Peace Economics, Peace Science and Public Policy

Volume 16, *Issue* 1 2010 *Article* 8

War! What Is It Good For? A Deep Determinants Analysis of the Cost of Interstate Conflict

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Abstract

Whatever gains may come from fighting wars, economic growth is not among them. We examine the long-run impact of interstate conflict on real GDP per capita for a cross section of countries between 1960 and 2000. We construct a fatality-weighted conflict variable that accounts for both the severity and endogeneity of individual confrontations. We include our conflict measure in a deep determinants income regression in which we control for trade, institutions and geography. We find that a standard deviation increase in fatality-weighted conflict over the period 1960 to 2000 results in an average decrease of about a tenth of a standard deviation in 2000 real GDP per capita.

KEYWORDS: interstate conflict, development

*We would like to thank Janice Compton, Courtney LaFountain, Alexandra Mislin, seminar participants at Dalhousie University, George Mason University, St. Cloud State University, SUNY Buffalo, the Universities of Guelph, Manitoba, Winnipeg, the 2007 International Atlantic Economic Conference, 2008 Canadian Economics Association Meetings, 2008 Small Open Economies in a Globalized World Conference, and 2009 RMC Defence and Security Economics Workshop for their helpful comments and suggestions, and also Jesse Gastelle for the final copy editing. The usual disclaimer applies. Please send correspondence to Steven Yamarik, Department of Economics, California State University at Long Beach, 1250 Bellflower Blvd., Long Beach, CA 90840, syamarik@csulb.edu.

Have you ever witnessed the anger of the good shopkeeper, James Goodfellow, when his careless son happened to break a square of glass? ... every one of the spectators ... offered the unfortunate owner this invariable consolation—"It is an ill wind that blows nobody good. Everybody must live, and what would become of the glaziers if panes of glass were never broken?"... But if, as is too often the case, you come to the conclusion that it is a good thing to break windows, that it causes money to circulate, and that the encouragement of industry in general will be the result of it, you will oblige me to call out, "Stop there! Your theory is confined to that which is seen; it takes no account of that which is not seen."

-Frédéric Bastiat, *That Which is Seen and That Which is Not Seen*

I. INTRODUCTION

Frédéric Bastiat's Parable of the Broken Window highlights the difference between *cost* and *opportunity cost*. The bystanders mistakenly assume that if the window had not been broken, then nothing would have been produced. In fact, the full opportunity cost of the broken window includes the bread that the shopkeeper can no longer afford to purchase because he now needs to fix his shop's window. While simple when applied to the shopkeeper, the Parable of the Broken Window is often misunderstood, perhaps nowhere with more unfortunate consequences than with regards to the economic cost of war. [1]

Despite the logic of the parable, there is no clear consensus on the economic consequences of interstate wars.[2] One line of reasoning argues that war is harmful to the economy. Simply put, war kills people, destroys property, restricts trade, and retards capital formation. Marwah and Klein (2005) find that military expenditures reduced private investment and thus lowered the growth rate for the Southern Cone of Latin America. Blomberg, Hess, and Thacker (2006) estimate that major external conflict in the previous two years has a negative

[1] For example, in a September 14, 2001 article "After the Horror" in the *New York Times*, Paul Krugman wrote:
"Ghastly as it may seem to say this, the terror attack - like the original 'day of infamy' which brought an end to the Great Depression - could even do some economic good. [...] the driving force behind the economic slowdown has been a plunge in business investment. Now, all of a sudden, we need some new office buildings. As I've already indicated, the destruction isn't big compared with the economy, but rebuilding will generate at least some increase in business spending." After this quote was published, Walter Williams accused Krugman of committing the broken-window fallacy writing, "There's No Free Lunch" in the October 4, 2001 *Jewish World Review*: "Would there have been even greater 'economic good' had the terrorists succeeded in destroying buildings in Los Angeles, San Francisco, Chicago, Philadelphia, Boston and all other major cities? Of course, you and I know that is utter nonsense. Property destruction always lowers the wealth of a nation."

[2] There is a large literature on intrastate (or civil) conflict as well, however, our focus is on war between states. As such, we use "war" interchangeably with interstate conflict throughout the paper.

contemporaneous impact on growth. Sevastianova (2009) finds that international war has a negative impact on the one- and two-year growth rate, but an insignificant impact on the longer five-year growth rate. Glick and Taylor (2010) also find a negative short-run relationship between war and growth. They estimate that the indirect cost of World Wars I and II stemming from lost trade was even greater than the direct costs associated with the loss of life.[3]

An alternative line of reasoning argues that the macroeconomic effect of war is ambiguous, or even positive. In the short-run, wartime expenditures increase aggregate demand and the level of real GDP.[4] Military research and production can increase innovation and technological progress in the long-run (Alchian, 1963; Kuznets, 1964; and Ruttan, 2006). Similarly, war can eliminate distributional coalitions, thereby reducing rent seeking, especially for the "losers" of the conflict (Olson, 1982). For the U.S., conventional wisdom is that the Second World War saved the U.S. economy from an even longer depression and planted the seeds for future prosperity.[5]

In this paper, we examine the long-run economic impact of interstate war. We construct a cross-country measure of interstate conflict between 1960 and 2000 that accounts for both the severity and endogeneity of individual confrontations. We then estimate the effect of interstate war on the level of real GDP per capita in 2000 controlling for differences in trade intensity, institutional quality and geographic location. We find that war reduces the long-run level of real GDP per person.

The estimation of the impact of war on economic performance poses five challenges to the researcher. First, interstate conflict is a bilateral action between two or more nations, while economic performance is largely an independent (or autonomous) outcome. As such, studies of interstate conflict and international trade (c.f. Martin, Mayer and Thoenig, 2008) estimate bilateral gravity models, while research into long-run economic performance use cross-country growth models (c.f. Rodrik, Subramanian and Trebbi, 2004). Second, the magnitude of the impact of interstate conflict can vary. There is no reason to expect that a border skirmish has the same impact as a major war. Any measure of conflict should take this into account by using appropriate weights that capture severity. Third, interstate conflict and economic outcomes may be jointly determined, therefore, an exogenous instrument for interstate conflict is needed to establish

[3] Others have found similar results with regards to lost trade and war. This literature is vast, but see the examples of Mansfield and Bronson (1997); Anderton and Carter (2001); and Kesht, Pollins, and Reuveny (2004).

[4] The resulting increase in government spending will also raise real interest rates and "crowd-out" private spending. Braun and McGrattan (1993) find that there is an overall increase in aggregate demand from military expenditures.

[5] See Searle (1945); Gemery and Hogendorn (1993); and Krugman (2009). For a dissenting view on the benefits of the Second World War, see Cullen and Fishback (2006) and Field (2008).

DOI: 10.2202/1554-8597.1197

causality. Fourth, the timing of interstate conflict is not clear-cut. Both the pre-war mobilization and the post-war impact can vary considerably across countries and conflicts. It is difficult to assume that the economic impact of interstate conflict can be adequately captured by a short-run growth rate. Fifth, the coverage of the cross-country sample must be extensive in order to include the high conflict nations.

We construct a three-part empirical model to address the five challenges listed above. In the first part, we model conflict as a jointly-determined outcome between two nations. We use a probit to estimate the probability of a war between any two countries based on geographic, historical and political factors. The predicted values are expected to be unrelated to economic outcomes like trade and production and thus can be used as instruments (Glick and Taylor, 2010). In the second part of the model, we aggregate up from bilateral conflicts to a cross-country measure. For each country, we add up the actual and predicted bilateral conflicts across all potential combatants. We then weight these actual and predicted values by average fatalities per day to account for the severity of each bilateral conflict.[6]

In the third part, we include our interstate conflict measure in a deep determinants income regression.[7] The deep determinants approach specifies that the level of income at the end of the period of study is a function of the average values of trade, institutional quality, and geography over the previous periods. As such, it elides over relatively short run factors (e.g. capital accumulation and productivity) in favor of using more fundamental factors to explain long run economic success.[8] Because of its simplicity, the deep determinants approach maximizes the sample coverage, thereby allowing us to include many of the poorest countries where war has been most prevalent during the last fifty years. Furthermore, addressing endogeneity concerns is facilitated by the existence of instruments for institutional quality and trade that have already been identified in the cross country growth literature. Most importantly, the deep determinants approach allows us to focus on the long-run. As explained above, existing studies that focus on the short run effect of war come up with mixed results. Is war simply a transitory supply shock? A minor blip in growth rates that can be erased within a few years?[9] Or, do its effects continue to haunt the economy long after

[6] Barro (1981) uses battle deaths per 1,000 people to measure the intensity of war for the U.S.
[7] Papers by Hall and Jones (1999), Frankel and Romer (1999), Acemoglu, Johnson and Robinson (2001) and Sachs (2003) examine the role of trade, institutions and/or geography as deep determinants of the long-run level of real GDP per person. Rodrik, Subramanian and Trebbi (2004) combine the three factors together into a unified framework.
[8] Hall and Jones (1999) provide several arguments as to why the level of output is a more appropriate measure of outcomes than growth rates when attempting to explain long run growth.
[9] For example, in addition to the citations above, Kugler (1973); Organski and Kugler (1977); and Rasler and Thompson (1985) argue that war has a negative effect in the short-run, but little to no

the dead have been buried and trade relations mended? Robert Higgs (1985), for example, makes a plausible case for war "ratcheting up" the size of government. He argues that this undermines long run outcomes, but is there any systematic empirical evidence for this? Or, do the long run benefits of the inventions that are developed and rushed into use during war years outweigh any costs due to government growth? Our approach can help answer these questions.

The remainder of our paper proceeds as follows. Section II details our empirical approach and estimation strategy, while section III provides information on the data we use. Section IV outlines our core empirical results as well as subsequent sensitivity analysis. Section V concludes.

II. EMPIRICAL APPROACH AND ESTIMATION STRATEGY

A. *Bilateral Conflict Equation*

We subscribe to the "Rationalist" interpretation for why bilateral conflict occurs.[10] According to the Rationalist, the joint utility of two countries at peace is always greater than their joint utility at war. However, the presence of imperfect information may cause disagreements over how to distribute the gains from peace.[11] Accordingly, the probability that two countries will go to war depends on two sets of contributing factors. The first set of factors contributes to the probability of a disagreement over the distribution of the gains from peace (e.g. bilateral distance, common language, prior disagreements, etc.). The second set of factors causes a disagreement to escalate because of imperfect information (e.g. the nature of political institutions, formal alliances, size of respective militaries).[12]

We define an indicator variable c_{ijt}, which is 1 if the two countries, i and j, are engaged in a conflict during year t; and 0 otherwise. $P(c_{ijt} = 1 | g,h,p)$ is then

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effect on long-run growth. This has been dubbed the "Phoenix" factor. Using cross-country data, Koubi (2005) estimates a negative contemporaneous and positive long-run relationship between war and economic growth.

[10] See Grossman (2003) for an example of the Rationalist approach. Powell (1999) surveys different approaches to explaining war. Martin, Mayer, and Thoenig (2008) present a formal model based on the Rationalist approach which results in a probit specification similar to ours.

[11] Each country wishes to maximize its share of the gains from peace. In a world of imperfect information, it is possible to demand a larger share than the other country is willing to accept. This results in escalation towards war. A famous example of such a miscalculation is the underestimation of Chinese tolerance towards the U.S. occupation of North Korea by General MacArthur in October 1950. This miscalculation directly contributed to the run-up to the Korean War.

[12] We recognize that the set of factors which determines the probability of disagreement overlaps with the set which determines the probability of escalation. This is irrelevant, however, to our main goal which is to identify factors which contribute to war that are exogenous to the long-run determinants of economic growth.

DOI: 10.2202/1554-8597.1197

the probability that i and j are at war in year t conditional on geographical characteristics g (e.g. bilateral distance, common border); shared historical factors h (e.g. common language, common colonizer); and relative political measures p (e.g. relative values of democracy, number of communist countries) that contribute to disagreement and escalation.[13] The response probability for a conflict is then

$$P\left(c_{ijt}=1 \middle| g,h,p\right)=\Phi\left(\pi_0+\pi_1 g_{ijt}+\pi_2 h_{ijt}+\pi_3 p_{ijt}\right) \tag{1}$$

where Φ is the standard normal cumulative distribution function and the standard errors of the estimates of π_0, π_1, π_2, π_3 are asymptotically standard normal.

The key identifying assumption is that the *bilateral* geographic, historical, and political factors are exogenous to each country's *individual* economic outcome. In particular, we are assuming that geographic isolation, historical relationships and political interplay between nations will impact an *individual* country's income only through its interactions with other countries. For example, the fact that France and Germany share a common border raises the probability of conflict, which could impact the income level of each country. However, geographic proximity of the two nations is unlikely to have a direct effect on the income level of each. This assumption allows us to generate a valid instrument, one that is independent of the error term in the cross-country income regression.

B. *Cross-Country Conflict Measure*

We create an aggregate measure of conflict for each country i in year t as a weighted sum of bilateral conflicts with all countries j during year t:

$$C_{it}=\frac{1}{J}\sum_{j\neq i}^{J} w_{ijt}c_{ijt} \tag{2}$$

where w is a weight, c is bilateral conflict and J is the number of potential combatant countries. The weight w_{ijt} should capture the severity of each conflict. Potential measures of severity include hostility level, duration and fatalities. We use fatalities per day of country i in conflict between i and j. We believe that fatalities per day provide a good indicator of severity, while limiting potential endogeneity.[14]

[13] The political measures are often justified by the democratic peace hypothesis (c.f. Levy and Razin, 2004).

[14] *Ex-ante*, it is unlikely that leaders know how many war fatalities will be sustained when entering a conflict. Further, this should be especially true for conflicts resulting in large fatalities, *ex post*, which are the ones receiving the most weight in our framework.

We sum equation (2) across 1960-2000 to create a cross-sectional conflict variable for each country *i*:

$$C_i = \sum_{t=1960}^{2000} C_{it} \,. \tag{3}$$

This cross-country conflict variable will be used to test the impact of war on the long-run level of real GDP per person.

We use the predicted probability of bilateral conflict $\hat{c}_{ijt}$ from (1) to create an instrument for cross-country conflict:

$$\hat{C}_{it} = \frac{1}{J}\sum_{j\neq i}^{J} w_{ijt}\hat{c}_{ijt} \tag{2'}$$

$$\hat{C}_i = \sum_{t=1960}^{2000} \hat{C}_{it} \,. \tag{3'}$$

The instrument $\hat{C}_i$ will be used to control for the endogeneity (or reverse causality) of conflict in the cross-country income regression.

C. *Cross-Country Income Regression*

The empirical growth literature has used either growth rates or levels to estimate the determinants of cross-country growth. The first generation of studies used annual average growth rates to estimate the impact of variables such as capital accumulation, education, and inflation on long-run growth.[15] These researchers sought to estimate the "proximate" causes of growth, but found very few stable and reliable relationships. For one thing, the use of multiple specifications generated highly unreliable and fragile results (Levine and Renelt, 1992 and Sala-i-Martin et. al., 2004). For another, the documentation of highly volatile growth rates through time called the econometrics of using growth rates into question (Pritchett, 2000).

In response, a deep determinants approach has emerged to attempt to answer the question, "why are some countries rich and others poor?"[16] The deep determinants approach relates the level of real per capita income *in the latest year* to a few fundamental or "deep" sources. The inclusion of a few deep

[15] Barro (1991) is an excellent example.

[16] Acemoglu, Johnson and Robinson (2001); Easterly and Levine (2003); Dollar and Kraay (2003); Rodrik, Subramanian and Trebbi (2004); and Glaeser, La Porta, Lopez-de-Silane and Shleifer (2004) are examples.

DOI: 10.2202/1554-8597.1197

determinants (i.e. geography, institutions, trade) limits the specification problems encountered by approaches using growth rates. Moreover, the use of the level of per capita income in the latest year also avoids some of the econometric problems inherent in growth rates. Perhaps most importantly, the deep determinants approach allows us to either borrow or create valid instruments for potentially endogenous independent variables. We get our instruments for trade and rule of law from Frankel and Romer (1999) and Hall and Jones (1999), respectively. One of our main contributions is to create an instrument for war which borrows equally from the approaches of Frankel and Romer (1999) and Martin, Mayer, and Thoenig (2008).

We add our cross-country conflict measure to a deep determinants regression:

$$\log\left(\frac{Y_i}{pop_i}\right) = b_0 + b_1 \log(C_i) + b_2 \log(T_i) + b_3 I_i + b_4 G_i + \varepsilon_i \qquad (4)$$

where *Y/pop* is the level of per capita income, *C* is conflict, *T* is trade, *I* is institutions, *G* is geography, and ε is an *i.i.d.* error term.[17]

We estimate the cross-country income equation (4) using two-stage least squares (2SLS). The identification strategy is to use fitted cross-country conflict to instrument actual cross-country conflict, fitted trade intensity from Frankel and Romer (1999) to instrument for trade intensity, and English and European language fractionalization to instrument for institutions (used by Rodrik, Subramanian, and Trebbi, 2004). In the first-stage, we estimate the following three regressions:

[17] The deep determinants approach does not predict the exact functional form (i.e. logs or levels) of the relationship between each deep determinant and real GDP per capita. We therefore conducted specification tests using a generalized R-squared criterion to determine the proper specification of conflict. The generalized R-squared test is a measure of explanatory power for models with endogenous explanatory variables (Pesaran and Smith, 1994). The tests results found that the log of conflict did much better in fitting the data than the level of conflict.

$$\log(C_i) = c_0 + c_1 \log(\hat{C}_i) + c_2 \log(\hat{T}_i) + c_3 LANG_i + c_4 G_i + u_i \quad (5)$$

$$\log(T_i) = d_0 + d_1 \log(\hat{C}_i) + d_2 \log(\hat{T}_i) + d_3 LANG_i + d_4 G_i + v_i \quad (6)$$

$$I_i = e_0 + e_1 \log(\hat{C}_i) + e_2 \log(\hat{T}_i) + e_3 LANG_i + e_4 G_i + z_i \quad (7)$$

where $\hat{C}$ is predicted conflict from (3’), $\hat{T}$ is predicted trade, *LANG* are the two language fractionalization variables, *G* is geography and (*u*,*v*,*z*) are *i.i.d.* error terms. In the second stage, we regress log(*Y*/*pop*) on the three predicted values from (5)-(7) and *G*.

Instrumental variables must satisfy two requirements for asymptotic consistency. They must be orthogonal to the error term (validity) and must be correlated with the included endogenous variable (relevance). To support the validity of our instrumental variables, we report the Hansen *J* statistic, keeping in mind that we can test for validity only when the number of excluded instruments exceeds the number of endogenous variables (over-identification). Relevance is checked by examining the first-stage *F* statistics.

The recent literature on weak instruments (c.f. Stock, Wright and Yogo, 2002) has shown that mere instrument relevance may not be sufficient. In other words, rejection of the null of under-identification does not ensure reliable IV inference. Thus, we also use the Shea (1997) partial *R*-squared statistic and the Stock and Yogo (2005) weak instrument test to assess the strength of our instruments. The Shea partial *R*-squared statistic records the additional explanatory power of the excluded instruments taking the inter-correlations of the instruments into account. The Stock and Yogo weak instrument test compares the Cragg-Donald statistic to pre-determined critical values to test the null of weak instruments.[18]

III. DATA

We construct bilateral and cross-country datasets of 159 current plus 9 former nation states from 1960 to 2000.[19] We use the State System Membership List from the Correlates of War (2008) for the entry date and possible exit date of each state.[20] The bilateral dataset is all country pairs or dyads in existence for each

[18] The Cragg-Donald statistic is the minimum eigenvalue of the generalized *F* statistic from the first-stage regression.

[19] The 9 former states with exit dates in parenthesis are South Vietnam (1975), North Vietnam (1975), South Yemen (1990), North Yemen (1990), East Germany (1990), West Germany (1990), Soviet Union (1991), Yugoslavia (1991) and Czechoslovakia (1992).

[20] The criteria for being a state after 1920 is that the entity must be a member of the United Nations or League of Nations, or have population greater than 500,000 and receive diplomatic missions from two major powers. Of the 158 current states, 60 had an entry date after 1960.

DOI: 10.2202/1554-8597.1197

year. Between 1960 and 2000, there are 456,484 country pairs, of which 369,999 are in our preferred specification for the probit in equation (1) (results in column 3 of Table 2). The cross-country dataset is a cross-section of 158 current states. We lose Myanmar and the 9 former nations due to a lack of real GDP measure in 2000.[21]

We use the Dyadic Militarized Interstate Dispute Dataset Version 2.0 (DYDMID2.0) of Maoz (2005) as our source of bilateral conflicts. DYDMID2.0 codes each dispute as “Threat to Use Force”, “Display of Force”, “Use of Force”, and “War”. We follow Martin, Mayer and Thoenig (2008) and define conflict as those *forceful* disputes recorded as “Use of Force” and “War”.

Table 1 shows the frequency of conflict in our bilateral dataset. In the complete sample, there are 1,463 conflicts out of 456,484 possible country pairs for a 0.32% incidence rate. In the preferred sample, there are 1,406 conflicts out of 366,999 country pairs for a 0.38% incidence rate. Thus, the use of our smaller sample appears to have little effect on the frequency rate of interstate conflict.

For continuity, we use the variables suggested by Martin, Mayer and Thoenig (2008) to choose the geographical, historical and political determinants of bilateral conflict.[22] For geographical factors, we use years since last conflict, log of bilateral distance, log sum of surface area, and dummies for conflict in previous year and common border. For historical variables, we use dummies for common language, common legal system, common colonizer post-1945, colonizer-colonist post-1945, and were/are part of the same country.[23] We obtain the geography and historical data from CEPII (2008). For political factors, we include the number of GATT/WTO members, number of communist states, dummy of a lagged defence alliance, sum of Polity, difference in Polity, lagged log sum of military personnel, and lagged log difference in military personnel. The defence alliance data comes from Gibler and Sarkees (2004). Polity is a composite measure of democratic institutions and comes from the Polity IV Project (2008). The military personnel data comes from the National Material Capabilities Version 3.02 dataset of Singer (1987).

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[21] The fact that our outcome measure is real GDP per person in 2000 introduces a potential selection bias in our sample. It is likely that countries that fought wars and then did very poor economically didn't survive until 2000. This selection bias would bias our results against finding a negative impact of war on income.

[22] We also included resource variables such as subsoil wealth, number of oil producers, number of gas producers, and access to seas. Each variable only had marginal explanatory power in the model, and so were excluded from our probit estimates.

[23] The common country variable is one if the two countries were or are the same state or the same administrative entity for a long period (25-50 years in the twentieth century, 75 year in the ninetieth century and 100 years before). See CEPII (2008) for details.

Table 1: Highest Hostility Level and Count of Bilateral Data

Highest Level of Hostility	Frequency	Percentage
Complete Sample		
No Militarized Action	454,467	99.558
Threat to Use Force	106	0.023
Display of Force	448	0.098
No Conflict Subtotal	*455,021*	*99.679*
Use of Force	1,296	0.284
War	167	0.037
Conflict Subtotal	*1,463*	*0.321*
Total	**456,484**	**100.00**
Preferred Sample		
No Militarized Action	365,069	99.474
Threat to Use Force	103	0.028
Display of Force	421	0.115
No Conflict Subtotal	*365,593*	*99.617*
Use of Force	1,241	0.338
War	165	0.045
Conflict Subtotal	*1,406*	*0.383*
Total	**366,999**	**100.00**

We obtain fatalities per conflict estimates from two sources. Our primary source is the UCDP/PRIO Armed Conflict Dataset Version 4 of Gleditsch et al. (2002). The Armed Conflict dataset provides estimates of battle deaths (fatalities resulting directly from combat) for over 200 armed conflicts. Our secondary source is the categorical fatality variable from the DYDMID2.0 dataset where 0 = 0, 1 = 1-25, 2 = 26-100, 3 = 101-250, 4 = 251-500, 5 = 501-999, 6 = 1000+ deaths. We use the median value of each category to generate a continuous conflict estimate for fatality categories 1-3. For fatalities greater than 250, we use the more precise estimate from the Armed Conflict dataset.

We measure fatalities per day for country i with country j in year t as:

$$w_{ijt} = \left[\frac{total\ \ fatalities}{conflict\ days}\right]\phi_t \gamma_i \tag{8}$$

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where *total fatalities* is total battle deaths of the conflict, *conflict days* is the length of the conflict in days, ϕ_t is the percentage of conflict occurring in year *t*, and γ_i the share of fatalities borne by country *i*. For the large conflicts (i.e. Vietnam war, Gulf war), we use the Armed Conflict Dataset estimates of fatalities per participant to measure γ_i. However, for most conflicts, we do not have estimates of fatalities per participant so we assume that fatalities are uniformly distributed across bilateral pairs in the conflict to measure γ_i.

For the cross-country regressions, we use estimates of real GDP per capita in 2000 from Penn World Tables 6.2 in Heston, Summers and Aten (2006). The year 2000 is the latest time period with complete coverage in the Penn World Tables 6.2. We measure trade as openness or trade intensity – sum of nominal imports and exports divided by nominal GDP. The data for trade intensity are obtained from the Penn World Tables 6.2. We use the fitted trade intensity from Frankel and Romer (1999) to instrument trade. We measure institutional quality as "rule of law" from Kaufman, Kraay and Mastruzzi (2005). The instruments English and European language fractionalization is the proportion of a country's population that speaks English and the proportion that speaks a major European language, respectively. We use data from Hall and Jones (1999) and fill in missing values using Gordon (2005). We measure geography as the absolute distance from the equator reported in the CIA Factbook (2008).

IV. EMPIRICAL RESULTS

A. *Probit Results*

We use a probit estimator to generate the predicted bilateral conflict probabilities in (1). We use bilateral data from 1960 to 2000. Table 2 presents the results of three specifications. The first specification includes the geography variables; the second adds the historical factors, and the third adds the political measures. We use the results of the third specification to construct our bilateral conflict probabilities.

The results are similar to those found in the conflict literature (c.f. Altfield and De Mesquita, 1979 and Martin, Mayer and Thoenig, 2008). In each specification, the coefficient for years since last conflict is negative, while that for conflict in previous year is positive. The coefficient signs support the idea that wars are endemic. Likewise, the coefficient for surface area is positive. Martin, Mayer and Thoenig (2008) argue that countries with large surface areas are more likely to have large minorities that can be a source of conflict with neighboring countries (like Turkey with Iraq). Interestingly, the coefficient for common language is positive, while that for common legal system is negative. We interpret these signs to mean that a common legal system is a more appropriate

Table 2: Probit Results
(Dependent Variable: Actual forceful conflict)

	(1)	(2)	(3)
Intercept	-1.778*** (0.166)	-1.939*** (0.175)	-2.184*** (0.194)
Years since last conflict	-0.005*** (0.000)	-0.004*** (0.000)	-0.004*** (0.000)
Conflict in previous year	1.756*** (0.041)	1.747*** (0.041)	1.740*** (0.044)
Log of distance	-0.262*** (0.016)	-0.256*** (0.016)	-0.259*** (0.018)
Log sum of surface area	0.059*** (0.005)	0.063*** (0.005)	0.048*** (0.007)
Common Border	0.283*** (0.038)	0.398*** (0.041)	0.432*** (0.044)
Common language		0.143*** (0.032)	0.161*** (0.035)
Common legal system		-0.193*** (0.031)	-0.141*** (-0.033)
Common colonizer post-1945		0.077* (0.047)	0.086* (0.053)
Colonial-Colonizer pair post-1945		0.465*** (0.081)	0.331*** (0.085)
Same Country		0.010 (0.055)	0.126** (0.059)
Number of GATT/WTO members			-0.095*** (0.022)
Lagged defense alliance			-0.172* (0.053)
Number of Communist states			-0.165*** (0.034)
Sum of Polity			-0.005*** (0.018)
Difference in Polity			0.013*** (0.022)
Lagged log sum of military personnel			0.078*** (0.007)
Lagged log difference of military personnel			-0.004 (0.105)
Pseudo *R*-squared	0.498	0.502	0.514
No. of observations	456,484	456,484	366,999

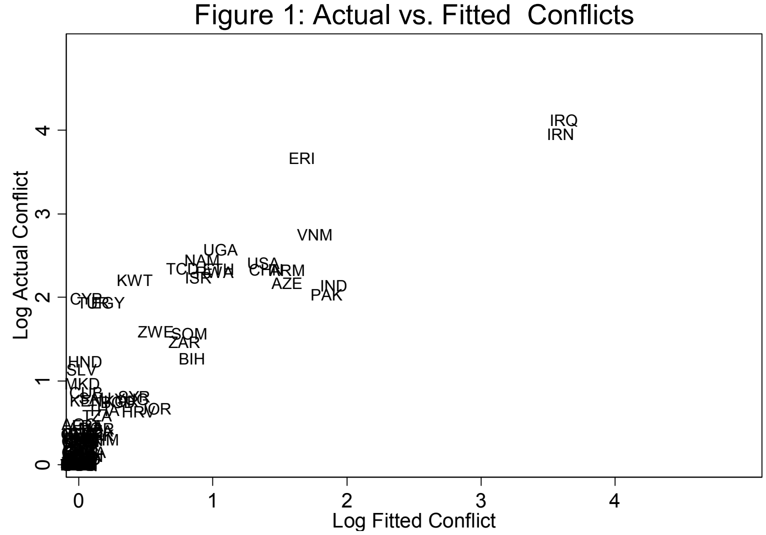
Note: Year dummies are included but not reported. Robust standard errors clustered by bilateral pair are in parenthesis measure of cultural likeness than a common language. The coefficients for colonial linkages and same state are all positive, indicating the greater likelihood of conflicts with colonial masters and breakaway states. In the third specification, we find that the coefficient for sum of Polity is negative and that for absolute difference is positive. This suggests that autocracies *in general* are more likely to fight than democracies, but more likely to wage war vs. democracies than other autocracies.

B. *Cross-country Conflict Measures*

We use equations (1), (2), (3), and (8) to construct our fatality-weighted actual (C) and fitted conflict ($\hat{C}$) variables. Appendix B presents the data sorted by actual conflict. The mean values for actual and fitted conflict are 2.2 and 0.8 fatalities per day. However, 37 percent (59 of 158) of our sample experienced no fatalities and thus have a zero for actual and fitted conflict. At the other end of the spectrum; Iraq (IRQ), Iran (IRN), Eritrea (ERI), Unified Vietnam (VNM), Uganda (UGA), Namibia (NAM) and the United States (USA) have an average value of 10 or higher fatalities per day. In particular, Iraq and Iran have values above 50, which are seven standard deviations away from the mean! [24]

Figure 1 plots the log of actual conflict vs. log of fitted conflict.[25] There is a strong positive relationship between actual and fitted conflict. The correlation coefficient is 0.88 in logs and 0.91 in levels. The high correlation suggests that our fitted conflict measure is a good instrument for our actual conflict variable.

Figure 1: Actual vs. Fitted Conflicts



[24] In addition, Former South Vietnam and North Vietnam had average fatalities per day of 355 and 380, respectively.

[25] We actually use the log of (1+ conflict measure) due to the presence of zero values.

C. *Cross-country Income Regressions*

Table 3 presents the results of our cross-country per capita income regression. The dependent variable is the log of real GDP per capita in 2000. Our variable of interest is fatality-weighted conflict. Panel A presents the OLS and second-stage results of the 2SLS regressions. Panel B shows the first-stage *F* statistics and Shea partial *R*-squared for our preferred 2SLS specifications in columns (4) and (6). The test results for overidentification (Hansen *J* statistic) and weak instrument (Cragg-Donald statistic) are shown at the bottom of panel A.

Columns (1) and (2) present the baseline OLS and 2SLS results for our 158-country sample. The four deep determinants explain 60 to 70 percent of the variation in the level of real GDP per capita. The coefficients for trade intensity, rule of law and geography are all positive and significant under OLS. Using 2SLS, we get the common result that institutions dominate in that the coefficient for rule of law increases markedly, while those for trade and geography decrease in value and in precision (Rodrik, Subramanian and Trebbi, 2004). For our variable of interest, the coefficient for interstate conflict has a negative sign in both (1) and (2), but is not statistically significant.

One possible reason for the insignificant relationship between conflict and real GDP per capita is the presence of observation(s) exerting undue influence on our estimates. For example, Iraq, Iran and Eritrea are particularly bellicose and stand out as possible outliers in Figure 1.[26] This is especially true for Iran and Iraq whose high conflict values are primarily the result of a single observation, the Iran-Iraq War of 1980 to 1988. The Iran-Iraq War involved trench warfare, chemical weapons (including mustard gas) and "human wave" attacks similar to those used in the Western Front of World War I. According to the Armed Conflict database, there were 644,500 total battle deaths for an average of 133 fatalities per day for Iran and 87 for Iraq over a nine-year period.[27] None of the other conflicts during our period of study come close to this level of destruction.

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[26] North and South Vietnam also have extremely high values for causality-weighted conflict. They are not included in our cross-country regressions since they no longer exist and thus have no value for real GDP in 2000. Unified Vietnam is included although their cross-country data is calculated from 1975 to 2000.

[27] As a comparison, the Armed Conflict database reports that U.S. battle deaths were 45,783 in the Vietnam War (1964-1973) for an average of 14 causalities per day over a ten-year period.

DOI: 10.2202/1554-8597.1197

Table 3: The Effect of Conflict on Economic Development
(dependent variable: Log of real GDP per capita in 2000)

Panel A: OLS and Second-Stage Results for 2SLS

	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS	(5) OLS	(6) 2SLS
Log (Conflict)	-0.045 (0.080)	-0.078 (0.108)	-0.033 (0.067)	-0.229** (0.105)	-0.061 (0.062)	-0.129* (0.069)
Log (Trade Intensity)	0.203** (0.094)	-0.381* (0.205)	0.231** (0.097)	-0.445** (0.199)	0.228*** (0.082)	-0.067 (0.199)
Rule of Law	0.812*** (0.054)	1.067*** (0.144)	0.830*** (0.050)	1.027*** (0.136)	0.764*** (0.054)	0.792*** (0.075)
Distance from equator	1.472*** (0.319)	0.940** (0.480)	1.356*** (0.319)	0.923** (0.472)	1.163** (0.504)	1.025** (0.491)
Oil Producer					0.714*** (0.152)	0.794*** (0.164)
Africa					-0.516** (0.220)	-0.546** (0.224)
Latin America					0.463** (0.192)	0.346** (0.210)
East Asia					-0.033 (0.247)	-0.110 (0.243)
R-squared	0.70	0.59	0.71	0.59	0.79	0.77
Hansen *J* (p-value)		0.22		0.35		0.83
Cragg-Donald statistic		10.82		11.47		12.48
No. of observations	158	158	155	155	158	158

Panel B: First-Stage Statistics

	(4)			(6)		
	Fitted Conflict	Institutions	Trade Intensity	Fitted Conflict	Institutions	Trade Intensity
F Statistic	40.56	14.14	19.59	36.46	30.35	14.91
Shea partial *R*-squared	0.65	0.26	0.29	0.61	0.34	0.25

Note: We estimated each equation using ordinary least squares (OLS) and two-stage least squares (2SLS). The instruments used in 2SLS are the log of fitted conflict, the log of fitted trade intensity, and European and English fractionalization. Robust standard errors are in parentheses where *, **, *** indicates significance at 10, 5, and 1% level.

In order to assess the possible influence of Iraq, Iran, Eritrea and other individual countries, we report details on the leverage and squared residuals of each observation in Appendix C. Leverage is a measure of how far an observation differs from the mean of the sample, while a large residual indicates that the observation is not well explained by the model. Iran and Iraq both exhibit a large degree of leverage, while Eritrea has both a large residual and leverage. As a result, these certainly support our prior belief based on Figure 1 that Iraq, Iran, and Eritrea may be possible outliers.

In columns (3) and (4) of Table 3, we exclude the outliers – Eritrea, Iran and Iraq – from the sample. The coefficient values under OLS are similar to those in column (1). However, when we control for endogeneity under 2SLS, the coefficient for conflict increases in magnitude to -0.229 and is now significant at the 5 percent level. In terms of impact, the point estimate in column (4) implies that a standard deviation increase in fatality weighted conflict leads to a decrease of about 14% of a standard deviation of 2000 real GDP.[28]

Another possibility for the insignificant relationship between conflict and real GDP per capita is omitted variable bias. Although the deep determinants approach explains close to two-thirds of the variation in our sample, important unobserved factors may remain. These unobserved factors are likely a product of a complex set of historical and geographical issues. There are two approaches taken in the growth literature to control for unobserved effects. The first is to include fixed effects in a panel data structure (c.f. Islam, 1995). The second is to include a set of continental 0-1 dummy variables (c.f. Barro, 1991 and Sala-i-Martin, 1997). We chose the second approach in order to utilize the cross-sectional information of conflict and the other deep determinants.

We follow the standard convention in the deep determinants literature (c.f. Rodrik, Subramanian and Trebbi, 2004) and include dummy variables for major oil producers, sub-Saharan Africa, Latin America and East Asia in columns (5) and (6).[29] With the exception of East Asia, the dummy variables have their predicted signs and are significant. The coefficient for conflict is negative and significant under 2SLS. Although smaller in magnitude than before, the point estimate in column (6) implies that a one standard deviation increase in fatality-weighted conflict reduces real GDP per person by about 9% of a standard deviation.

[28] To make this result more concrete, the mean of our 2000 real GDP per capita in log terms is 8.42342, while a standard deviation is 1.18860. Thus 14% of a standard deviation would represent a reduction from the mean to 8.25702. In levels terms this represents a reduction from $4552 to $3855. This is clearly a large effect.

[29] There are 12 major oil producers in our sample: Algeria, Bahrain, Gabon, Indonesia, Iran, Iraq, Kuwait, Nigeria, Oman, Saudi Arabia, United Arab Emirates, and Venezuela.

DOI: 10.2202/1554-8597.1197

The 2SLS coefficients in (4) and (6) are unbiased and consistent only if the instruments are valid, relevant and strong. The Hansen *J* statistic fails to reject the null of orthogonality at most conventional levels, which implies that the instruments are valid. In Panel B, the first-stage *F* statistic and Shea partial *R*-squared are high, indicating that the instruments are relevant. The Cragg-Donald statistic exceeds the critical values of Stock and Yogo (2005) in each column.[30] We can therefore reject the null of weak instruments. Taken together, the results in (4) and (6) provide solid evidence that interstate conflict has a negative impact on long-run economic development.

D. *Robustness*

It is well-known that cross-country growth regressions are highly sensitive to specification choice (c.f. Levine and Renelt, 1992 and Sala-i-Martin, 1997). In this section, we test the robustness of the negative link between conflict and economic development to the inclusion of additional explanatory variables and civil conflict measures. To examine the robustness of our specification, we include additional explanatory variables to our deep determinants regression found in (6) of Table 3. We include those variables found to be important by other researchers. These alternative specifications are reported in Table 4. To conserve space, we report the coefficient value (and standard error) for each deep determinant *C*, *T*, *I* and *G* and the *p*-value of a test of significance of the additional variable(s). We report the Hansen *J* and Cragg-Donald statistics at the bottom. For comparison purposes, we show the benchmark result in column (1) where the coefficient for conflict is -0.13 in value.

The first three specifications consider the additional roles of geography, disease and health differences. In column (2), we include the geographic controls – landlocked and log of surface area (see Frankel and Romer, 1999). These two variables are jointly significant, while the coefficient for conflict remains negative and significant. Recent work by Sachs (2003) and Carstensen and Gundlach (2006) show that malaria has direct effects on real GDP per capita. In column (3), we include malaria prevalence as an additional factor. Although the coefficient for malaria is negative and strongly significant, the coefficient for conflict remains negative and significant. To control for health differences, we add the log of life expectancy in 1960 in column (4). The coefficient for life expectancy is positive and significant, while the coefficient for conflict remains close to its benchmark value.

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[30] The critical value is calculated as a function of the number of endogenous regressors (n), the number of instrumental variables (K) and the desired maximal size (r) of a Wald test of $\beta = \beta_0$, when the significance level is 5 percent. In our case, the critical values for $r = 0.10$ and $r = 0.15$ are 10.01 and 6.48, respectively (Batten and Martina, 2007).

Table 4: Robustness to Alternative Specifications
(dependent variable: Log of real GDP per capita in 2000)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Conflict)	-0.130*	-0.162**	-0.118**	0.119*	-0.138**	0.121*	0.130**	0.139**	-0.150*
	(0.069)	(0.085)	(0.063)	(0.064)	(0.068)	(0.069)	(0.069)	(0.064)	(0.082)
Log (Trade Intensity)	-0.067	-0.373	-0.059	0.044	0.035	0.060	0.055	0.059	-0.268
	(0.199)	(0.440)	(0.180)	(0.190)	(0.191)	(0.200)	(0.203)	(0.198)	(0.281)
Rule of Law	0.792***	0.731***	0.709***	0.567***	0.727***	0.836***	0.754***	0.776***	1.001***
	(0.075)	(0.089)	(0.072)	0.102)	(0.087)	(0.098)	(0.105)	(0.079)	(0.229)
Distance from equator	1.025**	1.246***	-0.271	0.091	0.678	0.591	1.029**	0.874	1.301**
	(0.491)	(0.479)	(0.524)	(0.537)	(0.553)	(0.686)	(0.479)	(0.548)	(0.623)
Geographic Controls		[0.096]*							
Malaria			[0.000]***						
Life Expectancy				[0.000]***					
Fractionalization					[0.314]				
Legal Origin						[0.507]			
Democracy							[0.147]		
Civil Conflict								[0.381]	
R-squared	0.77	0.74	0.81	0.82	0.78	0.77	0.78	0.78	0.53
Hansen *J* (p-value)	0.83	0.68	0.65	0.25	0.43	0.63	0.30	0.69	0.45
Cragg-Donald statistic	12.48	2.98	12.88	9.85	14.11	11.15	8.82	12.53	2.73
No. of observations	158	158	154	152	152	158	158	158	127

Note: We estimated each equation using 2SLS where the log of fitted conflict, the log of fitted trade intensity, and European and English fractionalization are used as instruments. Robust standard errors are in parentheses where *, **, *** indicates significance at 10, 5, and 1% level. Dummy variables for major oil producer, sub-Saharan Africa, Latin America and East Asia are included in the second stage of all specifications, but not reported.

The next two specifications examine institutional and historical differences. In column (5), we include ethnic, language, and religious fractionalization measures of Alesina et al. (2004). The fractionalization measures record the heterogeneity in the population, but are jointly insignificant. The coefficient for conflict remains close to its benchmark value. We next add French and British legal origin in column (6). As with fractionalization, the legal origin variables are jointly insignificant, while conflict remains negative and

DOI: 10.2202/1554-8597.1197

significant. Although not reported, we also included colonial origin variables and found the coefficient for conflict remained close to its benchmark value.

Column (7) considers democratic differences where we include the mean and standard deviation of Polity during 1960-2000. The democracy variables are jointly insignificant and not surprisingly have little impact on the coefficient for conflict. In column (8), we examine whether measures of intrastate or civil conflict lie behind our result. Echoing the sentiments of other researchers, Paul Collier writes that, "Civil wars are liable to be more damaging than international conflicts in several respects. They are inevitably fought entirely on the territory of the country. They are likely to undermine the state: both its institutions such as property rights, and its organizations such as police. By contrast … international wars tend to strengthen the state (Collier 1999, p. 168)." We do not dispute the claim that intrastate conflict may be more harmful to economic development than interstate conflict. We are interested, however, in whether our results are driven by civil conflict. Given the propensity for interstate conflict to become civil conflict and vice versa, this may be the case.

In column (8), we jointly include five measures for civil conflict within our regression: ethnic conflict, revolutionary war, adverse regime change, genocide/politicide, and state failure. The data are from the Political Instability Task Force data set. We average each measure over the 1960 to 2000 period. In our 158 country sample, more than half experienced some form of civil conflict. With these 5 civil war measures included, the coefficient for interstate conflict remains strong and significantly negative. The test for joint significance of our civil conflict measures, however, is insignificant. This is somewhat surprising given the findings of Collier and others (c.f. Collier, 1999 and Murdoch and Sandler, 2004). However, there is a strong negative correlation between civil conflict and rule of law. As a result, most if not all of the explanatory power of civil conflict is taken away by rule of law.[31]

Lastly, we examine the impact of interstate conflict on developing economies. To do so, we estimate the model excluding the 31 OECD or developed countries in column (9). With a point estimate of -0.15 for conflict, we find a stable negative impact of interstate war on the level of per capita income in the developing world.[32]

[31] We confirmed this by re-estimating regression (8) excluding rule of law. The coefficients for 2 of our 5 civil conflict measures were negative and statistically significant (the remaining 3 were insignificant) and jointly the 5 measures were highly statistically significant (*p*-value of 0.001). The coefficient for interstate conflict in this regression remained statistically significant and relatively stable with a -0.188 estimate.

[32] We also run a specification including the initial level of real GDP per capita as a regressor. We find a negative coefficient for conflict although it is no longer significant.

V. CONCLUSION

This paper makes three fundamental contributions to the literatures on growth and conflict. First, we develop a unique measure of interstate conflict that captures both the frequency and severity of war. Second, we construct a strong instrument for conflict which is orthogonal to other possible explanations of economic outcomes. Third, when added to a deep determinants regression, we find evidence that interstate conflict results in a significant decrease in long-run economic development.

We find that a one standard deviation increase in fatality-weighted conflict results in an average reduction in real GDP per capita of between 0.09 and 0.14 of a standard deviation. Our estimate is consistent with common sense and is fairly stable across different specifications of our cross-country regression. Most surprisingly, these results suggest that the costs of war stay with a country much longer than is implied by previous studies. Even if an economy grows quickly after a war is over, our results imply that this will not be enough to return standards of living to where they would have been in the absence of conflict. War is more than a transitory supply shock, it permanently alters the economic potential of the country.

This paper began with Bastiat's *Parable of the Broken Window* which suggests that a full accounting of the costs of interstate conflict could only result in the conclusion that increased conflict is bad for long-run outcomes. Bastiat's intuition is vindicated by our econometric results. In addition to its horrific ethical costs, interstate war also delivers significant economic consequences long after the guns have been silenced.

DOI: 10.2202/1554-8597.1197

APPENDIX A: SUMMARY STATISTICS OF CROSS-COUNTRY DATA

	Mean	Stan. Dev.	Minimum	Maximum
Real GDP pc in 2000	8,403	8,864	359	34,365
Conflict	2.1656	6.7563	7.3084	60.3596
Rule of Law	-0.0433	0.9962	-1.8845	2.2422
Trade Intensity	69.4029	40.3520	12.1950	319.5578
Distance from Equator	0.2938	0.1856	0.0000	0.6690
Predicted Conflict	0.7940	4.0919	0.0000	36.2239
English Fraction	0.0526	0.2020	0.0000	0.9740
European Fraction	0.1850	0.3509	0.0000	1.0040
Fitted Trade Intensity	19.8105	14.3266	2.3002	71.8083

*real GDP per capita in 2000 is from PWT 6.2, conflict is the sum of fatality-weighted actual bilateral conflicts for 1960-2000, rule of law is for 1995-2000, trade intensity is nominal exports plus imports divided by nominal GDP for 1960-2000, predicted conflict is the sum of fitted bilateral probabilities of conflict times casualities per day for 1960-2000, English fraction is the percentage of population speaking English language, European fraction is the percentage of population speaking one of the five major European languages, and fitted trade intensity is the sum of fitted nominal exports plus imports nominal GDP derived from a geographically-based gravity model.

APPENDIX B: DATA

Country	Start Date	Actual Conflict	Real GDP per capita	Rule of Law	Nominal Openness	Distance Equator
Austria	pre-1960	0	27,000	2.06	58.93	0.5359
Belgium	pre-1960	0	24,662	1.52	108.11	0.5649
Bolivia	pre-1960	0	2,929	-0.51	45.30	0.1688
Brazil	pre-1960	0	7,194	-0.17	12.19	0.2173
Bulgaria	pre-1960	0	7,258	-0.15	97.13	0.4675
Colombia	pre-1960	0	6,080	-0.59	28.28	0.0532
Denmark	pre-1960	0	27,827	1.99	66.41	0.6191
Dominican Republic	pre-1960	0	6,497	-0.26	76.76	0.2062
Finland	pre-1960	0	22,741	2.08	50.36	0.6690
Guatemala	pre-1960	0	3,859	-0.71	36.64	0.1625
Haiti	pre-1960	0	2,069	-1.24	52.84	0.2104
Hungary	pre-1960	0	11,383	0.76	97.24	0.5269
Ireland	pre-1960	0	24,948	1.81	93.60	0.6068
Italy	pre-1960	0	22,487	0.96	35.58	0.5046
Japan	pre-1960	0	23,971	1.71	21.11	0.3968
Mexico	pre-1960	0	8,082	-0.29	30.83	0.1862
Mongolia	pre-1960	0	1,501	0.24	89.13	0.5277
New Zealand	pre-1960	0	20,423	2.07	52.92	0.4099
Norway	pre-1960	0	33,092	2.10	73.64	0.6664
Poland	pre-1960	0	8,611	0.55	46.00	0.5583
Romania	pre-1960	0	5,211	-0.25	48.50	0.4947
Spain	pre-1960	0	19,536	1.31	28.37	0.4155
Sri Lanka	pre-1960	0	4,047	0.00	74.63	0.0763
Sweden	pre-1960	0	25,232	1.98	54.88	0.6586
Switzerland	pre-1960	0	28,831	2.24	61.64	0.5268
Taiwan, China	pre-1960	0	19,184	1.01	69.82	0.2589
Uruguay	pre-1960	0	10,740	0.57	29.63	0.3869
Benin	1960	0	1,251	-0.26	56.58	0.0707
Madagascar	1960	0	823	-0.84	42.76	0.2106
Sierra Leone	1961	0	684	-0.88	46.44	0.0967
Burundi	1962	0	699	-0.66	29.80	0.0374
Trinidad and Tobago	1962	0	14,770	0.40	110.65	0.1158
Malawi	1964	0	839	-0.39	57.10	0.1757

DOI: 10.2202/1554-8597.1197

Country	Start Date	Actual Conflict	Real GDP per capita	Rule of Law	Nominal Openness	Distance Equator
Gambia, The	1965	0	954	-0.13	89.91	0.1473
Singapore	1965	0	29,434	2.15	319.56	0.0151
Guyana	1966	0	3,733	-0.02	183.22	0.0640
Lesotho	1966	0	1,834	-0.16	109.54	0.3288
Equatorial Guinea	1968	0	6,495	-1.60	109.35	0.0258
Mauritius	1968	0	15,121	0.84	104.62	0.2248
Swaziland	1968	0	8,517	0.05	158.71	0.2949
Fiji	1970	0	4,572	-0.33	107.18	0.1981
Bhutan	1971	0	828	-0.55	69.80	0.3053
Comoros	1975	0	1,359	-1.08	57.03	0.1297
Papua New Guinea	1975	0	4,355	-0.36	89.17	0.0733
Djibouti	1977	0	4,376	-0.44	122.11	0.1278
Germany, Unified	1990	0	25,061	1.90	42.98	0.5351
Belarus	1992	0	10,005	-1.03	119.44	0.5889
Estonia	1992	0	11,081	0.53	134.28	0.6521
Georgia	1992	0	3,886	-0.72	65.22	0.4670
Kazakhstan	1992	0	6,520	-0.77	81.17	0.4923
Kyrgyz Republic	1992	0	3,389	-0.76	84.41	0.4556
Latvia	1992	0	8,998	0.17	99.99	0.6318
Lithuania	1992	0	9,161	0.10	114.80	0.6146
Moldova	1992	0	2,218	-0.29	116.26	0.5241
Slovenia	1992	0	18,206	0.77	120.52	0.5119
Turkmenistan	1992	0	7,624	-1.17	160.47	0.4444
Ukraine	1992	0	5,003	-0.72	88.80	0.5587
Czech Republic	1993	0	13,617	0.62	105.18	0.5494
Slovak Republic	1993	0	9,697	0.19	105.13	0.5378
Nepal	pre-1960	0.0007	1,421	-0.32	30.02	0.3079
Liberia	pre-1960	0.0011	472	-1.83	94.16	0.0709
Mozambique	1975	0.0026	1,093	-0.97	32.60	0.2055
Togo	1960	0.0037	823	-1.00	67.70	0.0688
Cote D'ivorie	1960	0.0039	2,172	-0.59	70.75	0.0611
Malaysia	pre-1960	0.0045	11,406	0.73	113.18	0.0363
Chile	pre-1960	0.0088	11,430	1.28	40.40	0.3728
Guinea-Bissau	1974	0.0120	762	-1.37	44.85	0.1362
Greece	pre-1960	0.0128	13,982	0.73	35.92	0.4229

Country	Start Date	Actual Conflict	Real GDP per capita	Rule of Law	Nominal Openness	Distance Equator
Zambia	1964	0.0133	866	-0.37	82.72	0.1438
Panama	pre-1960	0.0134	7,935	0.06	150.85	0.1023
Tajikistan	1992	0.0135	1,660	-1.37	160.72	0.4201
Mauritania	1960	0.0153	1,521	-0.54	103.57	0.1992
Russia	pre-1960	0.0230	9,263	-0.83	58.60	0.6186
Sudan	pre-1960	0.0230	1,048	-1.29	28.81	0.1560
Yemen, Republic of	1990	0.0246	1,082	-0.87	59.63	0.1692
Canada	pre-1960	0.0302	26,821	1.95	49.37	0.4859
Jamaica	1962	0.0322	4,521	-0.20	85.68	0.2006
Lebanon	pre-1960	0.0507	6,175	-0.07	103.69	0.3790
Indonesia	pre-1960	0.0586	3,772	-0.75	43.27	0.0729
Costa Rica	pre-1960	0.0602	8,341	0.77	60.08	0.1105
United Arab Emirates*	1971	0.0604	32,182	1.15	115.14	0.2599
Laos	pre-1960	0.0641	1,257	-1.14	34.81	0.1839
Mali	1960	0.0707	1,047	-0.68	48.41	0.1390
Afghanistan	pre-1960	0.0729	478	-1.55	53.41	0.3841
Netherlands	pre-1960	0.0742	26,293	1.97	100.96	0.5764
Burkina Faso	1960	0.0763	933	-0.57	41.38	0.1339
Uzbekistan	1992	0.0903	3,543	-1.00	63.47	0.4586
Gabon	1960	0.0943	10,439	-0.45	94.92	0.0041
Tunisia	pre-1960	0.0994	6,993	0.32	68.23	0.4091
Australia	pre-1960	0.1453	25,835	1.95	31.64	0.3580
Central African Republic	1960	0.1531	945	-0.57	50.69	0.0481
Ghana	pre-1960	0.1620	1,392	-0.09	44.74	0.0744
Botswana	1966	0.1630	7,256	0.71	105.30	0.2393
Guinea	pre-1960	0.1634	2,546	-0.98	54.61	0.1297
South Africa	pre-1960	0.1653	8,226	0.28	50.61	0.3237
Bahrain*	1971	0.1781	18,652	0.85	178.47	0.2892
Qatar*	1971	0.1815	32,261	1.15	87.10	0.2812
Philippines	pre-1960	0.2046	3,826	-0.22	48.32	0.1547
Paraguay	pre-1960	0.3171	4,965	-0.69	43.42	0.2843
Venezuela*	pre-1960	0.3171	7,323	-0.71	46.62	0.1094
Albania	pre-1960	0.3207	3,797	-0.67	53.69	0.4590
Cameroon	1960	0.3226	2,472	-1.05	49.43	0.1192
Portugal	pre-1960	0.3255	17,323	1.27	52.75	0.4313

Country	Start Date	Actual Conflict	Real GDP per capita	Rule of Law	Nominal Openness	Distance Equator
Senegal	1960	0.3388	1,571	-0.26	58.93	0.1641
Niger	1960	0.3421	807	-0.93	42.24	0.1542
Cambodia	pre-1960	0.3500	514	-0.80	27.84	0.1336
Ecuador	pre-1960	0.3646	4,314	-0.58	45.18	0.0229
Peru	pre-1960	0.3646	4,205	-0.46	43.19	0.1310
Libya	pre-1960	0.3724	10,335	-1.01	51.03	0.3623
Nicaragua	pre-1960	0.3747	3,438	-0.80	55.41	0.1357
Korea, North	pre-1960	0.4195	1,379	-1.11	15.81	0.4392
Oman*	1971	0.4333	16,193	1.21	90.37	0.2272
Nigeria*	1960	0.4446	1,074	-1.17	40.93	0.0727
Congo, Republic	1960	0.4457	1,286	-1.23	117.58	0.0409
United Kingdom	pre-1960	0.4526	24,666	1.97	48.33	0.5723
Algeria*	1962	0.4997	5,753	-0.74	54.85	0.4080
Morocco	pre-1960	0.5391	3,720	0.34	47.42	0.3733
Argentina	pre-1960	0.5477	11,332	0.21	12.59	0.4075
France	pre-1960	0.5887	25,045	1.52	36.38	0.5429
Angola	1975	0.6179	1,975	-1.45	67.66	0.0983
Tanzania	1961	0.7956	817	-0.42	47.28	0.0239
Croatia	1992	0.8781	8,980	-0.14	107.53	0.5011
Thailand	1887	0.9103	6,474	0.43	51.79	0.1530
Jordan	pre-1960	0.9434	3,902	0.45	94.02	0.3511
Bangladesh	1971	1.1154	1,851	-0.69	21.60	0.2653
Korea, South	pre-1960	1.1409	15,702	0.76	47.30	0.4173
Kenya	1963	1.1511	1,268	-0.91	61.49	0.0057
Serbia and Montenegro	1992	1.1904	2,095	-1.03	31.35	0.4889
Saudi Arabia*	pre-1960	1.2107	15,827	0.75	86.31	0.2563
Syrian Arab Republic	pre-1960	1.2517	2,001	-0.37	49.52	0.3718
Cuba	pre-1960	1.3555	5,699	-0.62	51.68	0.2565
Macedonia, FYR	1993	1.6250	5,271	-0.40	83.41	0.4611
El Salvador	pre-1960	2.1009	4,732	-0.36	54.12	0.1531
Honduras	pre-1960	2.4198	2,240	-0.77	65.09	0.1577
Bosnia-Herzegovina	1992	2.5362	3,037	-0.69	96.54	0.4889
Congo, Dem. Rep.	1960	3.3209	359	-1.88	75.92	0.0000
Somalia	1960	3.7787	682	-1.74	19.76	0.1181
Zimbabwe	1965	3.8907	3,256	-0.32	65.43	0.1986

Country	Start Date	Actual Conflict	Real GDP per capita	Rule of Law	Nominal Openness	Distance Equator
Turkey	pre-1960	5.8992	5,715	0.09	20.98	0.4578
Egypt	pre-1960	5.9229	4,536	0.21	45.95	0.3333
Cyprus	1960	6.2916	20,457	0.83	104.01	0.3898
Pakistan	pre-1960	6.6374	2,477	-0.59	21.64	0.3464
India	pre-1960	7.5223	2,644	0.14	13.36	0.2808
Azerbaijan	1992	7.7666	3,591	-0.89	88.57	0.4484
Kuwait*	1961	8.0693	25,135	0.99	103.10	0.3258
Israel	pre-1960	8.3398	22,237	1.11	54.06	0.3565
Rwanda	1962	8.9674	1,018	-0.74	24.06	0.0226
Armenia	1992	9.2110	3,471	-0.44	78.45	0.4473
China	pre-1960	9.2740	4,002	-0.34	17.06	0.3285
Ethiopia	pre-1960	9.3097	725	-0.30	25.35	0.1001
Chad	1960	9.4100	830	-0.66	53.78	0.1153
United States	pre-1960	10.0904	34,365	1.82	15.21	0.3818
Namibia	1990	10.5118	5,269	0.85	129.40	0.1998
Uganda	1962	12.1114	1,058	-0.52	48.83	0.0025
Viet Nam, Unified	1976	14.5641	2,189	-0.68	83.09	0.1200
Eritrea	1993	37.8788	555	-0.10	98.87	0.1701
Iran*	pre-1960	50.6817	6,046	-0.57	46.19	0.3931
Iraq*	pre-1960	60.3596	2,445	-1.58	50.46	0.3702

* indicates a major oil producer.

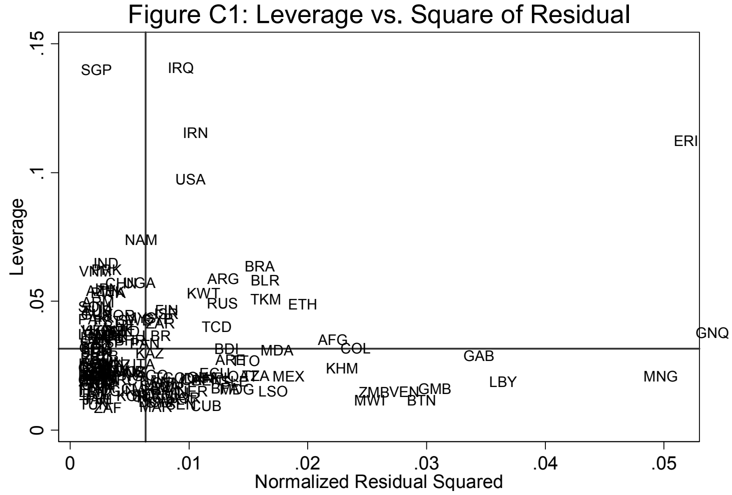
APPENDIX C: OUTLIER ANALYSIS

In order to consider the possibility that Iran, Iraq, and Eritrea are outliers, we consider three issues. First, an observation may not be well-explained by the model and thus have a *large residual*. As a result, the observation is not well-explained by the data. Second, an observation may be far from the mean of the distribution and thus have *leverage*. A least squares regression fit will attempt to prevent such a point from having a sizable residual. Third, an observation may have an impact on the point estimate and thus have *influence*. Influence is a combination of *large residual* and *leverage*. Figure C1 provides visual evidence of possible outliers.

DOI: 10.2202/1554-8597.1197

Figure C1 plots leverage vs. normalized residual squared for the 158 observations. Based on figure C1, Iraq (IRQ) and Iran (IRN) exhibit extremely high leverage, while Eritrea (ERI) has a large amount of leverage and residual. As a result, it appears accounting for these observations are necessary.

Figure C1: Leverage vs. Square of Residual



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