Natural Resources and Territorial Conflict

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Studies of interstate territorial conflict have recognized natural resources as one of the elements that makes many territories "salient" or valuable to the claimant states. These studies have generally treated all resources as equivalent, though, with no distinction made between issues based on their value or renewability. We suggest that natural resources show great variation in such characteristics, with important consequences for the management of territorial claims. For example, territorial claims involving non-renewable resources or resources with a direct military benefit (such as oil) are likely to produce a zero-sum game for disputants, resulting in more conflictual relations than contention over other types of resources. We test our hypotheses using an updated version of the Issue Correlates of War (ICOW) territorial claims dataset that indicates the specific resource(s) involved in each claim. We conclude by discussing the implications of these results for the scholarly understanding of natural resources, with respect to territorial claims as well as interstate conflict and cooperation more generally.

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Territorial claims have long been associated with natural resources. Alsace-Lorraine was valued by Germany and France for its rich deposits of coal and iron ore. Bolivia and Chile fought the War of the Pacific over territory that contained plentiful guano and nitrates, and today six states are contending over part of all of the Spratly Islands with their productive fishing grounds and potential oil deposits. While resources are often not the only reason that certain territories are valued -- Alsace-Lorraine also offered strategic military benefits and the desert between Bolivia and Chile also contained Bolivia's only seacoast -- they play an important part in many descriptions of territorial conflict.

Perhaps surprisingly, then, systematic research on interstate conflict has paid little attention to the impact of resources on the management or ending of territorial claims. When resources have been included in past studies, they have generally been represented by a single variable indicating the presence or absence of some type(s) of natural resource, with no further distinction between different types of resources. We attempt to fill this gap in the literature through a more focused analysis of how resources shape armed conflict over territory, considering which types of resources might have the most conflictual effects and under which conditions.

We begin with a brief review of the literature that has already addressed the topic of natural resources and armed conflict, noting the importance of issue based analysis in international conflict as well as acknowledging the important innovations made by the literature on intra-state conflict. We then lay out our theory and hypotheses, broadly arguing that contention over resources increases the likelihood of armed conflict over territorial claims, and further emphasizing the conflictual role of non-renewable resources and energy resources in particular. Empirical analysis on a data set of territorial claims over the past two centuries supports many of our hypotheses. We conclude by discussing the implications of our findings, and by suggesting a number of potentially fruitful directions for future research.

Theoretical Development

While territory has long been recognized as important by scholars of international conflict, it did not begin to receive much systematic study until the late 1980s (e.g. Goertz and Diehl 1988; Diehl 1992; Vasquez 1993; Hensel 1996). This work began connecting territorial

issues with the concept of issue salience, and demonstrated that states are more likely to fight, and less likely to compromise, over territorial issues due to their perceived importance. This dimension of salience is valuable with regards to territory, as it neatly encompasses the myriad of issues that may arise over territory, from resources to less tangible perceptions of nationhood or ethnic kin. A variety of research has examined the conflict propensity of territorial issues, with the consensus being that greater territorial salience makes armed conflict more likely (Vasquez 1995; Hensel 1996; Huth 1996; Huth and Allee 2002; Walter 2003; Hensel and Mitchell 2005; Quackenbush 2010).

Having established the importance of territory, the literature on what particular issues arise from territory has expanded in a variety of fruitful, yet incomplete directions. Diehl expanded this territorial analysis to encompass a wide variety of "issues", borrowing inspiration from Mansbach and Vazquez's desire to incorporate the issues and salience of state disputes (Diehl 1992; Mansbach and Vasquez 1981). The delineation of each issue as having particular salience, as reinforced by the aforementioned work by Hensel, spawned a literature that attempted to analyze the particular role of a variety of issues as they individually impacted conflict. These include analyses of conflict divided into groups by territoriality versus river or maritime claims (Kratochwil, Rohrlich, and Mahajan 1985; Prescott 1987; Gleick, 1993; Wolf 1998; Homer-Dixon and Blitt 1998; Sowers 2002; Hensel, Mitchell, and Sowers 2006; Hensel, et al. 2008; Brochmann & Hensel, 2009), studies based entirely on the role of one natural resource such as oil or diamonds (Lujala, Gleditsch, & Gilmore, 2005; Le Billon 2008; Colgan, 2010;), or as a more abstract analysis of how resources play into conflict (Le Billon 2001; Giordano, Giordano, & Wolf, 2005; Humphreys, 2005).

Natural resources have begun to receive considerable scholarly attention, although primarily in the context of intrastate conflict or civil wars. The importance of natural resources in the context of civil wars primarily comes in the form of providing rebel groups with the necessary income to finance their rebellion, and has been repeatedly shown to enable or at least exacerbate conflict within states (Collier and Hoeffler 1998; Le Billon 2001, 2008; Klare 2001; Ross 2004; Flint 2005). Environmental degradation and mismanagement has also been shown to stoke conflict, as it produces negative externalities and can create water shortages, food insecurity, or displacement, indirectly increasing the likelihood of conflict (Homer-Dixon 1994; Homer-Dixon and Blitt 1998; Reuveny 2000; Diehl and Gleditsch 2001). Thus, while the

relationship between resource mismanagement and conflict has been explored on the intrastate level, and connections have been drawn between such externalities as refugees and international conflict (Salehyan and Gleditsch 2006), the impact of natural resource management and international conflict has been studied primarily through indirect causes.

With regard to interstate conflict, the literature on the relationship between natural resources and conflict is much sparser. The centrality of a particular type of resource, such as oil or fish, to particular conflicts has been documented (Wolf 1998; Denoon and Brahms 2001; Diehl and Gleditsch 2001; Colgan 2013), with less work concerning the broader topic of natural resources and conflict as a whole (Klare 2000, 2001, 2012; Sowers 2002; Giordano, Giordano and Wolf 2005). Within this relatively sparse literature is an understanding that natural resources can be the source of disputes, and can exacerbate pre-existing disputes, often escalating them from previous obscurity. More thoroughly explored in the political economy literature is the relationship between the reliance on natural resources and clientelism or patronage politics, generating a "resource curse", in which states utilize their abundant resource wealth to avoid public accountability (Mahdavy 1970; Luciani 1987; Huntington 1991; Colgan 2013). This lack of accountability may press states to be more risk acceptant in their pursuit of armed conflict in international disputes (Colgan 2013), further bolstered by their desire to provide patronage to their supporters in their winning coalition (Bueno de Mesquita et al. 2004). Directly from domestic politics and resources within states, a reliance on and an abundance of resources have thus been posited to increase the likelihood of armed conflict in interstate disputes.

Hypotheses on Resource Presence

In line with the literature's expectations, it is not unreasonable to suspect that territory with resources of any type will be inherently more valuable than territory without such a resource component. While territories already possess inherent value, be it the exploitation of the populace, industry, commerce, a strategic position, or ethnic brethren, resources should enhance this value regardless of type. Further, while states may vary in how they approach territory based on resource type, the mere presence of a resource will enhance the salience of the territory and push a state to be more aggressive in its pursuit of acquisition. Resources represent wealth, and this wealth can be translated into military power or whatever other goals the states

pursue, and in recognition of this, states will value the claim more highly than they would have were there no resource component. This increased salience will result in states being more willing to resort to armed conflict to settle their claim, or pressure competing states to recognize a better negotiated settlement (Klare 2001).

In addition, the presence of resources will create incentives for autocracies and democracies to ensure the exploitation of the resource to benefit the regime. For autocratic leaders, the resource will represent potential private goods that can be provided to their winning coalition alongside whatever benefits the state may benefit from exploitation, making their regime more stable and ensuring the survival of the autocrat (Bueno de Mesquita et al. 2004). Democracies face similar incentives, not through the provision of goods but from interest groups lobbying the government to secure the resource for their industry or local interest, ensuring that democracies will also pursue the resource more aggressively to satisfy their domestic constituents (Olson 1965, Diehl and Gleditsch 2001, Homer-Dixon and Blitt 1998).

This suggests our first hypothesis:

Hypothesis 1: *Claims over territory with any resource component, regardless of type, will be more likely to lead to armed conflict than those without a resource component.*

While the expectation that resource presence alone raises conflict propensity is well understood, less well understood is how different types of resources impact this conflict behavior. We posit that states involved in a claim over territory with a resource component will adopt different strategies based on whether or not the resource in question is a renewable, or non-renewable resource. In order to examine this possibility, it will first be necessary to identify which resources are considered renewable or non-renewable, and postulate how this distinction impacts state behavior in dyadic territorial claims.

Renewable resources are defined as those resources which, if properly managed, can be exploited in perpetuity. That is, there is no set quantity of the resource within the world, and the resource could theoretically be consumed forever so long as the stresses of consumption are properly managed. Examples of renewable resources include fish, agriculture, timber, or freshwater resources. While fish can be exploited to extinction, or farmland can be over tilled, moderate consumption does not necessitate any finite limit on these resources' exploitation, which can be enjoyed for countless generations under conditions of managed use.

Renewable resources suffer from a management problem referred to as the "tragedy of the commons," in that they are perfectly manageable with cooperation, but should overexploitation be allowed, the resources could be exhausted and disappear. The classic example is this phenomenon is that of a town's "common" area, a parcel of land on which the townsfolk allow their cows to graze (Hardin 1968). Each townsperson faces competing incentives to allow their cows to graze freely, but if each were to do so, the land would be overexploited and the grass would be stretched so thing that all cows would die, and all would suffer. It is therefore in the common interest that the town cooperate in managing the land such that each cow is sufficiently fed while simultaneously ensuring the land stay lush enough for future exploitation. A more direct, and dire, example in international relations would be that of fishing stocks, in that, should fishing stocks be depleted too quickly, a species of fish may go extinct, and thus be gone for eternity (save through some extensive, and expensive, reintroduction program) (Sowers 2002, Homer-Dixon and Blitt 1998, Kratochwil, Rohrlich, and Mahajan 1985). Overexploitation can generate significant negative externalities beyond simply exhausting a resource, for the industries and population tied to that resource will be faced with unemployment, poverty, and in the case of those tied to food production, potential starvation (Diehl and Gleditsch 2001).

This creates an incentive structure for states facing a claim with renewable resources, in that there exist competing short term and long term incentives. There exists some moderate short term benefits to be gained by overexploitation and improper coordination, but there also exist strong long term benefits from cooperation, and most importantly, enormous costs to not coordinating as it may lead to the depletion of the resource in its entirety. As relates to state behavior, states will then be pushed toward cooperation over a territorial claim with renewable resources in order to ensure an orderly exploitation of this resource and avoid the enormous costs that conflict and improperly coordinated exploitation could entail. Such a framework is found in the “enticing opportunity model” (Mitchell 1995) of conflict resolution, which contends that states may come to view negotiations are more cost effective than conflict, pushing them toward negotiations and away from further conflict (Richmond 1998). Should further conflict diminish the value of a territory through direct damage or through mismanagement, as argued by this model, then states will be more likely to negotiate in the case of renewable resources.

Non-renewable resources, by contrast, are finite in nature, and disputes over territory with a non-renewable resource component more closely approximate a zero-sum game. Non-renewable resources include but are not limited to oil, mineral resources, coal, iron, gems, precious metals, and any number of additional resources whose quantity is finite. While it may be possible to extend the effective use of reserves through technological advancement (Prescott 1987) or replacement (e.g. nitrates in the Haber process), ultimately these resources will be exhausted, as replenishment is either impossible or unfeasible due to monetary restraints, and states will treat them as more valuable due to their scarcity (Klare 2001, 2012; Flint 2005). This value is derived in part from the fact that any gains by a competing state are inherently losses by the original state - for the finite nature of non-renewable resources means any lost resources are forgone gains, and gains for a potential adversary. Whatever the non-renewable resource is, it can be converted into military or economic advantage, threatening the state that might potentially lose the resource.

This perception of claims over territory with non-renewable resources and the resulting zero-sum dynamic makes any settlement of the claim significantly more difficult. The incentive for both short and long term benefit will unambiguously be for maximizing the short term exploitation of the resource, as in the long run, the resource will no longer exist. While it is possible to divide the territory under dispute, such division may asymmetrically distribute the resource component to one state, and it may not be easy to determine at which point the natural resource reserves are divided equitably. Similarly, while side payments may be one method of division to overcome this problem, they are inherently unreliable and can be unilaterally cancelled, at which point sovereign control by one state over the resource's extraction will represent effective control, making side payments tenuous at best as potential solutions. The concept of the "hurting stalemate" or incentives toward negotiations as more cost effective than conflict, may not hold be accurate to describe disputes over non-renewable resources. That is because, for so long as neither state has access to a finite resource, it is denying the goods in a relative sense, and ensuring that it is not falling behind relative to its opponent (Wall and Lynn 1993; Zartman 1985; Touval and Zartman 1985). Resources may not be exploited in the event of conflict, but their management in the long run is less important than the short term denial of access to opponents, making cooperation less attractive relative to renewable resources. Instead,

states will find it considerably more difficult to successfully settle disputes over territory with non-renewable resources, relative to those with renewable resources.

This will have the effect of altering the willingness of states to engage in armed conflict over a territorial claim with a natural resource present. As already noted, the presence of non-renewable resources create a zero-sum game for states competing over a claimed piece of territory. This zero-sum perception will make negotiations more difficult, and in doing so, will push states to pursue conflict as a means of settling the dispute more often than in territorial claims with renewable resources. States' inability to end disputes successfully, and to end their conflicts with compromise, will make armed conflict an increasingly attractive option for claims with non-renewable resources. Further, a decisive military outcome will allow the state unfettered access to the valuable resources contained in the territory, and deny the competing state access in its entirety, representing both an absolute and relative gain. Renewable resources, by contrast, risk damage and overexploitation should conflict disrupt their management, as a lack of effective control over the territory may permit private groups to exploit the resource without any oversight, or enable one wartime participant to justify its own overexploitation as it occupies the disputed territory (perhaps with the expectation it may someday need to return it). This has the impact of shifting the incentives yet further away from conflict in such claims, as states recognize just how onerous conflict can be on the continued use of any disputed territory's renewable resource, and will seek to avoid conflict.

This discussion suggests our second hypothesis:

Hypothesis 2: *Claims over territory containing non-renewable resources will be more likely to lead to armed conflict than claims over territory with only renewable resources.*

Hypotheses on Specific Resource Types

We have already outlined how resources are important in shaping state behavior in territorial claims, and divided the resources into two broad groups, renewable and non-renewable resources. However, within these groups are a number of additional resource types (both renewable and non-renewable) that warrant division and investigation, as states broadly conceive of resources as more or less valuable based on their nature of exploitation, use, or particular application. In many cases these resources perform according to the theoretical expectations of their exploitation, with renewables generally seeing less conflict than non-renewables, but there

are variations in this, as well as the degree to which conflict behavior is altered by the particular natural resource.

Agriculture, Food, and Water

While resources related to food production are some of the most easily substitutable natural resources (Sowers 2002), their importance to the economic wellbeing and sustenance of a state's population make these resources especially valuable to a state. Control over an area of fertile farmland or rich fishing grounds can provide food security to a state, a vital component to maintaining economic and political stability. Reliance on foreign food stocks can place a state in a precarious position relative to any potential opponent, and starvation can cripple a state's population while simultaneously producing widespread dissent across all sectors of the population. Even if food security is assured in the short term, control over agriculture and food production in the surplus will present advantages relative to other states, and provide a buffer against potential long term problems associated with population growth or inflationary food prices (Markakis 1998; Seddon and Adhikari 2003). This includes water resources and rivers, which have previously been shown to be a source of at least limited conflict between states (Gleick, 1993; Wolf 1998; Homer-Dixon and Blitt 1998; Sowers 2002; Hensel, Mitchell, and Sowers 2006; Hensel, Mitchell, Sowers, & Thyne, 2008). As such, in order to avoid the disastrous effect that food shortages might produce, or provide an advantageous surplus, states will be more willing to engage in armed conflict to secure these goods for themselves.

This expectation produces our third hypothesis:

Hypothesis 3: *Claims over territory containing resources related to agricultural and food production will be more likely to lead to armed conflict than other claims.*

Timber Resources

Logging and timber related resources are very commonly found in territorial disputes, but their presence may not increase the likelihood of conflict as might be first suspected. Timber is a relatively abundant resource which, while locally valuable and certainly valuable for export, is not geographically concentrated, and the territory under dispute will rarely be the primary source of the resource for any of the competing states. Its global abundance will also make timber or logging easily substitutable, and as such any localized shortage will rarely result in the economic

disruption or severe shortages of related goods that would be seen in most other natural resources. It is also likely that the geographic nature of the terrain under dispute may enter into a state's decision making calculus, with heavily forested areas providing a significant disadvantage to any offensive military operations. The net result of this is to decrease conflict over territory containing timber or logging related resources due to their relative lack of value and importance to national economies. From this we have the following hypothesis:

Hypothesis 4: *Claims over territory containing timber or logging resources will be less likely to lead to armed conflict than other claims.*

Energy Resources

As with resources related to food production, resources related to the generation of energy represent another important asset for states. Energy production is vital to any state, and while the particular resources relating to energy production have shifted over time from coal to oil or natural gas, the fundamental use remains the same. These energy resources are used to power industries, homes, and facilitate transport, and are highly convertible across sectors of the economy such that they are vital regardless of whether they provide a direct application, making them vital to the economic sustainability of any state (Klare 2001; Asif and Muneer 2007). States seek to control these resources to provide themselves with economic security, a premium or discount on virtually all economic activity that comes with a surplus production, and extremely lucrative profits and political sway that exports of these materials provide. Any disruption of these resources necessarily impacts the economic wellbeing of a state, can cripple its military capacity, and can lead to widespread discontent by those citizens impacted by shortages. This impact can range from inconvenience to life threatening (providing heating of homes in winter), making the political and economic ramifications most dire. Just as important, energy resources are not easily substitutable – petroleum is just one example of a resource for which few cheap alternatives exist. Oil in particular is geographically concentrated and its future attainability remains uncertain, greatly inflating its value (Westin 1986). Each of these factors make states much more willing to engage in armed conflict over energy-related resources, as reflected in the following hypothesis:

Hypothesis 5: *Claims over territory containing energy resources will be more likely to lead to armed conflict than other claims.*

Industrial Metals

The presence of metallic mineral resources or ores may prove especially tempting to states engaged in a territorial dispute, especially if these resources can be used in industrial production or converted into military hardware. Yet, one additional factor that can influence a state's perception of the value of a natural resource is its level of development. A developed state will face considerably different domestic pressures to acquire and utilize resources than less developed states, and may face a greater shortage of some resources necessary for the demands of its consumption-heavy population (Prescott 1987; Diehl and Gleditsch 2001). Those states which have industrialized or are industrializing may need very specific resources for particular industries or military applications in order to maintain their growth or military advantage over opposing states. Less developed countries, by contrast, may be concerned more with the basic necessities in their society, such as energy-related resources or those which can be converted into valuable export commodities on which they may be dependent (Bannon and Collier 2003). Further, more developed states will possess the capability to refine and utilize these metals, recognizing the immediate gains involved in their acquisition, while less developed states will need to either export the materials or import the necessary skills and equipment in order to properly enjoy their benefits.

As such, it is likely that some resources, particularly industrial metals, will be perceived to be more valuable to more developed or wealthy states engaged in a territorial dispute, while less developed states will be less concerned with these types of resources. The result is that the more developed states will be more willing to incur the costs of armed conflict in order to secure resources more necessary to maintaining their economic or military position, while less developed states will not face similar pressures, and may even be dissuaded by the associated costs of refinement. From these expectations comes our final hypothesis:

Hypothesis 6: *Claims over territory containing industrial metals will be more likely to lead to armed conflict than other claims when the challenger state in the claim is more developed economically.*

Research Design

In order to test our hypotheses, we will utilize the latest version of the Issue Correlates of War (ICOW) dataset, version 1.01 of the provisional territorial claims data set (Hensel 2001, Hensel et al. 2008). This data set includes all territorial claims around the world between 1816-2001.

Dependent Variables

The key dependent variable across all hypotheses will be the outbreak of militarized conflict. The ICOW data set includes information on when armed conflict occurred over each specific territorial claim, drawing from the COW militarized interstate dispute data set; see Hensel et al. (2008) for further details. The hypotheses will be analyzed in annual observations, using logistic regression analysis to study the likelihood that a given territorial claim will give rise to a militarized dispute in any given year.

The variable used to measure conflict will be the incidence of Militarized Interstate Disputes (MIDs). This includes all types of MIDs, from "Low-level" militarized disputes, those in which the threat, display, or use of force did not produce any fatalities, to fatal militarized disputes, which are those in which at least one service member was killed by enemy action during the dispute, to wars. The measure simply records whether at least one MID occurred during each annual observation for the specified claim-dyad.

Independent Variables

The key independent variables in each analysis are related to the presence of natural resources in claimed territories. Hypothesis 1 suggests that conflict will be more likely over territories that contain one or more resources. This will be measured with a dummy variable indicating whether or not the territorial claim in question had a resource basis -- that is, whether the claimants knew or believed that at least one resource was present in the claimed territory. This information is included in the ICOW territorial claims data set.

The remaining hypotheses are based on the presence of specific resource types. Information about the specific resource(s) in each claimed territory has not been included in previous releases of the ICOW territorial claims data, but we have collected it for this project, and it will be included in the next public release of the data. Regarding specific resource types,

Hypothesis 3 concerns resources involved with agriculture, food production, and water; examples in the data set are territories that contain or produce high-quality arable land, fishing/seafood, cash crops such as coffee, sugar or tobacco, and fresh water (whether used for human consumption or irrigation). Hypothesis 4 concerns timber, logging, and lumber.[1] Hypothesis 5 concerns energy resources, which includes coal and lignite, oil and natural gas, and hydroelectric power generation facilities. Hypothesis 6 concerns industrial metals, a category that includes aluminum, antimony, bauxite, copper, iron, lead, manganese, nickel, tin, titanium, tungsten, and zinc.

Going beyond these specific resource types to the renewability of the resource(s) in any given territory, Hypothesis 2 distinguishes between the presence of renewable and nonrenewable resources. Renewable resources include the agriculture, food production, water, timber, logging, lumber, and hydroelectric resources listed above, as well as animal furs and pelts and natural rubber. Nonrenewable resources include the energy resources (besides hydroelectric power) and industrial metals listed above, as well as fertilizers (guano, nitrates, phosphates, and sulfur), precious metals and stones (diamonds, gems, gold, and silver), radionuclides (radium and uranium), and salt mines.

Beyond the specific resource type, Hypothesis 6 suggested that the impact of industrial metals should depend on the development level of the claimant state in the territorial claim, or that state that is trying to acquire territory that is owned or administered by the target state in the claim. In order to get development data across the entire 1816-2001 period covered by this study, we constructed a measure of energy consumption per capita using the COW National Material Capabilities data set, dividing a state's energy consumption by its total population; we then took the natural log of this measure to reduce the impact of extreme values.[2] Our hypothesis is tested by interacting this development measure with the industrial metals variable described above; both constituent terms are also included in the model.

[Table 1 about here]

Table 1 shows the distribution of the different types of resources in the data set. At least one resource is present in nearly half (46.4%) of the 837 territorial claims in the data set. There

[1] This includes camphor, which typically comes from the wood of the camphor laurel tree.
[2] This measure is highly correlated (r=.73) with the more traditional GDP per capita, as collected by Angus Maddison, but is available for nearly one-third more cases overall, and nearly sixty percent more cases in the nineteenth century.

is great variation in the type of resources in these claims, though. Nearly one-third of all claimed territories (30.4%) include at least one renewable resource, and nearly one-third (30.9%) include at least one non-renewable resource.[3] Turning to the specific resource types covered by our hypotheses, agricultural, food, or water resources are the most common (27.4%), followed by energy (21.3%), industrial metals (10.2%), and timber (5.6%).

Control Variables

Our analyses control for the impact of three other factors that have been shown to have a systematic impact on armed conflict. We begin with the salience of the claimed territory, which has been found in numerous studies to increase the risk of claim militarization (e.g. Hensel 2001, Hensel et al. 2008). We measure this using the standard ICOW salience index (Hensel et al. 2008) with one important difference. Because we are focusing on contention over resources, we have removed the resource component from that index, so it now ranges from 0-10 rather than 0-12.

We also include two other variables that have been found in past studies to have an impact on armed conflict between states. Joint democracy is coded as present when both states are considered political democracies, as defined by a score of "7" or above on the Polity IV scale. We also measure the relative capabilities of the challenger state in the dyad, using the COW project's Composite Index of National Capabilities (CINC) score, which reports the share of the entire international system's capabilities held by each state in a given year. We transform this into a dyadic measure by dividing the challenger state's CINC score by the total score of the two states in the dyad, producing a measure that varies from 0.0 (the target state has all of the capabilities in the dyad) to 1.0 (the challenger has all of the capabilities in the dyad).

Analysis

Our analyses begin with the impact of the presence of any type of resources on the militarization of territorial claims. Hypothesis 1 suggested that militarized conflict should be more likely over territorial claims that contain resources of any type than over claims where no resources are present. Hypothesis 2 qualifies this by suggesting that the renewability of resources

[3] These categories are not mutually exclusive. 69 of the 837 territorial claims (8.2%) include both renewable and non-renewable resources.

that are present should affect the likelihood of militarization, with claims involving non-renewable resources being more conflictual than claims involving only renewable resources. Table 2 presents logit models that are used to evaluate these two hypotheses.

[Table 2 about here]

In Model I of Table 2, which is used to evaluate Hypothesis 1, the presence of any type of resource(s) in a claimed territory significantly increases the likelihood of armed conflict over that territory ($p<.001$). In Model II, used to evaluate Hypothesis 2, armed conflict is more likely when at least one renewable resource is present ($p<.05$), and even more likely when at least one non-renewable resource is present ($p<.001$). The control variables generally operate in the expected direction in both models, with conflict being more likely when the claimed territory has higher non-resource salience or when the challenger state has a greater share of dyadic capabilities, and less likely when the two claimants are both democratic.

[Table 3 about here]

A better way to interpret these results is with the use of marginal effects, examining the impact of each variable on the predicted probability of armed conflict. The marginal effects for the results in Table 3 demonstrate that when a resource is present, the likelihood of conflict increases by more than one-third (+35.4%), from an annual probability of .042 to .057. The increase is even greater when we consider the renewability of the resources that are present. When only renewable resources are present, the predicted probability of conflict increases by 16.7%. This probability increases by 50.9% when only non-renewable resources are present, and by 74.9% when both renewable and non-renewable resources are present.

These results offer clear support for the first two hypotheses on the general impact of resources. The remaining four hypotheses address specific types of resources, and are evaluated in Tables 4 and 5. Hypothesis 3 suggested that resources related to agriculture, food production, and fresh water should increase the risk of armed conflict, and this is supported by the results in these tables. Such resources have a strong, positive effect on the likelihood of conflict ($p<.02$), increasing the predicted probability of conflict by 23.1% when present.

[Tables 4 and 5 about here]

Hypothesis 4 suggested that conflict should be less likely when timber resources are present, and this is also supported by these statistical results. Claims to territory including timber or logging resources see significantly less armed conflict ($p<.05$), decreasing the predicted

probability of conflict by 26.0%. Hypothesis 5 suggested that conflict should be more likely over territory that contains such energy resources as coal, oil, or natural gas. This is strongly supported by the results, with energy resources significantly increasing the risk of conflict ($p<.001$) and increasing the predicted probability of conflict by a whopping 96.3%.

Finally, Hypothesis 6 suggested that industrial metals should increase the risk of armed conflict when the challenger state is more developed economically, with little systematic impact when the challenger is less developed. The model shows significant negative coefficients for both the presence of industrial metals ($p<.01$) and the development level of the challenger ($p<.001$), with a significant positive coefficient for the interaction term between these two factors ($p<.05$). The net effect, seen in the marginal effects in Table 5, is not consistent with the hypothesis. The risk of conflict when industrial metals are present is somewhat greater when the challenger is more developed, but even at the maximum observed value of development, the predicted probability of conflict is 18.2% lower than in the baseline situation with none of these resources present.

These four resource types covered by our hypotheses are not the only resources that have been involved in territorial claims since 1816, although they have been the most common. We also ran followup analyses including the less common resources, which have been present in less than 3% of all claims (and in some cases less than 1%). The effects of these less common resources do not reach conventional levels of statistical significance. Conflict may be slightly more likely in the presence of fertilizers like guano or nitrates ($p<.61$), precious metals or gems ($p<.11$), or radionuclides like uranium or radium ($p<.58$), and slightly less likely in the presence of natural rubber ($p<.52$) or salt mines ($p<.22$). Including these additional resources in the model does not change our conclusions regarding the four resource types covered by our hypotheses, though.

Finally, we consider the possibility that the impact of resources has changed over time. Resources that were conflictual in earlier historical periods may have little impact later, as the world economy has moved on. Similarly, resources that were thought to be abundant or that had little economic or military value in earlier periods may become substantially more dangerous at later periods when they become scarcer or technology allows the resource to play a more important role.

[Table 6 about here]

Table 6 splits the results of our main model, originally presented in Table 4, between the two centuries currently covered by ICOW data collection. The results for each variable in the model are generally consistent across the two centuries, but most of the key variables experience a substantial change in statistical significance level. The presence of energy resources, whether coal, lignite, oil, or natural gas, significantly increases the likelihood of armed conflict in both the nineteenth ($p<.03$) and twentieth ($p<.001$) centuries. Agricultural resources significantly increase conflict ($p<.01$) and timber resources significantly decrease conflict ($p<.01$) in the earlier period, but these effects lose statistical significance in the later period. The direction of the coefficients for the industrial metals-development interaction effect changes between the centuries, with these variables only reaching statistical significance in the twentieth century (all $p<.02$ or stronger), but the net effect is the same, with conflict being less likely when such resources are present (regardless of the challenger's development level) than in the baseline condition with no resources being present. Overall, then, the results remain largely consistent across time, even if not reaching identical levels of statistical significance in each century. [4]

Discussion

Taken together, the results of this paper's analyses suggest that natural resources have a strong effect on the likelihood of armed conflict over territorial claims. Our first two hypotheses received strong support. Armed conflict is significantly more likely when any resource is present in a claimed territory, and even moreso when the territory contains at least one non-renewable resources.

Hypotheses 3 through 6 predicted different impacts on conflict propensity for four specific types of resources, and generally received empirical support. As expected, armed conflict is more likely over territories that contain resources related to agriculture, food, and fresh water, indicating that states highly value these resources due to their role in meeting basic human needs. The presence of timber reduces armed conflict, in line with our theoretical

[4] Very similar results are found if the analysis is split between 1816-1945 and 1946-2001 to reflect more recent changes in the world economy since the beginning of the twentieth century. Before 1946, conflict is significantly more likely when agricultural or energy resources are present, although timber resources have no systematic effect in this model. Since World War II, conflict is significantly more likely when energy resources are present, and significantly less likely when industrial metals are present after considering the net effect of the interaction term in the model.

expectations. Whether this is due to a particular characteristic of timber, such as its relative abundance or substitutability, or the impediment to offensive military actions within disputed territory, is unclear. In either case, disputes over timber related resources will be less likely to experience any form of armed conflict even than those without natural resources, demonstrating that not all resource types necessarily conform to the general expectation that natural resources increase conflictual behavior. This directly contradicts the theoretical expectation of the intra-state conflict literature that timber and other "lootable" goods would foster conflict, demonstrating a clear difference between the behavior of states in interstate disputes and sub-state actors in intrastate disputes (Le Billion 2001; Ross 2004). Further research could benefit from examining this difference in greater detail.

The presence of energy resources in a claim raises the likelihood of conflict as per our expectations, highlighting the role that these resources play in ensuring the proper functioning of the economy of a state, and their relative value as an export commodity. Their value may also likely due to the geographic concentration of oil and natural gas resources, as well as the advantage that control over these resources would grant in influencing the policy of states to which the resources might be exported. The results for industrial metals, though, fail to support our theoretical expectations. While such resources are somewhat more conflict-prone when the challenger state is more developed (and thus has a greater need for and ability to employ the resource), even at high levels of development the risk of conflict is lower than when no resource is present. As with timber, this finding indicates that not all resources -- even non-renewable resources in this case -- necessarily increase conflict. Future research could benefit from trying to account for this finding. The result may be driven by the general relationship between the two claimants, where purchasing or trading for the resource is more effective and less risky than military action, or it may depend on the development level of the target state as well as the challenge.

Conclusions

These findings are consistent with the growing body of research on territorial claims, which has repeatedly found that more salient territories are more likely to experience armed conflict. Importantly, the impact of natural resources is not as straightforward as has often been implicitly assumed in the past, so our understanding of territorial conflict is enhanced by this

disaggregated analysis. Most of the results concord with the intuitive expectations that more scarce or economically vital resources will influence conflict propensity, though only so much, with resources rarely enough to press states to engage in more severe forms of conflict.

Nonrenewable resources, particularly energy sources like coal or oil, are much more conflictual than most renewable resources; this reinforces the finding that the presence of oil may be a key instigator of conflict (Colgan 2010). Territories with fertile agricultural land, food production, or water supplies appear to increase the risk of fatal conflict, consistent with research on the potential danger of disputes over water or rivers (Gleick 1993). This latter point is especially interesting because there is little systematic evidence of "water wars" with respect to river claims (e.g. Wolf 1998; Brochmann and Hensel 2009). While disagreements over the use of a shared river -- often involving concerns over pollution, dam construction, diversion for irrigation, or navigation -- tend to be handled peacefully and only rarely lead to armed conflict, the presence of water resources in a claimed territory seems to be more dangerous.

These findings suggest several important points for policymakers. First, it is important for claimants to be aware of the value of claimed territories, and to consider how this might affect the actions of one's opponent. The presence of a natural resource may slightly increase the probability of an opponent escalating a conflict slightly, but more importantly, the type of natural resource present will matter. Non-renewable resources, especially those related to energy, will play a much greater role in instigating conflict in any disputed territory, highlighting the importance of settling these claims, as well as their associated difficulties. Leaders in the claimant states as well as potential third party mediators would do well to prioritize those disputes with a higher risk of armed conflict, and attempt to settle these disputes before reach dangerous levels of severity.

One natural extension of this project would involve analysis of the conflict mediation or settlement of territorial claims with a natural resource component, with much of the theoretical expectations being borne from the same theoretical expectations regarding conflict propensity. The renewable and non-renewable resource distinction likely not only impacts the willingness to escalate to conflict, but also the ability to settle territorial disputes, and across all resource types, the divisibility of a resource can make settlement more difficult. Similarly, those disputes which find themselves mired in repeated low level conflict with minimal resolution would be worthy of

further analysis – for while we have shed some light on the origins of the conflict, it is less clear why these disputes are so enduring, and what might be done to bring them to an end.

Another promising avenue would involve looking at the escalation potential of territorial claims over different types of resources. Here we have focused on the likelihood that armed conflict will break out over a territorial claim, but we have not considered the severity level of the resulting conflicts. It may be that certain types of resources, in general of for certain types of claimants, increase the risk of low-level armed conflict such as military threats, buildups, or bloodless seizures of fishing boats, but see little risk of further escalation.

Finally, we believe that future research could benefit from further unpacking of the salience of claimed territories. Our analyses have suggested that much can be learned by disaggregating the typical dummy variable that has been used by past studies to indicate the presence of resources. Future researchers should also be encouraged to pursue similar efforts with some of the other factors that have been thought to make claimed territories more salient to leaders. For example, past studies have often included dummy variables to indicate whether or not a claimed territory has a strategic location, but this mean anything from valuable defensive positions to seaports or chokepoints that could impede trade routes. Similarly, past studies have often included dummy variables to indicate whether or not the claimed territory or its inhabitants have some sort of ethnic, religious, or other cultural connection to either or both claimant state. This could range from the presence of religious holy sites to the presence of a small population of one's ethnic or linguistic kin or the presence of a substantial majority of one's kin that is being repressed by another group, each of which might be expected to have different implications for the management of the claim.

References

Asif, M., & Muneer, T. (2007). Energy supply, its demand and security issues for developed and emerging economies. *Renewable and Sustainable Energy Reviews*, *11*(7), 1388-1413.

Bannon, I., & Collier, P. (Eds.). (2003). *Natural resources and violent conflict: options and actions*. World Bank publications.

Brochmann, M., & Hensel, P. R. (2009). Peaceful management of International River claims. *International Negotiation*, *14*(2), 393–418. doi:10.1163/157180609X432879

Bueno, D. M., Smith, A., Siverson, R., & Morrow, J. (2003). The logic of political survival.

Colgan, J. D. (2010). Oil and Revolutionary Governments: Fuel for International Conflict. *International Organization*, *64*(04), 661-694. doi:10.1017/S002081831000024X

Colgan, J. D. (2013). Domestic Revolutionary Leaders and International Conflict. *World Politics*, *65*(4), 656-690.

Collier, P., & Hoeffler, A. (1998). On economic causes of civil war. *Oxford economic papers*, *50*(4), 563-573.

Denoon, D. B., & Brams, S. J. (2001). Fair division in the Spratly Islands conflict. *Environmental conflict*.

Diehl, P. F. (1992). What are they fighting for? The importance of issues in international conflict research. *Journal of Peace Research*, 333-344.

Diehl, P. F., & Goertz, G. (1988). Territorial changes and militarized conflict. *Journal of Conflict Resolution*, *32*(1), 103-122.

Diehl, P. F., & Gleditsch, N. P. (2001). Controversies and questions. *Environmental conflict (pp. 1e12). Boulder, CO: Westview*.

Fearon, J. D. 1995. Rationalist explanations for war. *International organization*,*49*, 379-379.

Flint, C. (Ed.). (2005). *The geography of war and peace: from death camps to diplomats*. Oxford,, UK: Oxford University Press.

Giordano, M. F., Giordano, M. A., & Wolf, A. T. (2005). International Resource Conflict and Mitigation. *Journal of Peace Research*, *42*(1), 47-65. doi:10.1177/0022343305049666

Gleick, P. H. (1993). Water and conflict: Fresh water resources and international security. *International Security*, *18*(1), 79–112.

Giordano, M. F., Giordano, M. A., & Wolf, A. T. (2005). International resource conflict and mitigation. *Journal of Peace Research*, *42*(1), 47-65.

Hardin, G. (1968). The tragedy of the commons. *Science*, *162*(3859), 1243-1248.

Hensel, P. R. (1996). Charting a course to conflict: Territorial issues and interstate conflict, 1816-1992. *Conflict Management and Peace Science*, *15*(1), 43-73.

Hensel, P. R. (2001). Contentious issues and world politics: The management of territorial claims in the Americas, 1816–1992. *International Studies Quarterly*,*45*(1), 81-109.

Hensel, P. R., & Mitchell, S. M. (2005). Issue indivisibility and territorial claims. *GeoJournal*, *64*(4), 275-285.

Hensel, P. R., McLaughlin Mitchell, S., & Sowers, T. E. (2006). Conflict management of riparian disputes. *Political Geography*, *25*(4), 383-411.

Hensel, P. R., Mitchell, S. M., Sowers II, T. E., & Clayton, L. Thyne. 2008."Bones of Contention: Comparing Territorial, Maritime, and River Issues.". *Journal of Conflict Resolution*, *52*(1), 117-143.

Homer-Dixon, T. F. (1994). Environmental scarcities and violent conflict: evidence from cases. *International security*, *19*(1), 5-40.

Homer-Dixon, T. F., & Blitt, J. (Eds.). (1998). *Ecoviolence: Links among environment, population and security*. Rowman & Littlefield.

Humphreys, M. (2005). Natural Resources, Conflict, and Conflict Resolution: Uncovering the Mechanisms. *Journal of Conflict Resolution*, *49*(4), 508-537. doi:10.1177/0022002705277545

Huth, P. K. (1996). Enduring rivalries and territorial disputes, 1950-1990.*Conflict Management and Peace Science*, *15*(1), 7-41.

Klare, M. T. (2000). Redefining Security. *Globalization and the Challenges of the New Century: A Reader*, 131.

Klare, M. T. (2001). *Resource wars: The new landscape of global conflict*. Macmillan.

Klare, M. T. (2012). *The race for what's left: the global scramble for the world's last resources*.

Kratochwil, F. V., Rohrlich, P., & Mahajan, H. (1985). *Peace and disputed sovereignty: Reflections on conflict over territory*. Lanham: University Press of America.

Kocs, S. A. (1995). Territorial disputes and interstate war, 1945–1987. *The Journal of Politics*, *57*(01), 159-175.

Le Billon, P. (2001). The political ecology of war: natural resources and armed conflicts. *Political Geography*, *20*(5), 561-584.

Le Billon, P. (2008). Diamond wars? Conflict diamonds and geographies of resource wars. *Annals of the Association of American Geographers*, *98*(2), 345-372.

Lujala, P., Gleditsch, N. P., & Gilmore, E. (2005). A diamond curse? Civil war and a lootable resource. *Journal of Conflict Resolution*, *49*(4), 538-562.

Lujala, P., Gleditsch, N. P., & Gilmore, E. (2005). A Diamond Curse?: Civil War and a Lootable Resource. *Journal of Conflict Resolution*, *49*(4), 538-562. doi:10.1177/0022002705277548

Lujala, Paivi. (2010). The spoils of nature: Armed civil conflict and rebel access to natural resources. *Journal of Peace Research*.

Mahdavy, H. (1970). The patterns and problems of economic development in rentier states: The case of Iran. *1970*, 428-467.

Mansbach, R. W., & Vasquez, J. A. (1981). The effect of actor and issue classifications on the analysis of global conflict-cooperation. *Journal of Politics*,*43*(3), 861-874.

Markakis, J. (1998). *Resource conflict in the Horn of Africa*. Sage Publications Ltd.

Mitchell, C. (1995). The right moment: Notes on four models of "ripeness". *Global Society: Journal of Interdisciplinary International Relations*, *9*(2), 38-52.

Prescott, J. R. V. (1987). *Political frontiers and boundaries* (pp. 152-155). London: Allen & Unwin.

Quackenbush, S. L. (2010). General deterrence and international conflict: Testing perfect deterrence theory. *International Interactions*, *36*(1), 60-85.

Reuveny, R. (2000). The trade and conflict debate: A survey of theory, evidence and future research. *Peace Economics, Peace Science and Public Policy*, *6*(1).

Ross, M. L. (2004). What do we know about natural resources and civil war?. *Journal of Peace Research*, *41*(3), 337-356.

Seddon, D., & Adhikari, J. (2003). Conflict and food security in Nepal: A preliminary analysis.

Touval, S., & Zartman, I. W. (1985). *International mediation in theory and practice* (pp. 14-17). Boulder, CO: Westview Press.

Vasquez, J. A. (1995). Why do neighbors fight? Proximity, interaction, or territoriality. *Journal of Peace Research*, *32*(3), 277-293.

Wall, J. A., & Lynn, A. (1993). Mediation A Current Review. *Journal of Conflict Resolution*, *37*(1), 160-194.

Walter, B. F. 2003. Explaining the Intractability of Territorial Conflict1.*International Studies Review*, *5*(4), 137-153.

Walter, B. F. (2009). Bargaining failures and civil war. *Annual Review of Political Science*, *12*, 243-261.

Westing, A. H. (Ed.). (1986). *Global resources and international conflict: environmental factors in strategic policy and action*. Oxford University Press.

Wolf, A. T. (1998). Conflict and cooperation along international waterways. *water policy*, *1*(2), 251-265.

Zartman, I. W. (Ed.). (2007). *Peacemaking in international conflict: Methods and techniques*. US Institute of Peace Press.

Table 1: Resources in Territorial Claims, 1816-2001

Type of Resource	Claims with Resource Present	% of All Claims
Any resource(s)	388	46.4%
Renewable resource(s)	255	30.4%
Non-renewable resource(s)	259	30.9%
Specific resource types:		
Agriculture/food/water	229	27.4%
Timber	47	5.6
Energy	178	21.3
Industrial metals	85	10.2

Table 2: Contention over Resources and Territorial Claim Militarization, 1816-2001

	Model I	Model II
Variable	Coefficient (SE)	Coefficient (SE)
Any resource(s) in terr.	0.32 (0.08)***	--
Renewable resource(s)	--	0.16 (0.08)**
Non-renewable resource(s)	--	0.43 (0.08)***
Control Variables		
Non-resource salience	0.20 (0.02)***	0.19 (0.02)***
Recent conflict	0.77 (0.05)***	0.77 (0.06)***
Challenger Cap.s	0.57 (0.11)***	0.59 (0.11)***
Joint democracy	- 0.39 (0.18)**	- 0.36 (0.18)**
Constant	- 4.70 (0.15)***	- 4.71 (0.15)***
N:	13,028	13,028
X^2:	518.15 (5 df)	552.58 (6 df)
	p<.001	p<.001

*p<.10, **p<.05, ***p<.01

Table 3: Marginal Impact of Key Variable Resource Presence

Type of Resource	Prob. of Conflict (Change from baseline)
Model I:	
Baseline: No resources	.042
Natural resource(s)	.057 (+35.4%)
Model II:	
Baseline: No resources	.041
Renewable resource(s) only	.047 (+16.7%)
Non-renewable resource(s) only	.061 (+50.9%)
Both resource types	.071 (+74.9%)

• This table reports the predicted likelihood of armed conflict at the specific value of these variables, holding all other variables at their mean or modal values. Values were calculated using the MFX command in version 11.2 of STATA.

Table 4: Specific Resource Types and Territorial Claim Militarization, 1816-2001

Variable	Coefficient (SE)
Agriculture/food/water	0.22 (0.09)**
Timber	- 0.31 (0.16)**
Energy	0.72 (0.09)***
Industrial metals	- 0.56 (0.19)***
Challenger development	- 0.28 (0.07)***
Industrial*Chal.devel.	0.33 (0.17)**
Control Variables	
Non-resource salience	0.19 (0.02)***
Recent conflict	0.74 (0.05)***
Challenger Cap.s	0.71 (0.12)***
Joint democracy	- 0.27 (0.18)
Constant	- 4.62 (0.15)***
N:	13,023
X^2:	598.89 (10 df)
	p<.001

*p<.10, **p<.05, ***p<.01

Table 5: Marginal Impact of Key Variables, Resource Type and Development

Type of Resource	Prob. of Conflict (Change from baseline)
Baseline: None of these resources	.041
Only agriculture/food/water	.050 (+23.1%)
Only timber	.030 (- 26.0%)
Only energy	.080 (+96.3%)
Only industrial metals:	
Minimum chal. devel.	.027 (- 33.4%)
Mean chal. devel.	.028 (- 31.7%)
Maximum chal. devel.	.033 (- 18.2%)

• This table reports the predicted likelihood of armed conflict at the specific value of these variables, holding all other variables at their mean or modal values. Values were calculated using the MFX command in version 11.2 of STATA.

Table 6: Specific Resource Types and Territorial Claim Militarization, by Century

	Model I: 1816-1900	Model II: 1901-2001
Variable	Coefficient (SE)	Coefficient (SE)
Agriculture/food/water	0.77 (0.29)***	0.11 (0.09)
Timber	- 1.44 (0.56)***	- 0.07 (0.18)
Energy	0.73 (0.33)**	0.73 (0.10)***
Industrial metals	0.13 (0.43)	- 0.63 (0.22)***
Challenger development	0.16 (0.26)	- 0.41 (0.08)***
Industrial*Chal.devel.	- 2.35 (1.71)	0.43 (0.17)**
Control Variables		
Non-resource salience	0.18 (0.06)***	0.18 (0.02)***
Recent conflict	0.07 (0.43)	0.71 (0.05)***
Challenger Cap.s	0.26 (0.30)	0.77 (0.13)***
Joint democracy	- 0.74 (0.79)	- 0.28 (0.19)
Constant	- 4.77 (0.39)***	- 4.38 (0.17)***
N:	3781	9242
X^2:	52.19 (10 df) p<.001	506.62 (10 df) p<.001

*p<.10, **p<.05, ***p<.01