is statistically weaker and substantively roughly half the size of the influence of a democratic adversary, a campaign initiated by a democratic attacker is more likely to end in a given time period than is a campaign initiated by another state. As result, these coercive bombing campaigns will be shorter in duration. These finding are in line with previous work on democracy and the length of military engagement as democracies tend to fight shorter wars.

The use of other forces in combination with coercive bombing decreases the likelihood of a coercive campaign ending in a given time period, nearly cutting it in half (See Table 5). The direction of this relationship may be driven by sunk costs that the attacker has invested. When an attacker also put troops on the ground, he may be less likely to pull them out quickly. Placing troops on the ground is a costly signal in terms of both an adversary, and this act also generates audience costs with the domestic public. If the initial hurdle of putting troops in has been breached, the decision to remove them will be just as grave until the coercive outcome is certain.

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[12] There are no cases of joint democracy in the data.

[13] For an idea of relative impact, hazard ratios are presented in the appendix.

There is some evidence of duration dependence in the data. The estimate of P is greater than one, thus the hazard is monotonically increasing. As time passes, observations fail (or campaigns end) at a faster rate then they did initially. Thus as uncertainty decreases over time, campaigns are more likely to end at a faster rate than they did initially when uncertainty was greater.

For a more nuanced analysis, campaign durations are also examined by outcome. In this competing risks framework, one model is estimated for the time until a campaign ends successfully and another for the length of failed coercive campaigns.[14] The results for the competing risks model are presented in Table 4. When campaign durations are estimated by outcome, some differences between successful and failed coercive campaigns become apparent.

[Insert Table 4 about here]

The nature of the attacker's demand does not have a significant influence on the length of coercive bombing campaigns, regardless of which side makes the concessions.[15] This non-finding may be related to the coarseness of the coding of this variable. As a dichotomous indicator, too much detail may be lost concerning the goals of the attacker and the salience of the issue at stake. Creating a cleaner measure of the significance of the demand is a potentially important area for the development of future research.

Surprisingly, the combination of aerial bombing with other forces does not positively influence the likelihood of a successful campaign ending, but the combination does have a negative effect on the likelihood of terminating a failed campaign. The likelihood of a campaign ending in failure is decreased by nearly 2/3 when other forces are also engaged (See Table 6). This stands to reason as failed campaigns end when the attacker decides to terminate the action. When troops are also committed, an attacker may be less willing to declare the campaign a wash. Other forces were present in 37 of the 50 episodes considered (23 of those were failures).

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[14] All episodes are considered in both models, but in the success estimates, the failed cases are treated as right-censored because they have not experienced the event (a successful end).

[15] This variable did not attain statistical significance in all of Horowitz and Reiter's multiple models.

The support for the vulnerability variables is mixed. As an adversary becomes more vulnerable to denial strategies, the likelihood of a successful campaign ending is increased. This finding echoes the results from the unified model, but susceptibility to denial does not have a statistically significant influence on failed campaigns. Since the adversary concedes when campaigns end successful, their vulnerability should have a greater impact on these decisions than it would on decisions made about concession by the attacker, which is needed for a campaign to end unsuccessfully.

The variable categorizing vulnerability to punishment bombing strategies does not obtain statistical significance – either in the competing risks models or in the composite model. Punishment strategies are thought to be more difficult to target effectively, as wartime economies are often more adaptable and robust than attackers assume prior to the conflict (Byman, Waxman and Larson 1999).

The relationships between the regimes types of the two sides and campaign duration are interesting. Bennett and Stam (1998) find that after about 18 months, democracies are more likely to settle for draws or loses. Based on this information, we might conclude that democratic decision-makers should be more likely to concede quickly when faced with coercive pressure. So the expectation would be that in the success model, the presence of a democratic adversary (whose concession decision ends these episodes) would shorten campaigns. Instead, we see that the influence of a democratic state appears on the other side of the coercive equation. When a democratic attacker is involved, concession from the adversary (of whatever type) comes more quickly. By attacking, the democratic state is proving to the adversary that he is highly resolved and willing to escalate the crisis by dropping bombs. This signal induces concession by the adversary, making it more than three times more likely.

The opposite holds true in the failure model. While we might assume that a democratic attacker would concede more quickly to end the bombing, despite the fact that it means accepting failure, the data suggest something else. A democratic attacker does not shorten failed campaigns, but the presence of a democratic adversary does. These findings are in line with Schultz (1999) who finds that democratic states reveal information by their actions, which provide credible signals to opponents due to the openness of democratic societies. According to Schultz, this informational function is more influential when explaining patterns of international interactions involving democracies than the competing explanation of institutional constraints espoused by Bueno de Mesquita, Morrow, Siverson and Smith (1999).

So we return to the question of why do bombing campaigns persist? Here, we may find the influence of domestic politics. One potential explanation for bombing campaigns continuing beyond the extent of their coercive power may be the domestic costs associated with backing down. Fearon (1994) explores domestic influences on state crisis behavior. Once an initiating state has gone public with its decision to engage a target, there may be domestic political costs for backing down. Those leaders who choose to abandon unsuccessful strategic bombing avoid the costs of fighting, but they suffer any audience costs that may have been created by the public confrontation with the target.

Fearon's work suggests that public statements and actions may "lock in" certain courses of action. The stickiness of strategic bombing campaigns may be a byproduct of leader's concerns about being locked in to continuing these very public political confrontations. In the 1970s when Israel waged a campaign against the Palestinian Liberation Organization (PLO), they bombed rebel camps in and around Lebanon for nearly ten years but were unsuccessful at thwarting terrorist acts by the PLO. While this attempt at coercion failed, it persisted at least in part due to political pressure for the government to take on the terrorists. Only after the failed invasion of Lebanon in 1979 was the effort abandoned.

Coercive Bombing as Punishment

Wars should end when both sides know what the outcome will be. If there is no uncertainty, there is little incentive to bear the costs of war (Wagner 2000). If uncertainty diminishes over time, why does unsuccessful coercion via aerial bombing continue?

One possible answer to this question may have to do with the goals of the initiating state. Heretofore, coercion has been considered as the only possible motivation for the use of air power. Coercion is not pain for pain's sake, it must be for the sake of reaching a bargain (Schelling 1966). "Coercion succeeds when the adversary gives in while it still has the power to resist," (Byman, Waxman and Larson 1999, 13). Pummelling an adversary with air power does not constitute coercion, but rather bleeds over into the type of brute force described by Schelling.

If, at some point, coercion by bombing ceases to influence that bargaining process, those bombs serve only to punish the target state, not to change its behavior. Air power could also be a tool for delivering brute force against an enemy. Schelling (1966) differentiates between coercion and brute force, saying

> There is a difference between taking what you want and making someone give it to you, between fending off assault and making someone afraid to assault you, between holding what people are trying to take and making them afraid to take it, between losing what someone can forcibly take and giving it up to avoid risk or damage.

Coercion and brute force differ in intent as well as instrument (Schelling 1966). Some analysts have suggested that the air campaign against Afghanistan after September 11 constitutes a case of brute force rather than coercion (North 2002). Without clear goals for behavior modification, the US campaign against the Taliban and al Qaeda ranks as an instance of brute force. Similarly, after some period of time, aerial bombing may cease to be a tool of coercion, becoming instead an instrument of punishment.

"To be coercive, violence has to be anticipated. And it has to be avoidable by accommodation. The power to hurt is bargaining power," (Schelling 1966). If, as time passes during a bombing campaign, the line between coercion and brute force become blurred, it may be necessary to re-evaluate our motivations and expectations for extended uses of strategic bombing.

Conclusions

This paper represents an early attempt to explore the relationship between campaign duration, coercion and coercive outcomes. Future avenues for research include creating a means of comparing the military capabilities of the two sides, some of which are non-state actors, making traditional sources of data on capabilities incomplete for this project. The issue of the relative capabilities is further complicated by the presence of compound initiators and adversaries in the data. Should the capabilities of the most powerful states be considered or are capabilities additive?

In addition, more detailed information on numbers of sorties and targeting lists is available from disparate government sources for certain campaigns should be brought to bear on questions of this nature (despite the fact that it is seldomly presented in a user-friendly form). Beyond that, numerous scholars have long encouraged a more nuanced understanding of coercive outcomes. The simple failure/success specification is potentially a false dichotomy. In some cases, an initiating state may end up worse off than when they began. Horowitz and Reiter (2001) suggests at least three different campaign conclusions be considered. Our basic definitions of success and failure remain – success as the target concedes and failure as the coercive power abandons policy before target concedes or coercive failure, highlighted by Pape (1996), where the target utterly defeated on battlefield before it accedes. Horowitz and Reiter also suggests another potential type of failure, counter attack by the target. This trichotomy may not be as helpful for this duration research as it would be for strictly predicting outcomes[16]

Another potential area to improve upon this work is in the estimation techniques. Because of the limitations stemming from the small number of cases of these events, a better means of estimating this model would utilize Bayesian inference. Using Bayesian techniques, it will be possible to gain insight from the distribution of the data that do exist and then simulate data that will reflect that distribution in order to perform more advanced and rigorous empirical testing. While aerial bombing is a relatively new phenomenon to study, we cannot let that limitation stop us from gaining insights from the episodes that have taken place.

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[16] Both types of failure result in the coercive power deciding that it is too costly to continue bombing in relationship to the perceived coercive benefits.

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Table 1: Distribution of Outcome by Duration

Outcome	1	2	3	4	5	6	7	8	9	10
Failure	18	3	4	2	.	.	.	1	4	2
Success	16	2	1	0	.	.	.	0	0	0

Table 2: Summary statistics

	Mean	**Std. Dev.**	**Min.**	**Max.**
Outcome Variable				
Campaign Duration	27.63	34.011	0	120
Indicator Variables				
Other Forces	0.722	0.452	0	1
Democratic Adversary	0.222	0.420	0	1
Democratic Attacker	0.481	0.504	0	1
Attacker's Demand	0.352	0.482	0	1
Vulnerability to Denial	3.093	1.086	1	5
Vulnerability to Punishment	2.907	1.120	1	5
Major Power Attacker	0.722	0.452	0	1
N	54			

Table 3: Weibull Regression: Duration of Bombing Campaigns, 1917-1999

Variable	**Coefficient** (Std. Err.)
Democratic Adversary	1.419** (0.428)
Democratic Attacker	0.532† (0.336)
Vulnerability to Punishment	0.094 (0.188)
Vulnerability to Denial	0.541** (0.137)
Attacker's Demand	-0.186 (0.262)
Other Forces	-0.577* (0.338)
Major Power Attacker	0.080 (0.326)
Intercept	-6.116** (0.893)
Shape Parameter	
ln_p	0.231* (0.102)
N	50
Times at Risk	1492
Log-likelihood	-67.164
$\chi^2_{(6)}$	28.84

Significance levels : $\dagger$: 10% $*$: 5% $**$: 1%

Table 4: Competing Risks Model of Bombing Campaigns Ending

	Success Model	Failure Model
Variable	Coefficient (Std. Err.)	Coefficient (Std. Err.)
Democratic Adversary	0.231	1.645^{**}
	(0.656)	(0.571)
Democratic Attacker	1.184^{*}	0.559
	(0.533)	(0.442)
Attacker's Demand	0.033	0.356
	(0.848)	(0.420)
Vulnerability to Denial	1.844^{**}	-0.003
	(0.436)	(0.228)
Vulnerability to Punishment	-0.357	0.076
	(0.446)	(0.232)
Other Forces	1.041	-1.171^{**}
	(0.914)	(0.450)
Major Power Attacker	0.054	-0.286
	(0.866)	(0.391)
Intercept	-12.999^{**}	-4.927^{**}
	(2.650)	(1.307)
Shape Parameter		
ln_p	0.368	0.295^{**}
	(0.286)	(0.112)
N	50	50
Times at Risk	1492	1492
Log-likelihood	-28.724	-48.729
$\chi^2_{(6)}$	68.062	37.958

Significance levels : † : 10% $*$: 5% $**$: 1%

Appendix

Table 5: Composite Model

Variable	**Hazard Ratio**
Democratic Adversary	4.135
Democratic Attacker	1.702
Other Forces	0.562
Vulnerability to Denial	1.717
Vulnerability to Punishment	1.099
Attacker's Demand	0.830
Major Power Attacker	1.083

Table 6: Competing Risks Model

Variable	**Success Hazard Ratio**	**Failure Hazard Ratio**
Democratic Adversary	1.260	5.182
Democratic Attacker	3.268	1.749
Other Forces	2.831	0.310
Vulnerability to Denial	6.320	0.997
Vulnerability to Punishment	0.700	1.079
Attacker's Demand	1.034	1.427
Major Power Attacker	1.055	0.751