Pax Petrolica? Rethinking the Oil-Interstate War Linkage

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Abstract

In the last decade resource curse scholars have argued widely that oil-rich countries are more likely to initiate armed disputes with their neighbors. In this essay, we argue that the evidence suggests an oil peace, not conflict, as a function of both domestic and international factors. We draw on analyses of our own dataset and two from past studies to show that the evidence is more supportive of a petro-peace than it is of petro-aggression. We also demonstrate that the Iran-Iraq war is singularly responsible for what was believed to have been a radical-petro-aggression effect globally. We conclude that, to the extent that evidence suggests a trend, it is more likely for a Pax Petrolica.

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Introduction

The ‘resource curse,’ originally coined by Richard Auty more than a quarter-century ago, has become a mainstay of international and comparative politics.\(^1\) From autocracy to civil war onset to women’s economic marginalization, the linking of dysfunctional political phenomena to resource wealth today is more of a factory industry than a cottage one. In the last decade, the research program has turned to oil as catalyst of interstate conflict, arguing that oil-rich countries are more likely to initiate armed and other disputes with their neighbors. On face, it is a reasonable argument to make: Saddam Hussein’s Iraq and the post-Saddam occupation has consumed so much of the world’s attention since 1991 that it would seem challenging to suggest the link is tenuous. It is also plausible, as several recent studies conclude, that the effect is one with broad comparative implications.\(^2\)

We suggest here that the evidence for petro-aggression is in fact quite weak, and we present an alternative framework for understanding a potential oil peace. The results we present below suggest an association between oil and more peaceful, not more bellicose, international behavior. In this sense, we concur with the underemphasized component of the argument outlined by Colgan that oil can be associated with peace.\(^3\) Our analysis demonstrates that the

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\(^3\) It is worth noting here that the book and article, respectively, are titled *Petro-Aggression* and “Oil and Revolutionary Governments: Fuel for International Conflict.”
putative relationship between radical petrostates and interstate conflicts is largely driven by Middle East geopolitics rather than oil wealth. In fact, one single Middle East conflict between two states—Iran and Iraq between 1980 and 1988—accounts for previous findings suggesting a global correlation between oil and interstate war. The evidence is generally more suggestive of a *Pax Petrolica* than it is of petro-aggression.

This article proceeds as follows. First, it briefly situates our inquiry in the extant research suggesting a causal relationship between oil wealth and the initiation of militarized interstate disputes. Second, it develops our own theory of an oil peace. It also hypothesizes a disproportionate impact of the Iran-Iraq war. We build on the observation that one regional conflict lasting for nearly a decade happened to be between two of the world’s most significant oil producers and involved more than one hundred Militarized Interstate Disputes (MIDs) by one of the two states against noncombatant third parties.\(^4\) Once we account for these regional dynamics, we see a more accurate picture of the links between oil and dispute initiation. Third, it builds on analysis of cross-national time-series data from 1945-2010 as well as data from prominent recent studies to explore the role of oil in interstate conflict. Based on these analyses, we find reason to believe that oil producers are generally less likely to initiate interstate conflicts than oil-poor states. Further, we find that the dynamics of the Iran-Iraq war account for nearly all of the impact of what prior scholarship argued was a function of oil in the hands of radical leaders. The essay concludes with suggestions for future research aimed at improving the quality of theory, concepts, and measures related to the study of oil wealth and international conflict.

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\(^4\) This was because of the large number of attacks on oil tanker ships flying third party country flags, and because the “Tanker War” period of the conflict targeted the other combatant state’s ability to export oil.
Theories and Evidence

In the same way that rentier state theory has its origins in the case of late Pahlavi-era Iran, the research exploring oil and interstate conflict grew out of the observed behavior of a few oil rich and especially aggressive states—for example, Iraq under Saddam Hussein and Russia under Vladimir Putin. The former’s invasion of Iran in 1980, and of Kuwait in 1990, and the latter’s invasion of Georgia in 2008 and Ukraine in 2014, would seem to provide at least a plausible starting point for this hypothesis that oil wealth is connected to interstate conflict. The scholarship exploring this oil-interstate war linkage falls roughly into two groups: those who place the causal emphasis on the international system’s impact on oil producers versus those who focus predominantly on the realm of domestic politics in exporting countries.

International system effects largely arise from the way that world powers approach oil producing countries. As Strüver and Wegenast suggest, four main international factors shape the role oil plays in dispute onset: general global militarization, the internationalization of intrastate (civil) conflicts, the indulgence of oil import-dependent major powers, and resource wars over disputed border regions. The second and third of these are really domestic factors that play out internationally—on one hand because many scholars believe oil magnifies the risk of civil war and on the other because a smaller group suggest that oil-rich states are more likely to initiate conflicts. Bove, Gleditsch and Sekeris extend the second of these four factors, modeling third party intervention in civil war as a function of the conflict country’s oil wealth. Since civil wars can damage a country’s productive and export capacity (i.e Iraq 2003-2008, Libya 2011-2016, Syria since 2011), major powers reliant on oil imports have an incentive to intervene to stabilize

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6 Strüver and Wegenast, “The Hard Power of Natural Resources.”
world supply. Finally, we might see major powers dependent on oil imports extending a kind of security blanket over oil exporters, allowing them a form of moral hazard when starting conflicts. In a related line of argument, Ross and Voeten find that oil exporters are less likely to accept the jurisdiction of international institutions because their resource sectors allow them greater international economic latitude than other countries.

Among those who focus on domestic factors, Colgan develops and tests a conditional argument in which substantial oil sectors create opposing incentives for rulers to be both more pacific and more belligerent. Which of these sets of peace- versus conflict- inducing traits of oil wealth manifest, he argues, depends on whether the regime in power is revolutionary or status quo-oriented. Although, in the hands of more status-quo oriented leaders, oil export dependence breeds peace—because rulers rely on the flow of oil revenues to remain in power—revolutionary leaders see the revenues as a shield against the consequences of belligerent action. Oil allows revolutionary rulers to pay for conflicts they otherwise could not sustain. We extend his analysis below, and here our goals are not to overturn his results completely, but rather to demonstrate that the second part of the argument—about radical oil states being more bellicose—is not robust and that the oil peace is the dominant dynamic.

Cullen Hendrix extends Colgan’s analysis by adding the element of world oil prices. While he concludes that, when accounting for oil prices, the petro-radicalism effect is less consistent, he finds that increases in oil prices likewise associate with a greater number of militarized interstate disputes started by oil states. It is useful to note here, presaging our own

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approach below and as a question of best measurement practices, that simply using a measure of oil and gas income per capita instead of a categorical measure captures both changes in the price of oil AND the income changes to individual states.

**Pax Petrolica: Theorizing an Oil Peace**

Where there was once a resource curse consensus in the domestic arena, a dissenting scholarly community has emerged. This group of heterodox scholars has produced research that shows either conditionally or wholly positive effects for oil wealth on development,\(^9\) state capacity,\(^10\) and democracy.\(^11\) As we theorize in this section and demonstrate empirically in the next, there are good theoretical reasons to believe that it may also have conditionally or direct salutary international effects. Our theory of an oil peace rests on three foundations: the commercial peace thesis, the costs of war for oil producers, and the dampening impact of oil wealth on the incentives for diversionary foreign conflicts.\(^12\)

**International Costs of War**

We start by observing that countries dependent on the revenues derived from their oil and gas sectors rely on the willingness of importing countries to buy their fossil fuels, and usually on

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\(^12\) We should note here that we do not test all of the theorized mechanisms linking oil wealth to more peaceful international behavior in this essay. Given the strong conventional wisdom that oil leads to more bellicose behavior, we opt to demonstrate as broadly as possible here that there is evidence for an oil peace, and we intend to develop and test the causal logic of all of these mechanisms fully in a subsequent paper.
foreign investors for the ability to deliver it to buyers. First, and put simply, oil is commercial trade, a global network, the purchasing and selling of a commodity that happens to be disproportionately important to the world economy. Because it is so important to the revenues of exporting countries, and because losing those revenues would be so catastrophic, we suggest that it is likely to encourage more pacific, not more belligerent, international behavior. Subsequently, the oil peace falls into the broader framework of the commercial.\(^{13}\) Because of the peace-promoting impact of both trade dependence and of the diffusion of peaceful conflict resolutions through interstate trade networks, greater economic integration can lead states to set aside their proclivities to choose war over statecraft. The benefits of peace are a powerful positive incentive for pacific behavior on the part of oil-producing states. We suggest that commercial peace incentives are more likely to hold sway over oil exporting countries than are other commodity exporters. As Gartzke and Westerwinter suggest, “for trade to act as a barrier to conflict, the commercial losses anticipated from fighting must be large relative to the overall cost of fighting.”\(^{14}\) Many of the world’s oil exporters are not just oil trade-dependent, but overwhelmingly oil trade-dependent.

Emily Meierding outlines two additional barriers to oil wars and as applicable to oil-producing states: 1) international and 2) investment obstacles.\(^{15}\) First, oil-producing countries


\(^{14}\) Gartze and Westerwinter, “The Complex Structure of commercial peace,” 327.

have good reason to fear international sanctions and other penalties for system-damaging actions. International punishment is a disincentive to initiate conflicts. The devastation to Iraq’s economy between 1991 and 2003, as a result of post-Gulf War sanctions, as well as the current economic crisis in Iran due to sanctions, provide two solid examples. Belligerent countries face the prospect of both having their ability to export oil curtailed and of losing access to the US dollar-driven commodity financial system within which oil is traded.

Second, even if oil-rich countries were dedicated to conquering their neighbors, the chances they could then attract foreign firms to continue investing in their oil sectors, or in rebuilding and then maintaining export capacity in the conquered territory if it were also oil-rich are slim. Investors, in addition to usually being sensitive to the policy interests of their home countries, are skittish when it comes to the perceived costs of war due to uncertainty. Investing millions or billions of dollars in immobile assets such as those required to extract petroleum is highly questionable when war is a genuine threat.

Moreover, oil states considering starting wars risk harming their own long-term market position. Iran today, for example, is able to produce only about 500,000 barrels per day because of international sanctions, roughly one-sixth of its maximum pre-sanction production capacity. With Iran’s oil gone, global consumers simply find that supply from another of the 50 or so significant producers remaining. Collective action problems make it simply too difficult to achieve complete coordination, nearly all the time, for the oil supply weapon to be of much utility for individual states. In short, we find strong reason to expect that, at the international system level, constraints on bellicosity should lead rulers in oil-producing countries to be less inclined toward initiating conflicts:
At the domestic level, there are equally compelling reasons to expect an oil peace. These reasons stem from the logic of the domestic diversion or ‘scapegoat’ framework for understanding the international determinants of conflict initiation. That logic suggests that, facing popular dissent or disapproval at home, leaders might engage in military action abroad (especially territorial conflicts) as a means of trying to catalyze a rally-around-the-flag effect to bolster their domestic positions. This line of scholarship often suggests that diversionary military adventurism seeks to distract from economic underperformance. Conversely, we might expect that higher levels of oil income might enable leaders to circumvent political dissent by utilizing oil revenues for social policy increases or other kinds of side payments. These reasons also reinforce the international system level peace effect, leading us overall to expect oil producers to be less bellicose than non-oil producers.

Where other leaders might initiate conflicts abroad to distract opposition at home from economic or political problems (diversionary conflict initiation), rulers in oil-rich states could buy domestic peace by allocating resource rents to public goods provision or widely distributed club goods. Bodea et al (2016) find that this dynamic exists in the context of blunting the likelihood of civil conflict—public spending minimizes the risk of civil wars. Applying that logic of oil cushioning spending, we postulate it to be related to more peaceful international behavior as well. As such, we expect that

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H1a: If a country is a petrostate (oil exports >10% of total exports or >10% of GDP), then it is less likely to initiate militarized interstate disputes.

H1b: the more oil/gas income a country receives each year, the less likely it is to initiate militarized interstate disputes.\(^\text{18}\)

It is important to note here that there is a separate strand of research focused on how potential belligerent states view other states’ oil wealth—as a potential target to be captured. We do not focus on that here: following Colgan, Hendrix, and others, we focus exclusively on the impact that oil wealth putatively has on the domestic politics and foreign policy choices of countries that produce oil. The implication is an important one: first, it suggests we maintain a tight analytic focus on the question: how does a country’s oil wealth shape the decisions its leaders make about whether or not to engage in militarized disputes? It directs away from the question of whether non-oil producers might seek to capture the oil reserves of oil-rich states. Moreover, it carries methodological and data selection choices. Looking at how oil wealth shapes the decisions of rulers in oil-rich countries directs us to focus on monadic data and to focus even more closely on instigated militarized interstate disputes. We discuss this further below.

A Key Conflict for the Petro-Aggression Thesis: the Iran-Iraq War

On face, the regimes most in accord with a theory of petro-aggression would seem to be Iraq under Saddam Hussein, Libya under Moammar Qaddhafi, and Iran under the Ayatollah Khomeini. Two of them—Saddam and Khomeini—respectively started and sustained an eight-year war between their respective states resulting in roughly a million deaths. We highlight this war because it is plausible that the Iran and Iraq country years in which they were at war could

\(^{18}\) These two hypotheses reflect our expectations about the results of statistical tests using two different measures of oil wealth—a categorical measure, first, and a continuous one, second. We detail each one below in the section on data.
be statistical outliers. As we detail in the Appendix, during those years one or the other of these two states initiated 105 unique MID events, most of which were initiated against third-party non-combatant states. These 105 MID events are 49 percent of the total in the dataset for revolutionary petrostates: nearly half the global total over a 65-year period are comprised mostly of attacks on third-party non-combatant states during the Iran-Iraq war. The sum total of revisionist MID onsets in the dataset is 1748, of which the Iran-Iraq war comprises six percent. Formally stated, our expectation is that

\[ H_2: \text{the eight-year war between Iran and Iraq is unrepresentative of radical oil-rich rulers in terms of their conflict initiation during the 1945-2010 period because of the sheer number of MID events initiated by one of them against third party states. When the dummy variable for this war is included in the models, the radical-oil regimes variable is unlikely to remain a significant positive correlate of MID events.} \]

If we are correct about the influence of the Iran-Iraq war, once we account for it, oil wealth will be positively related to peace, not war. Additionally, when a dummy variable for the conflict is included in otherwise identical models, it will not be possible to reject the null hypothesis regarding petro-aggression and war. If a putative oil-radicalism effect on interstate conflict over 65 years worldwide is dependent on a single conflict, it is reasonable to conclude that no systematic relationship exists. Below we illustrate that the country years of this war are outliers, providing Pearson’s residuals for the Iran and Iraq years 1980-88 compared to the observations for the dataset as a whole.

**The Evidence for a Pax Petrolica: Data, Methods and Models**

Because different scholars have taken different data collection and methodological approaches to exploring the relationship between oil and interstate conflict, we employ both our
own dataset and two additional datasets here. Each allows us to test a distinct set of both existing theories of petro-aggression and our own, peace-inducing, intuitions.

*Petro-Aggression Analysis*

*Data*

Given our directly contrasting expectations about the role of oil wealth in interstate conflict, we wish to be maximally generous to past findings and to be sure any differences are not a function of using differently structured data. For the purpose of direct comparison, we employ the original replication data from both studies. We use Colgan’s original data in Models 1-4 (Table 1) and Hendrix’s original data in Models 5-8 (Table 2). However, there are several measurement and data construction issues that weigh against making these original data the empirical center of our research here. For those reasons, we present the results of analyzing our own data, which addressed those issues. We do so both to show that it is not a function of different data producing variant results and, equally important, to provide for future scholarship a replication dataset free of those problems and employing best practices for measurement in the study of oil wealth and politics.

In the main set of analyses that follow (in Table Three), we employ cross-sectional time series data for 159 countries and 1,076 governments ranging in time from 1945 to 2010 with directed (instigated) monadic country years as the units of analysis. We rely only on instigated country years because the theories we address here specify that oil shapes the bellicosity of

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19 In the course of exploring the original data from Colgan, we discovered two significant errors in its construction. First, the GDP per capita variable drawn from replication data for James Fearon and David Laitin, “Ethnicity, Insurgency, and Civil War,” The American Political Science Review 97, 1 (2003), 75-90, was lagged in that study. In the Colgan data, it is not, meaning that every country-year observation for the indicator is off by one year. Second, the first twelve country-years of data for Syria are missing. Given that Syria is both an important, if not globally dominant oil producer and under some of this period led by a revolutionary regime, this omission risks skewing results for exactly the kind of regime that is of interest. Since the Hendrix data builds directly on the Colgan data, both datasets suffer from these problems. In terms of measurement issues, we discuss these below in the context of updated standards in the study of the resource curse.
exporting states, not whether other states might attack them. We structure these data as we do to maximize comparability with the two recent studies whose conclusions we engage. Our dataset, we hope, can serve as a baseline for future research on the oil-interstate conflict link as it addresses two key problems with the data used in prior studies: first, the one-year error in GDP per capita and missing country years for Syria and, second, the use of outdated indicators for oil wealth. The data we analyze in the models in Table Three extend nine years further and employ a measure of oil wealth that has become the state of the art in oil-politics scholarship.

Main Explanatory Variables

Petro-States (Tables 1-3)

As the community of scholars working on oil and politics has grown, so too have questions about how to measure “oil wealth.” Measurement choices have taken three main forms—abundance, dependence, and categorical. Measuring abundance is a function of a) how large a country’s oil and natural gas reserves are or b) the country’s per capita income each year from them. Dependence reflects the role oil revenues play in the overall economy or in an average citizen’s annual income. Categorical (binary) measures rest on a coding decision to establish a cutoff of some kind above which a country is considered to be a “petro-state.” Conceptually, we have no empirical reason at present to establish such a cut point, at any level of production or revenue.

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As a result, scholars have come to rely on one, or both, of the continuous measures of abundance or dependence. In the initial, replication-aiming oil analyses that follow below we rely in part on a definition of petro-state as one whose oil export revenues comprise 10 percent or more of GDP. We do so, following Colgan, simply for reasons of exploring replicability, but as an analytic, theoretical, and empirical matter we would directly question whether there are good empirical or conceptual reasons to use 10% of GDP from fuel exports as a good break point. Put simply, there is no good reason to believe this binary measure captures any important aspects of oil wealth without careful empirical establishment of such “cut points.” Just as importantly, because scholars have not found any good reason to believe that oil wealth is “either or,” it has been the convention and increasingly the rule for at least the last decade to employ one, or both, of the continuous measures that are publicly available and arguably more valid.

Nonetheless, before we seek to argue for a Pax Petrolica using the best available data and measurement strategies, we seek first to establish that current studies return different results when corrected. Thus, in our initial analyses, petrostates are coded “1” for states relying on oil export revenues for 10 percent or more of GDP, otherwise coded “0”. From 2002 to 2010, we obtain each country’s net oil export revenues (Current US$) from the World Development Indicators and divide it by GDP. Afterward, if the outcome is equal or larger than 10 percent, it is coded “1”, otherwise coded “0”. In the second set of analyses, extending Hendrix’s analysis, the same measure is at work because his data are built on Colgan’s.

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Just as we noted above that binary measures are generally problematic, this particular one is doubly so. The reason is that by accounting for only revenues derived from oil exports, the export-numerator measure ignores all the oil and natural gas consumed domestically. In effect, this omits from any analysis all of the oil and gas consumed at home by highly diversified countries. The United States, to take an illustrative case, is both the world’s single largest producer today and consumes all that it produces and then some. In Colgan’s original export-only categorical coding, none of US oil would appear in our analysis, nor would oil produced for home consumption by Mexico, Brazil, Russia, Norway, the United Kingdom, Indonesia, Egypt, Iran, or any of the world’s other major producers with more diverse economies. In the broader resource curse research program, scholars who opt for ratio measures generally use total oil and gas income as the numerator to account for this. In short, the export revenue/GDP ratio is better thought of as a proxy for poor countries with undiversified economies than as one for oil wealth.

In addition, even ratio measures that include all oil and gas income in the numerator face endogeneity problems. The reason is that, because the denominator is GDP, countries whose GDP is smaller are in essence coded to look more oil-rich than others, biasing the measure against poorer states, which are more likely to be autocratic, unstable, corrupt, and arguably prone to both interstate and intrastate conflicts.24

Oil and Gas Income Per Capita (Table 3)

To this export revenue-based categorical measure, we add an additional indicator, the logged measure of oil and gas income per capita (2011 constant US$) so that we can explore the effects of continuous measures of oil wealth.25 In our dataset, there are 3,614 observations that

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24 Ross, *The Oil Curse*, 14-22; Brunnschweiler, “Cursing the Blessings?.”
have zero oil and gas income per capita, which would drop during the process of log transformation. To retain these observations, we add $0.001 to each zero value for oil and gas income per capita and take the natural logarithm.

*The Iran-Iraq War*

Second, we include a dummy variable to capture the plausibly unique dynamics of the Iran-Iraq war. We code all Iran and Iraq years “1” from 1980, the war’s onset, to 1988, its conclusion. This measure is the same across all three sets of data analysis. We suspect the Iran-Iraq war might exercise disproportionate influence on the results and use this dummy variable to investigate that likelihood.26

*Dependent Variable*

The main dependent variable we use here is the aggressor militarized interstate dispute initiation (MID) measure from the Correlates of War project (COW). In line with our theoretical discussion above, all of the analytic approaches to the oil-interstate conflict link limit the implications of their arguments to the notion that a country’s oil wealth shapes its, and only its, propensity to initiate conflicts. As such, we count the onset of MIDs when the state is considered a revisionist which is dissatisfied with the status quo by using force. Each revisionist MID onset is coded uniquely. To take account of the count dependent variable, in all the models reported here we employ time series-specific Poisson regression with random effects. We explored the appropriateness of using fixed effects Poisson and both fixed and random effects negative

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binomial regression estimators, but since for the most part results were similar and, in the interests of replicability, we report only the Poisson results.\textsuperscript{27}

\textit{Control Variables}

We include here a battery of control variables to account for the roles of country population size, GDP per capita, and the number of land borders a country shares with other states. We also include each state’s yearly Polity score, a dummy variable for major power status as well as Muslims as a share of each state’s population. Finally, we include a set of regional dummy variables and a set of time dependence controls (peace years plus three cubic splines) per Beck, Katz and Tucker.\textsuperscript{28} The regional dummies and time controls are included in all models but not presented. In both of the first two sets of analyses, we draw these control variables directly from the original authors’ datasets. We regress all of these variables on militarized interstate dispute using Poisson regression to account for the count nature of the dependent variable.

\textit{Oil Price Analysis}

Our oil price analysis builds on a recent study by Cullen Hendrix (2017). Hendrix, in turn, builds on Colgan’s work to explore the impact of global oil prices on interstate conflict, theorizing that price spikes might induce leaders in oil producing countries to be more militarily adventurous than they would under conditions of lower prices. Here, we perform the monadic

\textsuperscript{27} The results of the negative binomial models are available in the Appendix.

analysis on a sample of 147 states between 1947 and 2001. Because Hendrix’s analysis relies on the original structure of Colgan’s, we do as well in this set of models.

The dependent variable here, as in our first set of analyses, is the year-count of instigated militarized interstate disputes (MIDs). All independent variables from the original Colgan analysis are also the same, except for oil prices and the Iran-Iraq war indicator we constructed. We include our own Iran-Iraq dummy variable alongside the explanatory variables in Hendrix’s original analysis: the annual average price of West Texas Intermediate (WTI) crude oil in constant 2008 US dollars. Per Hendrix, we also interact oil prices with his petrostate and radical leader dummy variables.

In constructing our own data (results from which are located in Table Three), we attempted whenever possible to use the same data sources as used in Colgan and Hendrix for purposes of comparability. We use the World Bank data to measure each country’s population size and the Polity IV data to measure each country’s level of democracy. We also use expenditure-side real GDP per capita at chained PPPs (2011 constant US$) from the Penn World Table version 9.0 data from 1950 to 2010. From 1945 to 1949, we use Fearon and Laitin (2003)’s GDP per capita data and convert it from 1985 constant US dollars to 2011 US dollar by applying the US GDP deflator.

Revolutionary regimes are coded “1” if the leader comes to power in an irregular transition, meets three or more of seven criteria of radical policy, and he/she is not either

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29 We limit our analysis to the monadic because the data used in Hendrix’s dyadic research, drawn from Weeks (2012) end in 1998, and thus omit the longest recent oil boom which began in 1999-2000 and continued through 2014. We also present this research design setup, as well as the third one, in lesser detail since we are replicating these two sets of analyses with the original data plus our Iran-Iraq dummy. We refer readers to Hendrix, “Oil Prices and Interstate Conflict,” pp. 581-83 for full descriptions of his research design.


founding leader or foreign-installed leader. For the years 1945 to 2001, we use Colgan’s revolutionary leader data. From 2002 to 2010, we followed the coding rules in his analysis and from his 2012 article introducing the revolutionary leader data. We first incorporate five variables—each leader’s name, start date, end date, the way he/she reaches power, and the fate of the leader after he/she lost power—from the Archigos data to our extended dataset. Then, for the 2002-2010 years, we determine whether each leader is revolutionary based on Colgan’s (2010) coding rules. In both our analysis of the original Colgan data, and then in our analysis of our own data, we specify all models exactly as in Colgan’s own work, plus our Iran-Iraq war dummy.

Results

Petro-State Analysis

Table 1 presents the results of a set of four models aimed at replicating the substantive results of Colgan’s original analyses and testing the impact of a dummy variable for the years (1980-1988) of the Iran-Iraq War. Here, we use Colgan’s original dataset from the article in International Organization. Its time span is from 1945 to 2001 and is structured as detailed above. Models 1 and 2 are exact replications including both binary explanatory variables (revolutionary and petro-state) and the interaction effect of the two. We can successfully replicate Colgan’s original results. In Model 1, which uses random effects, revolutionary government, petro-state, and their interaction are all statistically significant with 99 percent confidence. Model 2, with country fixed effects, also confirms the statistical significance of two

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32 Henk E. Goemans, Kristian Skrede Gleditsch, and Giacomo Chiozza, “Introducing Archigos: A Dataset of Political Leaders,” Journal of Peace research 46, 2 (2009): 269-283. For regimes that continued from 2001 forward in time, we retained Colgan’s original codings and only changed them in cases of regime change. Two of those were Iraq and Afghanistan following the US-led invasions and overthrow of those governments.
independent variables: revolutionary government and the interaction of revolutionary petro-state with 99 percent confidence. Revolutionary states are significantly more likely to initiate MIDs than others. And, in line with past studies, oil states are significantly less likely to initiate MIDs than non-oil producers. As indicated in Models 1 and 2, radical oil states have a larger war-proneness effect than radical states alone.

We base Models 3 and 4 on Models 1 and 2 but also include our Iran-Iraq war dummy. In both models, the Iran-Iraq War variable is statistically significant but, more importantly, when it is included revolutionary petro-state interaction fails to achieve statistical significance at even 90 percent confidence, falling well short of conventional standards. Regardless of whether we specify random or fixed effects, once the Iran-Iraq War dummy variable is included, the interaction variable, revolutionary petro-state, loses its statistical significance. In short, accounting for the Iran-Iraq war using Colgan’s original data, we can no longer find support for the argument that radical oil states are more bellicose than radical non-oil states and we cannot reject the null hypothesis that no relationship exists.

Table 1 about here

Oil Price Analysis

Table 2 presents Hendrix’s monadic models with the same dummy variable for the years (1980-1988) of the Iran-Iraq War as in Table 1. While Models 5 and 6 use country-fixed effects, Models 7 and 8 implement random effects. Models 5 and 7 use negative binomial regression analysis and Models 6 and 8 utilize Poisson regression analysis like Colgan’s. In all four models, following Hendrix’s original specification and like Colgan, the dependent variable only takes account of aggressor MIDs.
Hendrix applies panel-fixed effects to all his models. Even with the country-fixed effects in Models 5 and 6, the Iran-Iraq War dummy variable maintains statistical significance with 99 percent confidence. Again, once it is included, oil prices, revolutionary governments, petro-states, the interaction variable between oil price and revolutionary governments, and the triple interaction variable variables – oil price, revolutionary governments, and petro-states – all lose statistical significance at 95 percent confidence throughout the models.

In Hendrix’s model, the panel-fixed effects include dummy variables for each country to take account of the within effect in each country. The Iran-Iraq War dummy variable codes all Iran and Iraq years “1” from 1980 to 1988. Because both panel-fixed effects country dummy variables and the Iran-Iraq War dummy variable capture the effect of an independent variable changing over time in the same level (country-level), the panel-fixed effects cancel out the effect of the Iran-Iraq War dummy variable.

Once the effect of the Iraq-Iraq War disappears due to the panel-fixed effects, the interaction variable between revolutionary leadership and petro-states maintains statistical significance at 95 percent confidence in Models 5 and 6. Holding other variables constant, revolutionary petro-states are more likely to initiate MIDs at 0.921 percent (Model 5) and 0.342 percent (Model 6) more per year than revolutionary non-petro-states. These are the only two models in which we do not observe oil’s peace-inducing effect in revolutionary governments.

On the other hand, the interaction variable between oil price and petro-states fails to achieve significance at 95 percent confidence. This is a major difference from Hendrix’s result. In his models, the interaction variable obtains significance with 95 percent confidence interval

and it supports his hypothesis: Higher oil prices are associated with an increased frequency of MID onsets in petro-states. Once the Iran-Iraq War dummy variable is included, however, it is no longer possible to confirm the positive relationship between high oil prices and petro-states’ greater war-proneness.

In Models 7 and 8 with random effects, the Iran-Iraq War dummy variable continues to be statistically significant. More importantly, again the key independent variables, oil price, revolutionary government, petro-state, the interaction between oil price and revolutionary government, oil price and petro-state, and triple interaction among oil price, revolutionary government, and petro-state, all fail to achieve statistical significance with 95 percent confidence as they did in Models 5 and 6. Moreover, once the country-fixed effects are removed from the models, the interaction between revolutionary leadership and petro-state loses statistical significance with 90 percent (Model 7) and 95 percent (Model 8) confidence.

This result demonstrates that the effects of the revolutionary petro-state interaction variable in Hendrix’s models are highly influenced by the application of panel fixed effects. Moreover, it is not clear methodologically or theoretically why we would decide to apply the country-fixed effect to these models. On one hand, doing so reduces the risk of omitted variable bias by accounting for unobservable and time-invariant differences across countries. On the other, without solid reason to believe that the important omitted variables specific to countries are indeed time-invariant, we run the risk of violating that assumption. Moreover, we have no way of being even minimally confident that those country-specific and time-invariant factors are uncorrelated with our explanatory variables. For these reasons, we present both sets of results, and the results suggest that the three-way interaction effect is highly dependent on the fixed effects specification.
As we have detailed here, one of the two most important findings is that what scholars took to be a global correlation between oil wealth and interstate conflict (conditioned on radical leadership) was an artifact of a single conflict—the Iran-Iraq war. Each time that we account for the conflict, the radicalism-oil interaction effect virtually disappears and makes it impossible to reject that null hypothesis: namely, that there is no relationship. To ascertain whether the observations for the two countries during their war are indeed outliers, we calculated studentized Pearson and deviance residuals for them. Below we present the studentized Pearson residuals: the deviance residuals are available in the Appendix. They illustrate clearly that the Iran-Iraq war years fall well outside from zero and the normal ranges of distribution for even other high-MID observations. The small set of observations from this single war has driven the uncorrected models in this and past studies to overestimate the bellicosity of revolutionary petro-states.

**Table 2 about here**

*Oil and Gas Income Analysis*

Table 3 demonstrates the results of four models employing the most comprehensive dataset currently available for studying oil and militarized interstate disputes and employing the benchmark indicator for oil wealth. The dataset extends the time series to 2010 and uses a continuous measure of oil wealth (Model 11 and 12) directly compared to the binary indicator (Model 9 and 10) for petrostates: logged oil and gas income per capita (2011 constant US$). As we discussed above, this has increasingly become the measure of choice for capturing the effects of oil wealth, or abundance. Models 9-12 employ the full time span from 1945 to 2010.

In Model 9, we use Colgan’s binary variable that measures net oil export revenue for 10 percent or higher of GDP. The revolutionary government, petro-state, and their interaction
variable are statistically significant at 95 percent confidence. However, the substantive impact of revolutionary government and its interaction variable with petro-state decreases significantly. The difference between non-petro-states and petro-state with revolutionary governments is much smaller than in the original data period of 1945-2001. Non-petro-states with revolutionary governments aggressively engage in MID's more than non-revolutionary governments at a rate of 0.04 per year, or 38.39 percent more per year. Petro-states with revolutionary governments aggressively engage in MID's more than nonrevolutionary governments at a rate of 0.06 per year, or 50.17 percent more per year. The difference is only a rate of 0.021, or one-fifth of one revisionist onset event per year.

Model 10 has the same variables as in Model 5 but also includes the 1980-1988 Iran-Iraq War dummy variable. The Iran-Iraq War variable is again statistically significant and, when it is included, revolutionary governments (more bellicose) and petro-states (more peaceful) remain statistically significant, but the radical oil interaction effect ceases to be significant at even 10%. As such, holding other factors constant, revolutionary petro-states are actually less likely to initiate MID's at a rate of 0.029, or 18.43 percent less per year than revolutionary non-petro-states. This result provides even stronger support for our intuition that the Iran-Iraq war is sui generis in the context of the full global sample. The studentized Pearson residuals in Figure 2 are based on Model 10.

Model 11 uses a continuous measure of oil wealth directly compared to the binary indicator for petro-states: logged oil and gas income per capita (2011 constant US$). Model 11 is thus essentially a replication of Colgan’s base model but with a continuous measure of oil wealth rather than a binary one. The relationship between oil and gas income and MID onsets is presented in Figure 1.1. Figures 1.2 and 1.3 show the predicted marginal effect of logged oil and
gas income per capita on the expected log count of aggressive MIDs per year in Model 11. All else equal, under revolutionary governments, a 10 percent increase in oil and gas income per capita is positively associated with the number of aggressive MIDs at 0.03 percent more per year. Under non-revolutionary governments, a 10 percent increase in oil and gas income per capita is negatively associated with the number of aggressive MIDs at 0.32 percent less per year. In non-revolutionary governments, when using the continuous oil and gas income measure, we can observe oil’s peace-inducing effect. While the oil income is still positively associated with the increase of aggressive MIDs per year under revolutionary governments, the magnitude of the relationship between revolutionary-petro-states and aggressive military conflict dramatically decreases in our models, compared with Colgan’s original models.
Model 12 also has the same variables as in Model 11 but includes the 1980-1988 Iran-Iraq War dummy variable. Like Model 10, the Iran-Iraq War variable is statistically significant but the interaction variable, revolutionary petro-state, fails to achieve statistical significance at even 90 percent confidence. Figure 1.3 shows the predicted marginal effect of logged oil and gas income per capita on the expected log count of aggressive MIDs per year distinguished by revolutionary and non-revolutionary governments in Model 8. Unlike Model 11, the 95 percent confidence intervals for revolutionary and non-revolutionary governments overlap with one another. Moreover, as oil wealth increases, both revolutionary and non-revolutionary governments are less likely to initiate MIDs. The reason, as discussed above, is that the Iran-Iraq war country years are strict outliers in the dataset as a whole. Figure 2 presents this graphically with studentized Pearson residuals for those years compared to the rest of the dataset.

![Figure 2: Studentized Pearson Residuals for the Iran-Iraq War (Model 10)](image)

Table 3 about here

Discussion and Conclusion
Based on this elaborated analysis, it is possible to advance some preliminary conclusions. First, to the extent that oil wealth has a consistent effect, the evidence suggests it is generally a peaceful one. All else equal, oil-producing countries tend to be less aggressive toward their neighbors than non-oil producers once we account for the statistical outlier that is the Iran-Iraq war. This relationship holds across multiple measurement choices and model specifications. Even revolutionary oil-producing countries are no more bellicose than revolutionary non-oil producing countries. When we take account of the Iran-Iraq War, oil prices also, whether alone or interacted with oil wealth and radical leadership, have at best an inconsistent impact on the risk of interstate conflict.

In short, the relationships we find here suggest the possibility of an oil peace. What remains open to investigation are the mechanisms that might link oil wealth to more peaceful international behavior. Are they primarily domestic, or systemic? And which implications of oil wealth at each level appear to be steering substantial oil producers to more pacific international roles? To the extent that oil producing countries are more peaceful than non-oil producers, it may well suggest a need to ‘normalize’ oil producers as ones whose behavior is explained by the commercial peace thesis just as producers of other commodities are.34 These questions of causal process are an obvious next step for scholarship seeking to reconcile the inconsistency of the oil-interstate war thesis with the suggestive evidence for an oil peace.

Methodologically, our findings here suggest several things. First, it is past time to bring measurement choices in the oil-interstate war research agenda up to date. The data we analyze here for oil and gas income per capita, and which is publicly archived, employs the best available measure of oil abundance and its original form extends from 1932 to 2015 (Ross and Mahdavi

34 As mentioned above, this project is next on our research agenda.
2015). For scholars seeking to compliment that with a ratio measure of dependence, best practices in the resource curse research program most often now use oil/gas income as a share of GDP, rather than only export revenues. Moreover, we lack any good empirical or theoretical reasons to establish categorical boundaries between what is a “petrostate” and what is not, and unless and until we do, it makes more sense to use continuous data. Second, unless there are solid reasons to dismiss system-level causal factors in our statistical models (and there are certainly not at present—on the contrary, nearly all current studies of war onset find multiple important determinants at this level of analysis), scholars should employ random effects estimators.

Finally, what stands out in this set of analyses is the centrality of Middle East geopolitical dynamics during the last half of the 20th century. The Iran-Iraq war during the 1980s looms large in explaining interstate conflict not just in that region but in the global sample. Accounting for the dynamics of the war between Iran and Iraq, in particular the large numbers of disputes initiated by one of them against third party countries, we find strong support for region-specific theories of bellicosity. It is long past necessary to note that domestic politics often matters for international relations, but closer attention in the future to other regional dynamics could illuminate other important patterns in the field of interstate conflict studies. This statistical “glitch” argues for closer attention to regional particularities that might covary systematically with war determinants, and methodologically suggests that astute econometric research could benefit from reengagement with close-range regional expertise.35 In this case, at least, area studies acumen revealed a very different pattern of international conflict across the globe. In the 21st century, in which there are now as many as fifty substantial oil producing countries around

35 For a detailed discussion of this imperative, see Benjamin Smith and David Waldner, *Rethinking the Resource Curse*, (New York: Cambridge University Press, forthcoming 2021).
the world,\textsuperscript{36} establishing that there is an oil peace carries both important scholarly implications and policy ones.

\textsuperscript{36} Ross, \textit{The Oil Curse}, 20-22.
### Table 1. Colgan Analysis with Iran-Iraq War Variable.
**Timespan: 1945-2001 for all models.**

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aggressor-MIDs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revolutionary Government</td>
<td>0.286*** (0.099)</td>
<td>0.289*** (0.104)</td>
<td>0.288*** (0.099)</td>
<td>0.292*** (0.104)</td>
</tr>
<tr>
<td>Petro-StateColgan (Oil Export Revenues ≥10% of GDP)</td>
<td>-0.433*** (0.158)</td>
<td>-0.328* (0.179)</td>
<td>-0.362** (0.158)</td>
<td>-0.225 (0.179)</td>
</tr>
<tr>
<td>Revolutionary Government × Petro-StateColgan</td>
<td>0.707*** (0.203)</td>
<td>0.660*** (0.212)</td>
<td>0.345 (0.220)</td>
<td>0.303 (0.229)</td>
</tr>
<tr>
<td>Iran-Iraq War 1980-1988</td>
<td>1.267*** (0.192)</td>
<td>1.337*** (0.195)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP&lt;sub&gt;pc&lt;/sub&gt;, &lt;i&gt;log&lt;/i&gt;</td>
<td>-0.025 (0.060)</td>
<td>0.052 (0.075)</td>
<td>-0.051 (0.060)</td>
<td>0.039 (0.075)</td>
</tr>
<tr>
<td>Population, &lt;i&gt;log&lt;/i&gt;</td>
<td>0.244*** (0.066)</td>
<td>-0.07 (0.137)</td>
<td>0.209*** (0.066)</td>
<td>-0.22 (0.139)</td>
</tr>
<tr>
<td>Polity</td>
<td>-0.01 (0.007)</td>
<td>-0.006 (0.008)</td>
<td>-0.011 (0.007)</td>
<td>-0.008 (0.008)</td>
</tr>
<tr>
<td>Contiguous Borders</td>
<td>0.112*** (0.022)</td>
<td>0.180*** (0.029)</td>
<td>0.114*** (0.022)</td>
<td>0.186*** (0.029)</td>
</tr>
<tr>
<td>Cold War</td>
<td>0.135* (0.078)</td>
<td>0.1 (0.095)</td>
<td>0.031 (0.080)</td>
<td>-0.06 (0.098)</td>
</tr>
<tr>
<td>Muslim, % Population</td>
<td>0.182 (0.287)</td>
<td></td>
<td>0.155 (0.284)</td>
<td></td>
</tr>
<tr>
<td>Major Power</td>
<td>0.33 (0.413)</td>
<td></td>
<td>0.385 (0.407)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-4.310*** (0.767)</td>
<td></td>
<td>-3.712*** (0.775)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>6244</td>
<td>5377</td>
<td>6244</td>
<td>5377</td>
</tr>
<tr>
<td>Countries</td>
<td>153</td>
<td>126</td>
<td>153</td>
<td>126</td>
</tr>
<tr>
<td>Country Fixed Effects</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>AIC</td>
<td>5538.91</td>
<td>4709.78</td>
<td>5498.58</td>
<td>4665.95</td>
</tr>
<tr>
<td>BIC</td>
<td>5687.18</td>
<td>4782.27</td>
<td>5653.59</td>
<td>4745.02</td>
</tr>
</tbody>
</table>

**Note** All models use Poisson regression analysis for cross-sectional time-series data. Standard errors are in parentheses. Regional dummy variables and a spline of peace years are included in all models but not shown in this table. *** p<0.01, ** p<0.05, * p<0.1.
Table 2. Hendrix Oil Price Analysis w/ Iran-Iraq War Variable.  

<table>
<thead>
<tr>
<th></th>
<th>Models 5&amp;6: Fixed Effects</th>
<th>Models 7&amp;8: Random Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 5</td>
<td>Model 6</td>
</tr>
<tr>
<td>Dependent Variable:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil Price</td>
<td>0.003 (0.002)</td>
<td>0.003 (0.002)</td>
</tr>
<tr>
<td>Revolutionary Government</td>
<td>0.292* (0.175)</td>
<td>0.305* (0.172)</td>
</tr>
<tr>
<td>Oil Price × Revolutionary Government</td>
<td>-0.003 (0.004)</td>
<td>-0.004 (0.004)</td>
</tr>
<tr>
<td>Petro-StateColgan</td>
<td>-0.138 (0.573)</td>
<td>-0.151 (0.576)</td>
</tr>
<tr>
<td>Petro-StateColgan ×</td>
<td>1.051** (0.463)</td>
<td>1.135** (0.442)</td>
</tr>
<tr>
<td>Revolutionary Government</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil Price × Petro-StateColgan</td>
<td>-0.002 (0.008)</td>
<td>-0.002 (0.008)</td>
</tr>
<tr>
<td>Oil Price × Revolutionary Government</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PetropstateColgan ×</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iran-Iraq War 1980-1988</td>
<td>1.823*** (0.357)</td>
<td>1.892*** (0.338)</td>
</tr>
<tr>
<td>Major Power</td>
<td>2.638*** (0.182)</td>
<td>2.640*** (0.179)</td>
</tr>
<tr>
<td>Cold War</td>
<td>-0.375** (0.147)</td>
<td>-0.367** (0.145)</td>
</tr>
<tr>
<td>Population, log</td>
<td>(0.224)</td>
<td>(0.220)</td>
</tr>
<tr>
<td>GDPpc, log</td>
<td>-0.016 (0.126)</td>
<td>-0.006 (0.126)</td>
</tr>
<tr>
<td>Polity IV</td>
<td>-0.020* (0.012)</td>
<td>-0.019* (0.012)</td>
</tr>
<tr>
<td>Constant</td>
<td>-16.474*** (2.034)</td>
<td>-24.522*** (2.028)</td>
</tr>
</tbody>
</table>

|                          |                           |                            |                          |
| No. Observations         | 6014                      | 6014                       | 6014                     | 6014 |
| No. Countries            | 153                       | 153                        | 153                      | 153 |
| Country Fixed Effects    | Yes                       | Yes                        | No                       | No  |
| AIC                      | 5116.864                  | 5133.234                   | 5685.567                 | 5735.59 |
| BIC                      | 5445.255                  | 5468.326                   | 5806.201                 | 5849.521 |

_Note_ Robust errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Table 3. Oil-War Models w/ petrostate and oil income measures. 
Time span: 1945-2010 for all models.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Revolutionaries Government</td>
<td>0.325*** (0.098)</td>
<td>0.390*** (0.085)</td>
</tr>
<tr>
<td>Oil &amp; Gas Income_{pc, log}</td>
<td>-0.440*** (0.143)</td>
<td>-0.387*** (0.143)</td>
</tr>
<tr>
<td>Petro-State_{Colgan}</td>
<td>0.522*** (0.185)</td>
<td>0.183 (0.200)</td>
</tr>
<tr>
<td>Revolutionaries Government \times Oil &amp; Gas Income_{pc, log}</td>
<td>1.326*** (0.193)</td>
<td>1.347*** (0.187)</td>
</tr>
<tr>
<td>Revolutionary Government x Petro-State_{Colgan}</td>
<td>0.093*** (0.020)</td>
<td>0.097*** (0.020)</td>
</tr>
<tr>
<td>GDP_{pc, log}</td>
<td>-0.115** (0.054)</td>
<td>-0.139** (0.054)</td>
</tr>
<tr>
<td>Population, _log</td>
<td>0.208*** (0.059)</td>
<td>0.174*** (0.059)</td>
</tr>
<tr>
<td>Polity IV</td>
<td>-0.008 (0.007)</td>
<td>-0.009 (0.007)</td>
</tr>
<tr>
<td>Contiguous Borders</td>
<td>0.178 (0.267)</td>
<td>0.155 (0.265)</td>
</tr>
<tr>
<td>Muslim, % Population</td>
<td>0.760** (0.363)</td>
<td>0.788** (0.361)</td>
</tr>
<tr>
<td>Major Power</td>
<td>-4.550*** (1.082)</td>
<td>-3.750*** (1.092)</td>
</tr>
<tr>
<td>Constant</td>
<td>6334.335</td>
<td>6291.079</td>
</tr>
<tr>
<td>No. Observations</td>
<td>7317</td>
<td>7317</td>
</tr>
<tr>
<td>No. Countries</td>
<td>159</td>
<td>159</td>
</tr>
<tr>
<td>AIC</td>
<td>6486.09</td>
<td>6449.732</td>
</tr>
</tbody>
</table>

Note: All models use random effects Poisson regression analysis for cross-sectional time-series data. Standard errors are in parentheses. Regional dummy variables and a spline of peace years are included in all models but not shown in this table. *** p<0.01, ** p<0.05, * p<0.1.