FIGHTING ON QUICKSAND: CORRUPTION WEAKENS STATE CAPACITY IN WAR

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Abstract

This paper explores whether corruption negatively affects the outcomes of interstate conflicts. Applying quantitative methods on about 200 years of data suggests that more corrupt countries are less likely to win interstate wars and more likely to suffer a higher ratio of combat losses in those wars. Democracies tend to be less corrupt and are less impacted by corruption's effects. The rot of corruption thus likely affects one of the main duties of the state: public defense.

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Part 1: Introduction

Corruption—in its many forms—is both reflective of societal issues and a harmful force on society. Given the vast corrosive effects of corruption, it is reasonable to expect it to affect a society's ability to succeed in conflicts. This paper uses quantitative methods to explore how much, and whether, corruption affects interstate war outcomes to suggest that the level of corruption is a major and significant factor in determining those outcomes. I analyze nearly 200 years of war data to conclude that higher levels of corruption reduce the likelihood of victory in war and increase the ratio of combat losses. The more corruption is present in a society, the greater its deleterious effects on war outcomes.

There is consensus among researchers that corruption—at any level—has a negative effect upon society.[1] Corruption reflects fundamental political, economic, and institutional weaknesses and shortcomings. Corruption has major negative impacts on institutional efficacy, including on public and private organizations and the quality of services or goods they provide (Min, 2023; Montes & Paschoal, 2015; Steingrüber & Gadanya, 2021; Wang, 2020). It damages perceptions of regime legitimacy among citizens, causes moral decay & social discontentment, skews funding away from education (which adversely affects incidence of corruption), and reduces interpersonal trust in a positive feedback cycle (Bjørnskov, 2011; Rothstein, 2013; Seligson, 2002). Corruption lowers investments and damages economic growth (Mauro, 1997; Rose-Ackerman, 1999; Spyromitros & Panagiotidis, 2022). Even low levels of corruption cause inefficiency in the allocation of resources. Adverse effects of corruption on public welfare cannot be avoided (Lambsdorff, 2001).

Corruption's negative effects are particularly noticeable in the defense sector. The larger the government's role in an economy, the higher the level of expected corruption (LaPalombara, 1994); sectors in which economic competition is restricted feature greater opportunities for corruption (Elliot, 1997, 182). Public procurement, particularly semi-secret defense sector procurement, is one of the government activities most vulnerable to corruption (Freeman & Solmirano, 2012; Tagarev, 2010). More corrupt countries tend to have higher military

[1] I use a broad definition of corruption in this introduction of the misuse of public power for private benefit; "corruption does not have to be on a grand scale to inflict serious damage." (Myint 2000, 45) For a brief introduction to corruption, see (Amundsen 1999). Later on, this paper leverages the V-Dem dataset as the determinant source for the level of corruption by state.

spending both as a share of GDP and as a share of total government expenditure than less corrupt countries (Gupta et al., 2001).[2]

Despite the vast and wide-ranging negative impacts of corruption, no large quantitative study has yet been performed (that this author is aware of) to determine whether corruption has a direct effect on war outcomes. Recent research touches on corruption, particularly Lyall's (2020) concentration on inequality as a driver of outcomes and Talmadge's (2015) focus on authoritarian regimes' need to prop up their own regime which degrades military power, but that research does not suggest corruption alone is a prime determinant of military outcomes. This paper focuses on interstate conflicts to investigate whether corruption affects the probability of victory and combat losses in interstate wars.

There is a large body of literature on predicting interstate war outcomes, to which this study contributes. The main determinant of victory between states—following realist theory—is relative state power (Mearsheimer, 2001, chapters 1-3; Waltz, 1979 188-9). Power is a function of actual and potential (or latent) military strength. Actual power is represented by quantity, quality, and relative value of military forces (Casetti, 1984; Mearsheimer, 2001). Economic strength and total population determine latent power—the material assets a state can transform into military power (Hendershot ,1973; Mearsheimer 2001). Economic capabilities can also translate into crucial technological superiority used to dominate foes (Morgenthau, 1978, chapters 11-12).

Total power does not explain outcomes in all conflicts; of all the instances of asymmetric conflicts between 1800-2003 for instance, the weaker power won 3 in 10 (Arreguín-Toft, 2001). The relative motivation of each state and its constituents determines whether their will to continue fighting (Mack, 1975; Shaohua, 2009). The strategy and its relative value employed by each state to achieve military victory also affects the probability of victory, a weaker state can apply tactics to nullify a stronger opponent's relative conventional superiority (Arreguín-Toft, 2001). War initiators—particularly great powers in the more modern era—tend to win at a greater rate (Wang & Ray, 1994). Regime type—which tends to be interconnected with all other factors—also affects outcomes, as does the socio-political integration of people in the underlying fabric of society (Lyall, 2020). While autocratic regimes can win some conflicts because they do

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[2] Complementarity of military spending and corruption further harms economic performance (d'Agostino, Dunne, and Pieroni 2012).

not suffer as many constraints imposed by a war-weary constituency as a democracy (Merom, 2003), autocracies often raise military forces to uphold their regimes, forces which struggle to wage successful conventional wars (Talmadge, 2015). Democracies tend to be richer, better organized and more capable at winning wars than other regimes; democracies are generally more effective and are more likely to start wars they think they can win (Biddle & Long, 2004; Reiter & Stam, 1998A; Reiter & Stam, 1998B).

This paper contributes to the discussion by testing whether corruption significantly affects interstate war outcomes. A point to bear in mind throughout this paper is that corruption is representative of other deleterious societal factors. It is difficult to distinguish between the consequences and causes of corruption (Enste & Heldman, 2017, p. 7). For instance, there is clear evidence that corruption is intricately connected with interpersonal trust, religion, and power relationships; freedom of press and strength of an independent judiciary; business competition; the longevity of democracy; quality of government institutions; and presence of natural resources (Enste & Heldman, 2017, p. 8; Treisman, 2000;). The more pervasive corruption is, the more it reflects and affects the foundations of society. Myint (2000, p. 41) drives this point home: “When systemic corruption takes hold of a country, the institutions, rules and peoples’ behavior and attitudes become adapted to the corrupt way of doing things, and corruption becomes a way of life.” While the quantified level of corruption is interwoven with variables shown to impact outcomes in war (i.e. high amounts of corruption negatively affect the size of the economy and the size of the economy affects latent power), I expect its impact to be so important that they are not fully subsumed in those other variables.

The rest of this paper is organized as follows. In Part 2, I present a brief framework for how corruption may affect war outcomes before presenting the two hypotheses that will be tested in this paper. Part 3 presents the data and methodology. Part 4 showcases the outputs of the statistical tests. Part 5 is a discussion followed by the conclusion in Part 6.

Part 2: Framework and Hypotheses

In constructing an understanding of how corruption interlaces with the dynamics of warfare, we must delineate how corruption might permeate and shape the outcome of a conflict. Borrowing the USMC’s conceptualization of war (building off Clausewitz), war is characterized as the interaction of physical, moral, and mental forces (USMC 1997A, 15-17). Physical characteristics include equipment, supplies, objectives, losses of manpower or terrain. Moral characteristics include resolve, conscience, emotion, fear, morale, and esprit. Mental characteristics include the ability to grasp the complexity of a battlefield, to make effective estimates and decisions, to devise strategies and tactics. These three forces come together to provide a comprehensive framework for the factors involved in warfare. Clear advantages or vulnerabilities in these forces are what drives results. The factors shown to contribute to war outcomes discussed in the preceding section in turn can be folded into this same framework. Likewise, other authors' theoretical frameworks for understanding military success can subsume—such as the four organizational practices proffered by Talmadge (2015). An advantage in materiel or manpower (latent and military power) is a physical characteristic; clever strategies that nullify an opponent's power or technological advantage is a mental characteristic; the interrelationship of society, government type, and individual consciousness that suggests autocracies are worse at winning conventional wars includes a moral element.

Most saliently, corruption infiltrates the material basis of military operations, precipitating cascading ramifications that compromise operational efficacy. Within this realm, corrupt practices manifest in various forms, from embezzlement and illicit trade to the diversion of resources for personal gain. Such malfeasance results in the degradation of critical military assets, leaving units ill-equipped and vulnerable on the battlefield.[3] The effects of corruption extend beyond equipment shortages; they encompass systemic breakdowns in logistical support, compromised intelligence networks, and distorted procurement processes (Africa Center of Strategic Studies, 2015; Beliakova, 2024; Biddle & Zirkle, 1996; Blasko, 2015; Transparency International; Malmvig & Andersen, 2018, 2).[4] Acts of corruption can also include treachery,

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[3] Note for instance that Russia's logistics broke down almost immediately during its initial invasion of Ukraine (2022) due to 'poor operational planning, inadequate equipment and support and most importantly corruption.' (UK Ministry of Defense 2022).

[4] "The manipulation of personnel, budgets, and accountability often weakens the capability of security forces. Unqualified personnel, funds diverted to ghost salaries, fraudulent procurements, and manipulation of information lead to inefficiency and undermine battlefield performance (Elite Capture and Corruption of Security Sectors" Working Group 2023, 25). "One of the most significant ways corruption impacts military forces is by diverting resources and funding. Corrupt officials may siphon off funds allocated for military equipment, training, or personnel, leaving the armed forces underfunded and ill-equipped. This can result in soldiers operating with outdated or poorly maintained equipment, inadequate training, and insufficient

selling material intelligence, and selling critical assets (Andvig ,2007, 36-8). While total committed resources may overcome this source of friction, the cost paid can drag on a belligerent's economic ability to continue a conflict.[5] In some corrupt states, the politico-economic elite have little incentive to strengthen state capacity or institutions (which wage war) because they do not depend on them for revenue (OECD, 2010, 10). Consequently, it is reasonable to expect more corrupt regimes to find themselves hamstrung by inefficiencies and resource misallocation, impeding their capacity to mount effective military campaigns (Tagarev, 2010; Pyman et al., 2008).

Less obviously, corruption and its underlying forces affect the moral fabric of the military, wider government, and underlying economic processes that enable warfare. The lack of interpersonal trust associated with systemic corruption affects morale and drive; low interpersonal trust negatively affects productivity (de Bliek, 2016; Dirks, 1999; Umo, 2021). Soldier morale is negatively affected by corrupt practices; when leaders lose moral authority through corrupt practices, their control of subordinates declines; endemic corruption has detrimental effects on public trust for the defense establishment with ramifications like budget cuts (Chaudhury et al., 2006; Kurki, 2023, p.6; MacLachlan, 2018; Pope, 1941, p. 197; Tagarev, 2010, p. 79; Zemanovičová et al., 2000, p. 6;). Correlates of corruption further impact morale. Cultural traits like hypermasculinity are associated with corruption, which negatively affects factors like leadership styles and mental health (Husted, 1999; Scheff, 2008; Scholl & Schermuly, 2020; Williams 2019; WongHo et al., 2017). Corruption saps perception of state legitimacy among the people, which can percolate down to the soldier and reduce their motivation to fight (Seligson, 2002). In cases where elites have captured the security sector and stacked military forces with those demonstrating loyalty to their regime, such behavior often features favoritism based on ethnic or tribal affiliation, which not only skews the efficacy of military forces but also affects their loyalty and priorities (US Institute for Peace, 2023, pp. 21-22).

At the cognitive nexus of warfare, corruption exerts a profound influence on decision-making processes and leadership efficacy, compromising the

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supplies, all of which can hinder their ability to carry out their duties effectively. Moreover, the diversion of resources can lead to a lack of investment in essential military infrastructure, such as bases, barracks, and transportation systems, further exacerbating the problem and leaving the military in a vulnerable state." (Westwood 2023).

[5] Kickbacks are estimated to double the cost of Russian defense procurement (The Economist 2023).

intellectual acuity and strategic agility of military institutions. More corrupt societies tend to invest less in public education (Duerrenberger & Warning, 2018; Eicher et al., 2009); making decisions relies upon various skills—including analytical skills—which benefit from high-quality education. Having capable soldiers and government officials is advantageous (Decety, 2019; van Creveld, 1984; USMC, 1997B, p. 26). More educated public officials are less likely to be corrupt, thereby also affecting both the moral and physical forces that characterize warfare (Dridi 2014). Positions in the government hierarchy exposed to systemic corruption result in favoritism—including nepotism, sectarianism, and partisanship—which yields lower quality decision-makers (Pyman, 2017; Transparency International, 2019, p. 2). Just as with the previous two forces, corrupt practices distort the actual process of decision-making as well. In short, corruption engenders a climate of cognitive dysfunction, characterized by inequitable recruitment practices, compromised analytical capabilities, and systemic inefficiencies in decision-making.

This non-exhaustive list of the potential effects of corruption suggest that the presence and level of corruption can have acerbic effects on the forces that shape military operations. This paper explores whether those effects drastically affect interstate war outcomes. To that end, I investigate two hypotheses:

Hypothesis 1: Relative corruption affects interstate war outcomes whereby more corrupt countries are more likely to suffer defeat.

Hypothesis 2: Relative corruption affects interstate war outcomes whereby more corrupt countries are more likely to suffer greater losses than less corrupt countries.

Part 3: Methodology

States involved in inter-state wars are our main unit of analysis. I extract two variables: war outcomes and combat losses. To identify wars, war participants, and battlefield losses, I use version 4 of the Correlates of War interstate war data (Sarkees & Wayman, 2010). I limit the sample to inter-state wars. The CoW dataset represents 95 individual conflicts and spans the time-period of 1816-2007. I do not modify the wars or their actors.

3. A. Dependent Variables: War Outcomes, Proportional Deaths, Battle Outcomes

For ***war outcomes***, I consider only two possible variables: win or lose. I exclude any inconclusive outcomes, shrinking the sample by 18 wars because the sample was too varied and small to provide a valuable comparable baseline.[6] I follow the CoW definition of outcomes and code a victory as a 1 and a defeat as a 0. States are not grouped into dyads, as a result the total sample size is 274. An alternative methodology in which states are grouped by side is presented in the appendix (Appendix 8).

For ***proportional deaths***, I create two variables: losses relative to underlying population and losses relative to total war losses. I rely upon the CoW data on combat deaths to yield country-specific total combat deaths by conflict. I then create one variable for battlefield deaths as a ***proportion of total population*** by dividing the battlefield deaths with the relevant population number. Population data is sourced from Gapminder's Population Dataset version 7—which combines country specific data from the CLIO Infra Project for the range of 1800-1949 with UN World Population Prospect dataset following 1950. I partially account for the misalignment of modern state borders to their preceding polities' borders by either combining the germane territories that made up a larger state (i.e. the population of Hungary and Austria would be included in the Austrian empire's total population count) or by adjusting populations based on alternative source details (i.e. the population of the Papal States in the mid-19th century was just over 3 million). In addition to relative losses as a function of underlying total population, I also create a ***ratio of losses*** as a comparison of total losses between belligerents. For instance, the CoW dataset notes that Spain lost 600 men in the Franco-Spanish war of 1823, and France lost 400. The ratio of battlefield losses for Spain was therefore 1.5 and for France 0.66. The only modification made is to exclude Yugoslavia's losses in the War for Kosovo (1998-9) as the relative losses suffered by Yugoslavia was such an outlier. While I include the War for

[6] In follow-on research, it may be beneficial to include this category as a comparison group using a multinomial logistic regression, though the value might be muted given the variety of outcomes classified as inconclusive. For instance, among the 19 wars removed are the Franco-Turkish War (1918-1921) and Franco-Mexican War (1861-1867), which the CoW respectively classifies as a compromise and a transformed conflict. France ultimately did not meet its strategic aims in either war.

Kosovo in the War Outcomes analysis, I remove it from the ratio of combat losses analysis.

3. B. Explanatory Variables

Relative corruption is derived from the Varieties of Democracy (V-Dem) version 13 dataset, which measures 600+ indicators annually from 1789 to the present for all countries of the world (Coppedge et al., 2023). V-Dem variables are compiled by a team of investigators and country experts. For their corruption indices, they aggregate multiple indicators through layers of groupings and analyses and convert the resulting values to a 0-1 scale.[7] I use one index: the political corruption index (v2x_corr), which measures how pervasive political corruption is in a country. It quantifies both petty and grand types of corruption - types of corruption that affect law making and the type which affects implementation of laws. Each regime is ascribed a corruption score, I use the one for the year preceding the start of the war to avoid possible reverse causation. V-Dem indices are available by historical regimes, requiring no adjustment for modern versus defunct states.

Absolute corruption is simply the raw v_dem (v2x_corr) index.

3. C. Control Variables

To measure and account for ***relative power***, I utilize Composite Index of National Capability (CINC) scores from the CoW National Material Capabilities version 6.0 data set (Singer, Bremer, & Stuckey 1972, 19-48). This dataset contains annual values for total population, urban population, iron and steel production, energy consumption, military personnel, and military expenditure of all state members from 1816-2016. These values are then converted into capability components for each state. Each component is compared to the rest of the international system to represent a given state's share of total world capability at a point in time. I create a ratio of CINC scores for belligerents to determine relative power. ***Absolute power*** is the raw CINC score.

To measure ***regime type***, I rely upon Polity2 scores from the Polity5 Project (Center for Systemic Peace, 2018). The project codes characteristics of states in

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[7] For further context and discussions of the validity of the V-Dem index, see McMann et al. 2016; McMann et al. 2017; Bernhard et al. 2017; Fariss and Lo 2020.

the world system for purposes of comparative, quantitative analysis, and covers all major, independent states in the global system over the period 1800-2018 (i.e., states with a total population of 500,000 or more in the most recent year). The "Polity Score" captures this regime authority spectrum on a 21-point scale ranging from -10 (hereditary monarchy) to +10 (consolidated democracy). In some instances, a nonextant regime was not covered with a polity score. In these cases, I applied the polity score from the most relevant state that would make up the other regime. For instance, I used the polity score for Turkey to represent that of the Ottoman Empire's.

I derived ***regime classification*** using the Polity project's recommended classification notation, whereby "autocracies" boast of a polity score of -10 to -6, "anocracies" score -5 to +5, and "democracies" score +6 to +10. I code autocracies as a -1, anocracies as a 0, and democracies as a 1.

I control for war ***initiation*** using the provided notation from the CoW dataset. War or initiators are coded as 1, countries that are targeted are coded as 0.

War outcomes is also used as a control variable in the combat losses section of this paper, for which I rely upon the CoW notation.

3.D. Summary Statistics

Table 1

Summary Statistics for War Outcomes and Combat Casualties Analyses

Variable	Mean	Median	Std. Dev	N
Initiator	0.68	1	0.47	274
Outcome	0.57	1	0.50	274
Proportional Losses[8]	0.005	0.0003	0.03	266
Ratio of Losses[9]	1.60	0.33	8.07	266
Absolute Corruption	0.38	0.32	0.27	274

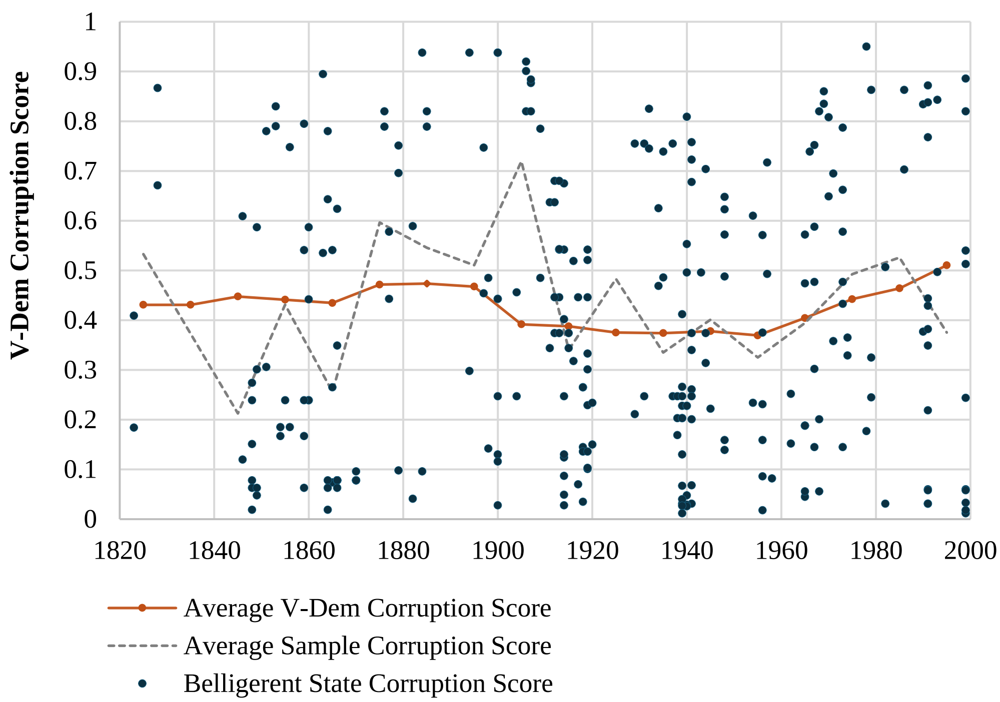
[8] Excluding Yugoslavia's losses in the War for Kosovo (1998-9). Including this instance would not affect the mean, median, or standard deviation of the dataset but would make the analysis not completely compatible with the ratio of losses, where including losses does make a massive difference.
[9] Including the War for Kosovo (boasting a ratio of 2,500:1) would have increased the standard deviation for this variable to 150.87.

Relative Corruption	1.22	0.54	1.93	274
Polity Score	-1.39	-4	6.82	274
Regime Classification	-0.05	0	0.69	274
Absolute Power	0.04	0.009	0.06	274
Relative Power	3.77	0.48	10.14	274

Displaying sample data as a time series (Figure 1) compared to the underlying V-Dem dataset suggests the sample is broadly representative. Regime-denominated scatter plots are in the Appendix (Appendices 14.A-B).

Figure 1

Scatterplot of sample belligerent raw corruption scores, their average over 10-year increments, and the overall 10-year average V-Dem corruption scores over time.



3. E. Statistical Framework

Two outcomes are tested to explore the two hypotheses in this paper: war outcomes and battlefield deaths. War outcomes are binary - either 0 or 1. The most appropriate statistical test is therefore ***binary logistic regression*** analysis. This test estimates the probability of the dependent variable's occurrence based on the predictors in the model. Battlefield deaths—in their various possible forms - are nonbinary count integers which suffer from overdispersion making a ***negative binomial regression*** the more appropriate approach to analyses. Though less appropriate, I also provide multiple linear regression analyses in the appendix (Appendix 10) of this paper. Finally, a panel of logit outputs aligned to Part 4 of this paper is shown in the appendix (Appendices 12.A-B.).

4. Results

4. A. War Outcomes

Table 2

Pearson Correlation Coefficients for War-Outcome Variables.

	Initiator	Outcome	Proportional Losses	Ratio of Losses	Absolute Corruption	Relative Corruption	Polity Score	Regime Classificatio	Absolute Power	Relative Power
Initiator	1	-	-	-	-	-	-	-	-	-
Outcome	-.05	1	-	-	-	-	-	-	-	-
Proportional Losses	.03	-.07	1	-	-	-	-	-	-	-
Ratio of Losses	-.09	-.08	.0	1	-	-	-	-	-	-
Absolute Corruption	-.03	-.32	.0	.11	1	-	-	-	-	-
Relative Corruption	-.04	-.32	-.06	.02	0.4	1	-	-	-	-
Polity Score	-.03	.03	-.08	.09	.01	-.06	1	-	-	-
Regime Classification	-.03	.03	-.1	.09	-.03	-.05	.91	1	-	-

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Absolute Power	-.19	.15	.1	-.03	.01	.07	.01	.08	1	-
Relative Power	-.29	.04	-.03	.32	.03	.09	.15	.13	.40	1

Note: both absolute and relative corruption are negatively correlated with war outcomes.

I create four models testing variations of the variables associated with war outcomes to determine the value of all null factors (variables identified as important based on the literature review), the importance of relative corruption, and the optimal variable mix. Model 1 leverages the control variables without applying relative corruption to note the impact relative corruption provides to explaining outcomes. Model 2 leverages relative corruption as its only explanatory variable. Model 2 outperforms Model 1. Model 3 brings together relative corruption with metrics for regime type, initiation, and power. This model is intended to be contrasted with Model 4, as it tests whether regime type (democracy, anocracy, or autocracy) and absolute power (nominal CINC score) creates better outputs than Polity scores and relative power. Model 3 yields more significant outputs, as demonstrated by its χ^2 and R^2 tests. Relative corruption is still the most important explanatory variable. Model 4 boasts of the highest predicted accuracy, R^2 and χ^2. I therefore utilize Polity Scores (rather than regime classification) and relative power (rather than absolute power) as independent variables in the rest of this paper.

Holding all other variables constant, the odds ratio suggests a 1-point increase in relative corruption reduces the probability of victory by 41.3%. In terms of model accuracy, including relative corruption nearly doubled the model's R^2 and χ^2. Relative corruption is the most significant control variable. I also showcase the results of a version of Model 4 using absolute corruption in lieu of relative corruption—the results are in the appendix (Appendix 1).

Table 3

Summary Table of Regression Results Predicting War Outcomes.

Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Initiator				
B	-0.75***	-	-0.78**	-0.73**

Standard Error	0.29	-	0.31	0.31
Exp (B)	0.47	-	0.46	0.48
Polity Score				
B	0.08***	-	-	0.06**
Standard Error	0.02	-	-	0.02
Exp (B)	1.09	-	-	1.06
Regime Classification				
B	-	-	0.54***	-
Standard Error	-	-	0.20	-
Exp (B)	-	-	1.72	-
Relative Power				
B	0.01	-	-	0.03
Standard Error	0.02	-	-	0.02
Exp (B)	1.01	-	-	1.03
Absolute Power				
B	-	-	3.83	-
Standard Error	-	-	2.69	-
Exp (B)	-	-	45.93	-
Relative Corruption				
B	-	-	-	-0.53***
Standard Error	-	-	-	0.12
Exp (B)	-	-	-	0.59
Constant				
B	0.89***	0.92***	1.29***	1.37***
Standard Error	0.27	0.17	0.32	0.30
Exp (B)	2.45	2.51	3.61	3.94
Model Accuracy				
Predicted % Correct	62.0	69.7	67.2	68.6
$\chi 2$	29.51***	28.49***	57.09***	57.79***
Cox & Snell R^2	0.10	0.13	0.19	0.19
Nagelkerke R^2	0.14	0.18	0.25	0.26
N	274	274	274	274

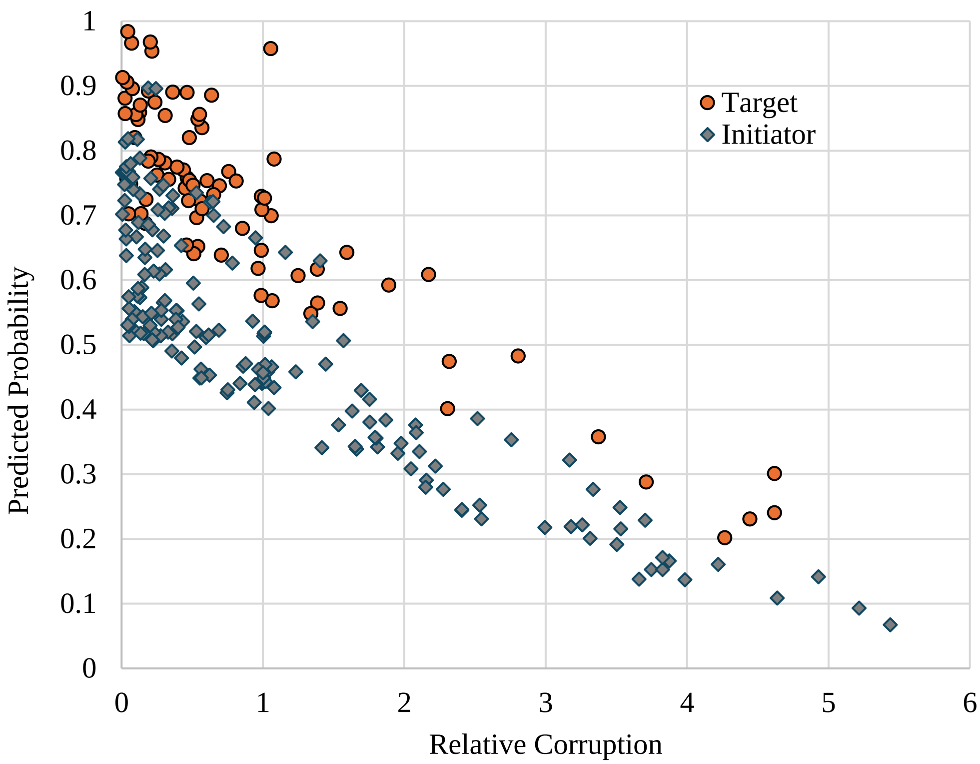
** Significant at the 0.05 level (2-tailed)
*** Significant at the 0.01 level (2-tailed).

A Hosmer and Lemeshow test contingency table, which assesses whether the observed event rates match expected event rates in subgroups of the model population, suggests Model 4 is a good fit (see Appendix 2.A-B).

Visualizing the output of Model 4 through logit outputs broken down between target and initiator underlies the connection. Logit scores (log-odds) from Model 4 indicate the natural logarithm of the odds of victory versus defeat. Higher log-odds suggests a greater likelihood of victory, while lower log-odds suggests a greater likelihood of defeat. Note the downward sloping concentration of logit scores and the grouping of initiators, which will be explored in more depth further in this article. I show the data capped at a relative corruption score of 6 to remove outliers, the unadulterated logit outputs are shown in the appendix (Appendix 3).

Figure 2

Logit Outputs for Model 4 limited to corruption ratio of 6



Plugging data into Model 4 highlights the value and significance of the model in outcome prediction. For instance, model outputs for the Crimean war (1850's) yielded a predicted logit score of -0.21 for Russia and 0.78 for Great Britain; converting logit scores to implied probabilities suggests that Russia had a 44.87% chance of losing and that Great Britain had a 68.57% chance of winning.

Two further sets of logistic regression analyses were conducted to test whether the effects of corruption were still significant after selecting for regime type and war initiation. The regression outputs and panel logit outputs (Appendices 4-5) show that relative corruption is a significant variable in every instance, though the effect is more muted among democracies. Average absolute and relative corruption scores for democracies are significantly lower than those of anocracies and autocracies (see Appendix 14). To account for Talmadge's (2015) observation that militaries under autocratic regimes are often employed and trained for use against adversaries at a domestic level, I isolated the corruption factor by running another binomial logistic regression test on a sample in which no democracies were present, leaving only wars fought by anocracies and autocracies. The outcome of the model and the relative corruption factor were statistically significant (see Appendix 7).

To support the validity of these results, I also ran binomial logistic regression tests on an adjusted dataset where belligerent states are amalgamated into dyads. The results of the regression confirm that relative or absolute corruption are significant variables in determining outcomes. The nature of the modifications and the outcomes are available in the appendix (Appendices 8-9).

4.B. War Losses

Unlike the relatively straightforward results for war outcomes, analysis of combat losses in war attributable to corruption is more nuanced. Below are the results of four negative binomial regression models split into two tables. All tests control for war outcomes. On the left of the first table (Table 4) feature proportional losses as the independent variable (as a proportion of the belligerent country's underlying total population) predicted using a ratio of corruption—the same model as Model 4 in Table 3. On the right side of the first table is a model predicting the ratio of losses (the combat losses of one country versus another) likewise using the ratio of corruption.[10]

[10] As a reminding example, the "ratio of losses" would be 1.5 for Spain and 0.66 for France for the Franco-Spanish war of 1823 in which Spain lost 600 men and France 400.

The second table (Table 5) once more predicts proportional and the ratio of losses but uses absolute corruption rather than relative corruption as an independent variable.

Table 4

*Negative binomial regression results predicting proportional losses and ratio of losses using **relative** corruption as a predictive variable.*

	Proportional Losses	**Ratio of Losses**
Outcome		
B	-12.96	-1.47***
Standard Error	1.90	0.20
Z Score	-0.63	-7.40
Initiator		
B	0.57	0.29
Standard Error	2.11	0.21
Z Score	0.27	1.40
Relative Corruption		
B	-0.89	0.21***
Standard Error	1.6	0.04
Z Score	-0.55	5.58
Polity Score		
B	-0.09	0.001
Standard Error	0.19	0.01
Z Score	-0.46	0.09
Ratio of Power		
B	-0.27	0.01
Standard Error	1.11	0.01
Z Score	-0.24	0.93
Intercept		
B	-4.59	0.18
Standard Error	2.38	0.21
Z Score	-1.93	0.85
Accuracy		
N	266	266
Log-Likelihood	-7.60	-364.23
Deviance	4.72	216.21

χ^2	$1.1x10^9$	498
Pseudo R^2	0.007	0.53

* Significant at the 0.1 level (2-tailed).
** Significant at the 0.05 level (2-tailed).
*** Significant at the 0.01 level (2-tailed).

Table 5

*Negative binomial regression results predicting proportional losses and ratio of losses using **absolute** corruption as a predictive variable.*

	Proportional Losses	**Ratio of Losses**
Outcome		
B	-0.84	-1.49***
Standard Error	1.91	0.2
Z Score	-0.44	-7.58
Initiator		
B	0.56	0.61***
Standard Error	2.08	0.21
Z Score	0.27	2.91
Absolute Corruption		
B	-0.38	2.61***
Standard Error	3.32	0.35
Z Score	-0.11	7.46
Polity Score		
B	-0.09	-0.04***
Standard Error	0.18	0.01
Z Score	-0.51	-3.02
Ratio of Power		
B	-0.46	0.03***
Standard Error	1.33	0.01
Z Score	-0.34	3.14
Intercept		
B	-5.16**	-0.98***
Standard Error	2.56	0.28
Z Score	-2.02	-3.51

Accuracy		
N	266	266
Log-Likelihood	-7.90	-368.29
Deviance	5.33	224.33
χ^2	8.47×10^9	6.84×10^2
Pseudo R^2	0.004	0.52

* Significant at the 0.1 level (2-tailed).
** Significant at the 0.05 level (2-tailed).
*** Significant at the 0.01 level (2-tailed).

There does not appear to be any significant relationship for any independent variable or model when it comes to predicting proportional losses.[11]

Turning to the ratio of losses however, the models become relatively accurate and the contribution of corruption is highly significant. The R^2, χ^2, and large Log-Likelihood scores suggest a reasonably good fit. Both relative and absolute corruption appear to be strong predictors of relative losses. Both corruption variables have relatively small standard errors and high betas.[12]

Across both tables, the only significant factor with a similar impact magnitude on loss ratios is what country won the war. Positive beta values for corruption variables suggest a positive relationship - as corruption increases, the relative ratio of losses increases as well. The results suggest that for each one unit increase in ***relative*** corruption, the expected log count of losses as a ratio increases by 0.21 - holding all other variables constant. In other words, $e^{0.21} = 1.23$; the relative ratio of losses is expected to increase by a factor of 1.23 holding all other variables constant. For each one unit increase in ***absolute*** corruption, the expected log count of losses as a ratio increases by 2.6. Since absolute corruption ranges from 0 to 1 in our data, it makes more sense to interpret these variables within

[11] To confirm this result, I also ran two binomial regression analyses in which I labeled the dyad that had lost larger numbers of troops (absolute losses) and greater proportional losses (relative to total underlying population) as 0 or 1, where 1 noted which party suffered greater losses. I ran the regressions on the modified War Outcome dataset noted in Appendix 8, and found no significant outcome using this approach either.
[12] Negative Binomial Regression uses logarithmic transformation. The beta coefficient represents the change in the logarithm of the expected count of the dependent variable.

this context. A 0.3 unit increase in absolute corruption from, say 0.5 to 0.8, would lead to an increase in the ratio of losses of $e^{2.6x0.3}$ = 2.18, holding all else constant.

I confirmed these results by running two further negative binomial regressions on the modified sample noted at the end of Part 4.A. and discussed in Appendix 8. The tests reflect the same pattern: both relative and absolute corruption are significant predictors of relative ratios of combat losses. See Appendix 11 for those results.

5. Discussion

Returning to the initial hypotheses presented in Part 2 of this paper, the results suggest that corruption is an important factor in conflicts and their outcomes. More corrupt countries appear more likely to lose wars; both the relative and absolute level of corruption negatively affect the relative ratio of losses but not proportional losses.

Corruption's factor weight and statistical significance tends to be greater than many other factors identified in the literature on war outcomes. A country suffering from more corruption is more likely to be affected by corruption's nefarious effects if it engages in an interstate war. This observation is particularly important given that autocratic and anocratic regimes are more likely to begin wars, and these countries are in turn more likely to suffer from corruption than democracies (see Appendix 14). These states should beware, for failed military interventions can lead to regime change (de Mesquita, 1992; Frantz 2014). Historically, most extractive regimes aiming to conquer more territory ruin their economies (Kimenyi & Mbaku, 1995; Long & Shleifer 1993). In contrast, democracies are more likely to begin wars when they think they can win (Reiter & Stam, 1998B); democracies are also richer and less affected by corruption when they do engage in war, providing additional evidence that the very nature of democracy is intertwined with institutions that may combat corruption, or that more corrupt countries are not truly democratic (Kolstad & Wiig, 2011).

Conclusion

This initial study of corruption's impact on interstate wars strongly suggests that relative and absolute levels of corruption greatly affect conflict outcomes. Confirming this observation will require additional research. Compilations of case studies very clearly linking levels of corruption with negative outcomes in wars, and casualties would create a valuable "ground up" perspective on the same material. Noting whether the statistical pattern holds on battles as well as wars would likewise substantiate the causal relationship—initial tests using the Interstate War Battles dataset (details in Appendix 13) suggest increases in relative corruption reduce probability of victory in battles. Performing tests on different data sets—such as the Historical Evaluation and Research Organization,[13] Project Mars (Lyall, 2020), V-Dem (to demarcate regime type instead of corruption levels), the Corruptions Perception Index and World Bank Governance Indicators (as other representations of corruption), Clodfelder's (2017) encyclopedia of casualties, the UCDP Armed Conflict and PRIO Battle Deaths Datasets (Brosché & Sundberg 2023; Lacina & Gleditsch 2005), and a modified CDB90 dataset as used by Grauer & Horowitz (2012) to study battle outcomes—would be good tests of how robust corruption is as an explanatory variable. Corruption's effects should also be clear over cross sectional studies. I recommend a study be performed on non-interstate wars as well, for I expect corruption to have deleterious effects on state capabilities when states are not fighting each other, including intrastate wars.

Public defense is one of the primary public goods modern states provide; waging war is inextricably tied to the purpose of states, both in the modern and pre-modern eras.[14] One of the key takeaways of this study, assuming the conclusions are robust, is that corruption seriously affects the ability of a state to effectively win wars. Not only should this study reinforce calls to action to combat corruption, it specifically implies that regimes upheld through corrupt means, especially autocracies and anocracies, are the most exposed to the nefarious effects of corruption once they enter a conflict. Saddam Hussein should perhaps have been more sanguine about avoiding a war with coalition forces in the 90's; Nicolas Maduro might avoid careening into an invasion of Guyana if it pulls in third parties. Saber rattling may be a valuable signal, but corrupt regimes should be hesitant about beginning wars they are unlikely to win.

[13] Used by Biddle and Long (2004).

[14] Indeed the purpose of the state is inextricably tied with waging war. For instance, Weber (1946, 77) notes that the state force is a means specific to the state, that the state has an 'especially intimate' relationship with violence to claim the monopoly on the legitimate use of physical force. Alternatively, Tilly (1985) argues that state making and war risking could be considered legitimate protection rackets that depend on violence. See also Bayly 2004, 100-10, 248; Eloranta 2005; Brauer and van Tuyll 2008; Lacey 2015.

Appendices

Appendix A: War Outcomes

Table A1

Binomial logistic regression results using absolute corruption in lieu of relative corruption to predict war outcomes.

Variables	**Results**
Initiator	
B	-0.81***
Standard Error	0.30
Exp (B)	0.44
Polity Score	
B	0.05**
Standard Error	0.02
Exp (B)	1.05
Relative Power	
B	0.002
Standard Error	0.02
Exp (B)	1.00
Absolute Corruption	
B	-1.95***
Standard Error	0.55
Exp (B)	0.14
Constant	
B	2.49***
Standard Error	0.61
Exp (B)	12.02
Model Accuracy	
Predicted % Correct	66.8
$\chi 2$	42.82***
Cox & Snell R^2	0.15
Nagelkerke R^2	0.19
N	274

* Significant at the 0.1 level (2-tailed).
** Significant at the 0.05 level (2-tailed).

*** Significant at the 0.01 level (2-tailed).

Table A2

Hosmer and Lemeshow Test - Model 4 of War Outcomes.

Chi-square	Degrees of Freedom	Significance
4.728	8	0.79

Table A3

Contingency Table for Hosmer and Lemeshow Test of Model 4 of War Outcomes.

Decile	Outcome = Defeat		Outcome = Victory		Total
	Observed	Expected	Observed	Expected	
1	24	23.08	3	3.92	27
2	20	18.57	7	8.43	27
3	14	15.43	13	11.57	27
4	12	13.48	15	13.52	27
5	11	12.30	16	14.70	27
6	10	10.49	17	16.51	27
7	12	8.57	15	18.44	27
8	8	7.09	19	19.91	27
9	4	6.20	23	20.80	27
10	4	3.80	27	27.21	31

Figure A1

Logit Outputs for Model 4 of the War Outcomes section—war initiator versus targets of war declarations are marked.

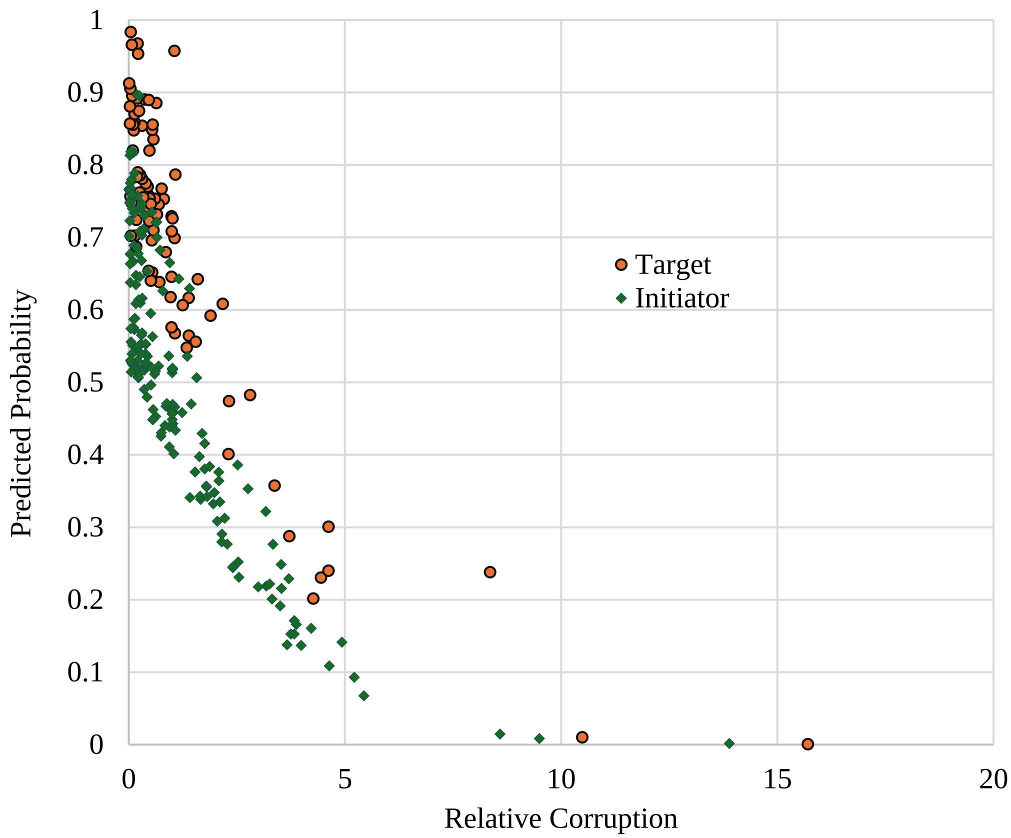


Table A4

War outcomes selected by regime type.

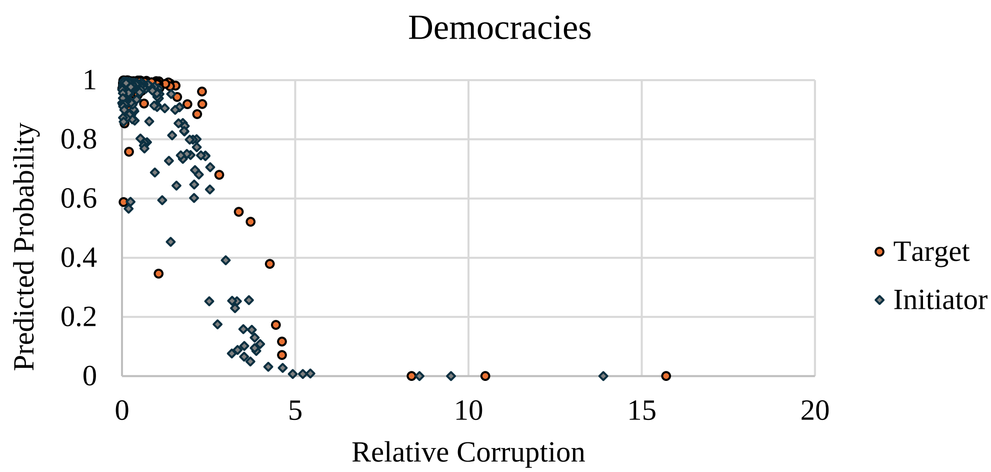
Variables	**Democracy**	**Anocracy**	**Autocracy**
Polity Score			
B	-0.15	0.00	-0.06
Standard Error	0.35	0.06	0.23
Significance	0.66	0.99	0.80
Exp (B)	0.86	1.00	0.95

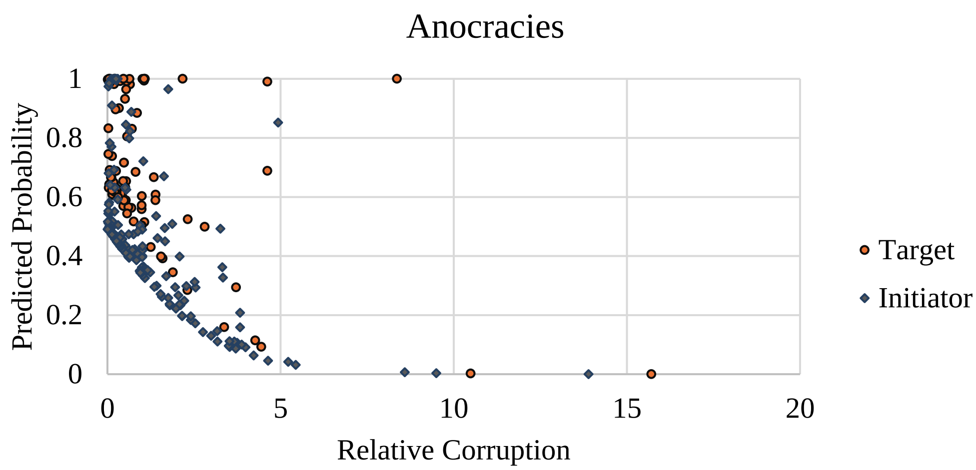
Relative Power			
B	-0.06**	0.39***	0.07**
Standard Error	0.03	0.14	0.03
Exp (B)	0.95	1.48	1.07
Initiator			
B	-1.8	-0.55	-0.6
Standard Error	1.32	0.44	0.61
Significance	0.17	0.21	0.33
Exp (B)	0.17	0.58	0.55
Relative Corruption			
B	-1.80*	-0.65***	-0.74***
Standard Error	1.04	0.21	0.26
Exp (B)	0.17	0.52	0.48
Constant			
B	5.84*	0.52	0.65
Standard Error	3.55	0.41	2.12
Exp (B)	342.84	1.68	1.91
Model Accuracy			
$\chi 2$	8.28*	30.02***	18.73***
Cox & Snell R^2	0.12	0.21	0.21
Nagelkerke R^2	0.23	0.27	0.28
N	64	131	79

* Significant at the 0.1 level (2-tailed).
** Significant at the 0.05 level (2-tailed).
*** Significant at the 0.01 level (2-tailed).

Figure A2

Panel of logit outputs for Model 4 selected by regime types.


Democracies
Predicted Probability
1
0.8
0.6
0.4
0.2
0
0
5
10
15
20
Relative Corruption
Target
Initiator


Anocracies
Predicted Probability
1
0.8
0.6
0.4
0.2
0
0
5
10
15
20
Relative Corruption
Target
Initiator

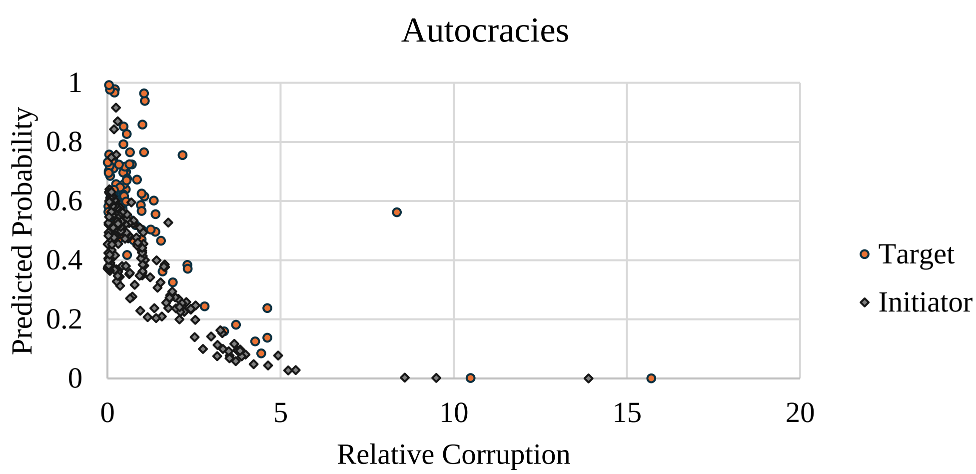

Autocracies
Predicted Probability
1
0.8
0.6
0.4
0.2
0
0
5
10
15
20
Relative Corruption
Target
Initiator

Table A5

War outcomes selected by initiator versus target.

Variables	**Initiator**	**Target**
Polity Score		
B	0.07**	0.04
Standard Error	0.03	0.04
Exp (B)	1.07	1.04
Relative Power		
B	-0.03	0.04
Standard Error	0.03	0.02
Exp (B)	0.97	1.04
Relative Corruption		
B	-0.78***	-0.31*
Standard Error	0.18	0.18
Exp (B)	0.46	0.74
Constant		
B	0.98***	1.04***
Standard Error	0.24	0.31
Exp (B)	2.65	2.83
Model Accuracy		
$\chi 2$	45.84***	11.32***
Cox & Snell R^2	0.23	0.12
Nagelkerke R^2	0.29	0.17
N	186	88

* Significant at the 0.1 level (2-tailed).
** Significant at the 0.05 level (2-tailed).
*** Significant at the 0.01 level (2-tailed).

Table A6

*Binomial logistic regression results on a sample in which all conflicts involving any democracy has been removed, thereby fully controlling for the possible impact of democracy, leaving 117 observations in 45 unique wars***.**

Variables	**Results**

Initiator	
B	1.34***
Standard Error	0.45
Exp (B)	0.26
Polity Score	
B	-0.02
Standard Error	0.06
Exp (B)	1.02
Relative Power	
B	0.12*
Standard Error	0.06
Exp (B)	0.89
Relative Corruption	
B	-0.31**
Standard Error	0.16
Exp (B)	1.36
Constant	
B	-0.43
Standard Error	0.42
Exp (B)	1.53
Model Accuracy	
Predicted % Correct	70.09
$\chi2$	26.75***
Cox & Snell R^2	0.20
Nagelkerke R^2	0.27
N	117

* Significant at the 0.1 level (2-tailed).
** Significant at the 0.05 level (2-tailed).
*** Significant at the 0.01 level (2-tailed).

Table A7

Modified Dataset Adjustment and Summary Statistics.

Keeping all countries as separate entities in our war outcome dataset might be seen as artificially inflating the sample. I therefore create a consolidated dataset.

For every conflict, I grouped belligerents by their side. I then averaged whether their side initiated the conflict, summed the total battle deaths, averaged the proportional battle deaths, averaged the relative corruption, averaged the Polity score, and summed the CINC score for each side.

Variable	**Mean**	**Median**	**Std. Dev**	**N**
Initiator	1.56	1.94	0.47	154
Outcome	0.5	0.5	0.5	154
Proportional Losses	0.005	0.0002	0.04	152
Ratio of Losses	2.87	1	10.71	152
Absolute Corruption	0.43	0.39	0.26	154
Relative Corruption	1.71	1.0	2.24	154
Polity Score	-2.09	-4	5.91	154
Relative Power	6.70	1.0	16.12	154

Table A8

Binomial Regression Result Predicting War Outcomes on Adjusted Dataset (from Appendix 3), using the same variables as Model 4 in Part 4 of this paper.

Variables	***Results***
Polity Score	
B	0.03
Standard Error	0.03
Exp (B)	1.03
Relative Power	
B	0.04**
Standard Error	0.02
Exp (B)	1.04
Relative Corruption	
B	-0.62***
Standard Error	0.19
Exp (B)	0.54
Initiator	
B	-1.4***

Standard Error	0.41
Exp (B)	0.25
Constant	
B	2.94***
Standard Error	0.71
Exp (B)	18.87
Accuracy	
χ2	47.85***
Cox & Snell R^2	0.27
Nagelkerke R^2	0.36
N	154

* Significant at the 0.1 level (2-tailed).
** Significant at the 0.05 level (2-tailed).
*** Significant at the 0.01 level (2-tailed).

The outcome of running the binomial regression analysis on this consolidated sample is broadly aligned with the results for Model 4 of the war outcomes model.

Appendix B: Combat Losses

Table B1

Combat Losses using multiple linear regression analysis.

Variables	**Model 1 (Proportional Losses)**	**Model 2 (Ratio of Losses)**	**Model 1 (Proportional Losses)**	**Model 2 (Ratio of Losses)**
Polity Score				
B	0.0	-0.05	0.0	-0.08
Standard Error	0.0	0.07	0.0	0.07
T-Score	-1.35	-0.77	-1.27	-1.08
Relative Power				
B	0.0	-0.06	0.0	-0.004
Standard Error	0.0	0.06	0.0	0.06
T-Score	-0.001	-1.08	-0.21	-0.06

Relative Corruption				
B	-0.002	1.81***	-	-
Standard Error	0.001	0.25	-	-
T-Score	-1.45	7.23	-	-
Absolute Corruption				
B	-	-	-0.003	3.75*
Standard Error	-	-	0.008	1.92
T-Score	-	-	-0.36	1.95
Initiator				
B	0.001	1.05	0.001	0.95
Standard Error	0.005	1.02	0.004	1.11
T-Score	0.28	1.02	0.30	0.85
Outcome				
B	-0.006	-0.42	-0.005	-2.03
Standard Error	0.004	0.97	0.004	1.05
T-Score	-1.55	-0.43	-1.20	-1.94
Constant				
B	0.009	-1.03	0.008	0.55
Standard Error	0.005	1.15	0.006	1.48
T-Score	1.79	-0.89	1.23	0.37
Model Accuracy				
N	266	266	266	266
Multiple R^2	0.14	0.44	0.11	0.22
Adjusted R^2	0.001	0.19	-0.01	0.03
Std. Error of the Estimate	0.03	0.18	0.03	8.07
ANOVA F-Test	1.07	12.54***	0.67	2.54**

* Significant at the 0.1 level (2-tailed).
** Significant at the 0.05 level (2-tailed).
*** Significant at the 0.01 level (2-tailed).

Table B2:

Negative binomial regressions predicting ratio of losses using the modified data presented in Appendix 8.

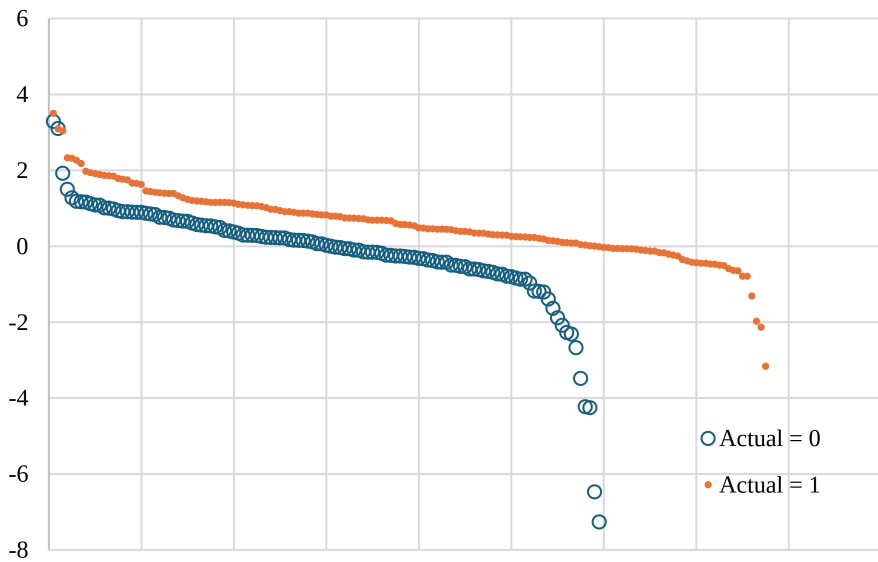
Negative Binomial Regression Results

Variables	Absolute Corruption	Relative Corruption
Outcome		
B	-1.28***	-1.01***
Standard Error	0.24	0.24
Z Score	-5.42	-4.12
Initiator		
B	0.35	0.095
Standard Error	0.24	0.24
Z Score	1.49	0.39
Absolute Corruption		
B	1.84***	-
Standard Error	0.45	-
Z Score	4.12	-
Significance	0	-
Relative Corruption		
B	-	0.22***
Standard Error	-	0.04
Z Score	-	5.21
Significance	-	0
Polity Score		
B	0.03	-0.02
Standard Error	0.02	0.02
Z Score	1.53	-1.25
Significance	0.13	0.21
Ratio of Power		
B	0.01	-0.002
Standard Error	0.01	0.01
Z Score	1.39	-0.19
Significance	0.16	0.85
Intercept		
B	0.08	0.45
Standard Error	0.49	0.47
Z Score	-0.16	0.96
Significance	0.87	0.34
Accuracy		
N	152	152

Log-Likelihood	-292.89	-276.3
Deviance	122.53	89.36
χ2	387	151
Pseudo R^2	0.43	0.54

Figure B1

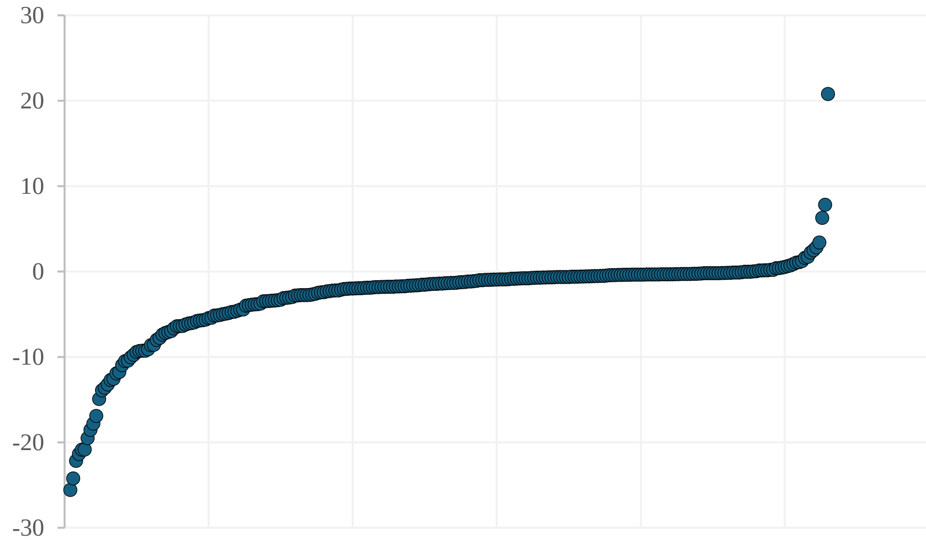
War Outcomes: Predicted Values.



Predicted values from applying Model 4 from Section 4.A. to the underlying data, noting if the actual result was a 0 or 1.

Figure B2

Ratio of Losses: Predicted Values.



Predicted values from applying the negative binomial regression model using relative corruption as the independent variable to predict ratio of losses (not absolute corruption—though the predicted values were very similar), whose results are showcased in Table 6, Section 4.C.

Appendix C: Battle Outcomes

Using the Interstate War Battles (IWB) dataset (Min, 2000) to roughly test whether relative corruption affects battle outcomes suggests a 1-point increase in relative corruption is associated with a 4% reduction in probability of victory, with increasing impact the more corruption is present. The battles listed in this dataset are from the same set of conflicts available in the CoW dataset with the addition of two (the 1950 China–Taiwan Islands War and the 1984 China–Vietnam War); 97 conflicts are represented through 1,708 battles ranging from 1823 to 2003. The IWB dataset captures clashes at a specific time and location between organized state-level forces over a contested strategic objective. I code defeats with 0s and victories with 1 and split each row so that the outcome for each battle is recorded as an individual entry to match the structure of the CoW dataset. I had to transform a certain number of points in the dataset because they sometimes inappropriately included coalition forces as co-belligerents. Otherwise, I create a simple average of the corruption scores of each relevant country. My control variables were a country's Polity2 score (to proxy leadership quality), their CINC score (to proxy material and technological strength), and whether they were the initiator or target in the battle. No tactical controls are used because they would be confounded with the effects of corruption. When a coalition fights a battle, their CINC score is summed and a ratio is developed (to compare underlying belligerent strength), and their corruption and Polity2 scores are averaged. I run and show the results of binomial regression tests predicting battle outcomes in this Appendix.

Table C1

Summary Statistics for Battle Outcomes.

Variable	**Mean**	**Median**	**Std. Dev**	**N**
Initiator	0.50	0.50	0.50	3259
Relative Corruption	2.71	1	4.69	3259
Relative Power	1	1	19.82	3259
Regime Type	-0.85	-1	6.90	3259

Table C2

Correlation Matrix for Variables Associated with Battle Outcomes.

Variables	**Initiator**	**Relative Corruption**	**Relative Power**	**Polity Score**
Initiator	1	-	-	-
Relative Corruption	-.17	1	-	-
Relative Power	.13	-.05	1	-
Polity Score	.16	-.28	.05	1

Table C3

Summary Table of Binomial Regression Analysis Predicting Battle Outcomes.

Variables	**Model 1**	**Model 2**	**Model 3**
Polity Score			

B	0.03***	-	0.02***
Standard Error	0.01	-	0.01
Exp (B)	1.03	-	1.02
Relative Power			
B	0.001	-	0.001
Standard Error	0.002	-	0.002
Exp (B)	1.00	-	1.00
Initiator			
B	1.65***	-	1.61***
Standard Error	0.08	-	0.08
Exp (B)	5.20	-	5.02
Relative Corruption			
B	-	-0.75***	-0.04***
Standard Error	-	0.01	0.01
Exp (B)	-	0.93	0.96
Constant			
B	-0.80***	0.19***	-0.69***
Standard Error	0.06	0.04	0.06
Exp (B)	0.45	1.21	0.50
Accuracy			
$\chi2$	572.13***	85.64***	591.30***
Cox & Snell R^2	0.16	0.03	0.17
Nagelkerke R^2	0.23	0.04	0.22
N	3259	3259	3259

*** Significant at the 0.01 level (2-tailed).

Figure C1

Logit Outputs for Battlefield Outcomes.

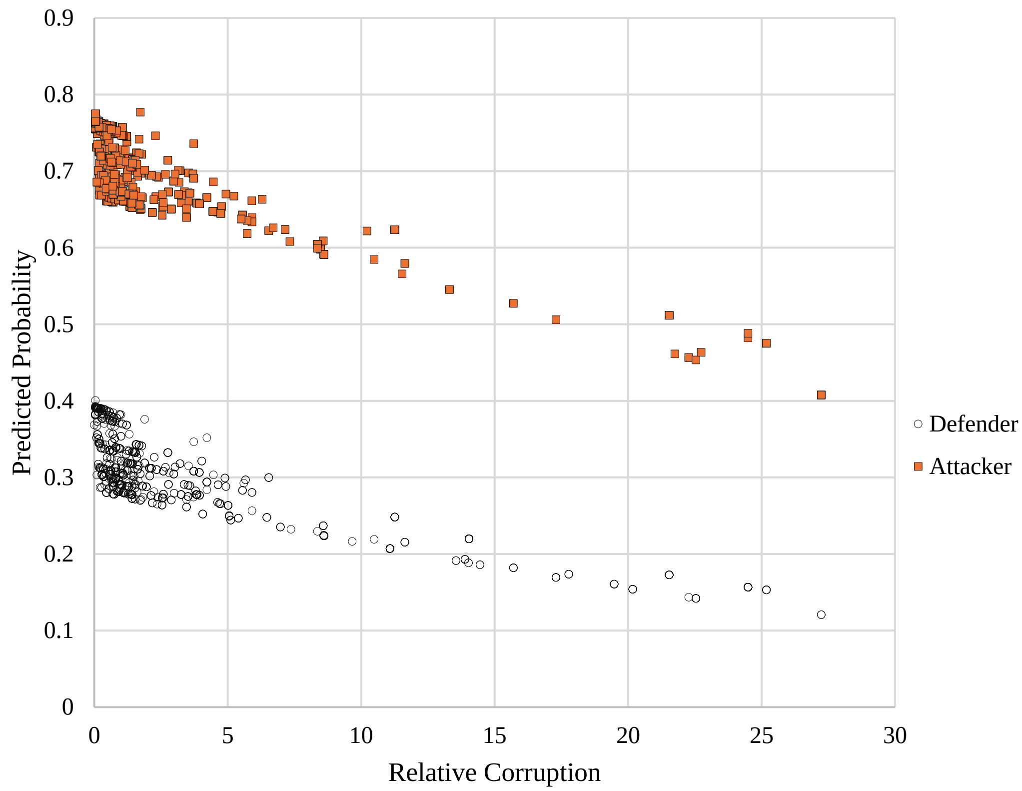
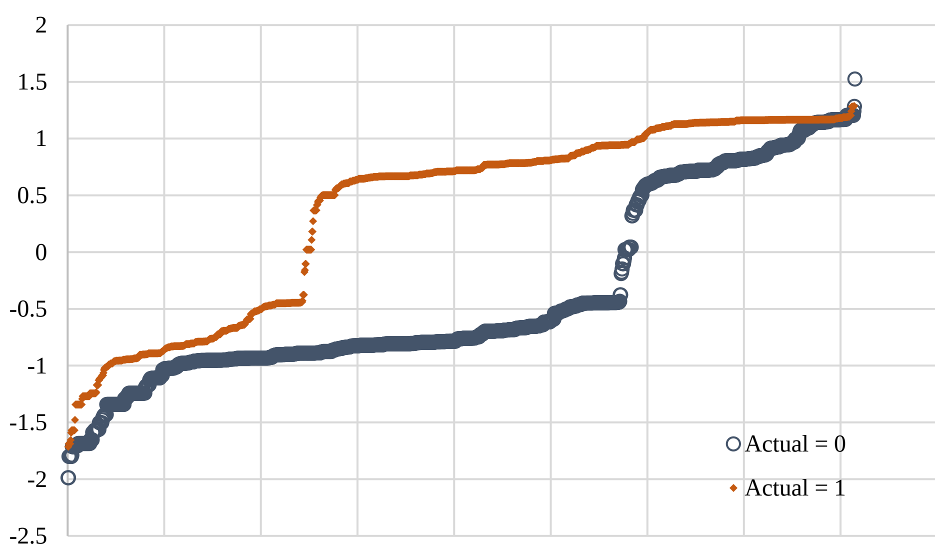


Figure C2

Logit Outputs for Battlefield Outcomes.



Regime comparison of corruption

I showcase the results for two series of Mann-Whitney and Wilcoxon Rank tests to explore whether there are significant difference between regime corruption scores. Along with the scatter plots of scores, these tests suggest significant differences for the absolute and relative corruption scores of democracies compared to anocracies and autocracies, but relatively muted differences between anocracies and autocracies.

Figure C3

Time series scatter plot of absolute corruption scores by regime type with regression lines

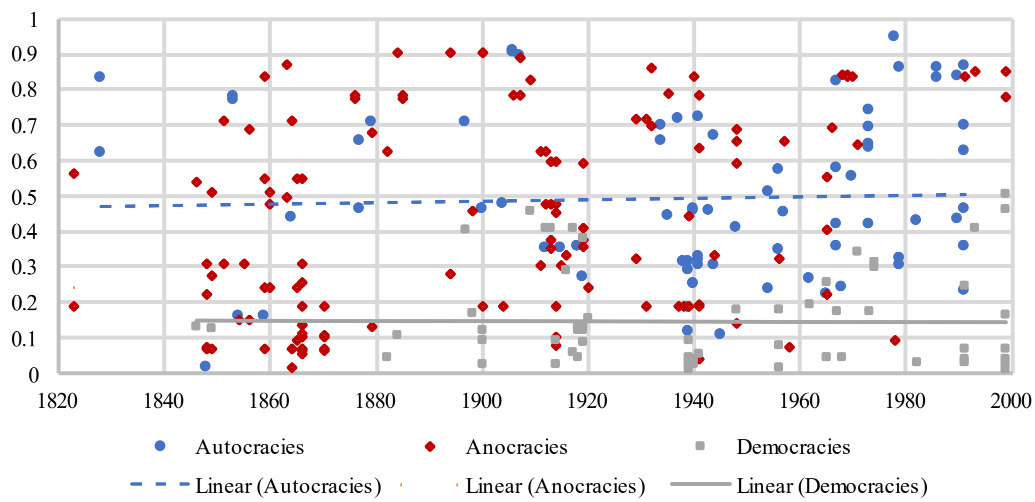
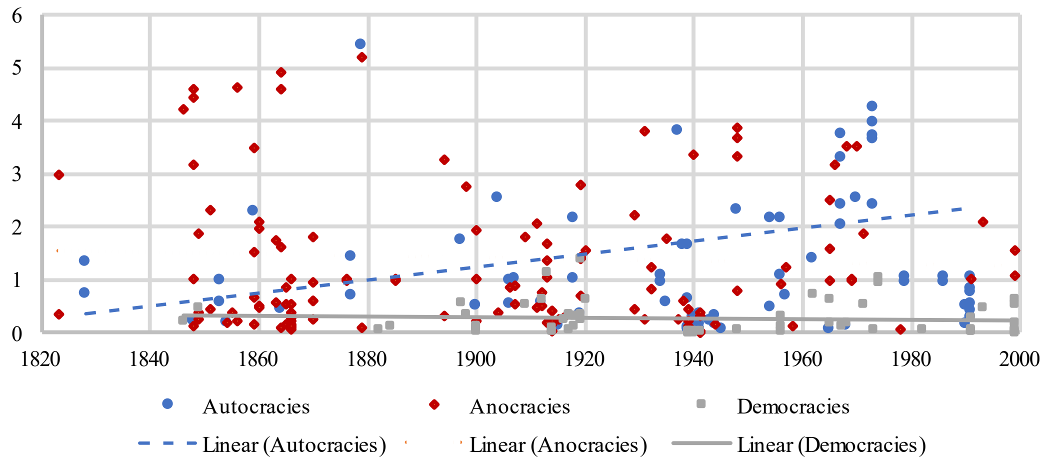


Figure C4

Time series scatter plot of absolute corruption scores by regime type with regression lines



To run the Wilcoxon Rank test, I divided the sample dataset into 10 "buckets" by 18-year intervals, averaged the absolute and relative corruption score for each regime type within that 18 year interval, and compared these buckets to each other.

Table C4

Absolute corruption score by regime type and temporal intervals

Bucket	Autocracies	Anocracies	Democracies
1820-1838	0.72	0.38	-
1838-1856	0.43	0.28	0.13
1856-1874	0.30	0.27	-
1874-1892	0.61	0.68	0.08
1892-1910	0.69	0.64	0.21
1910-1928	0.34	0.40	0.18
1928-1946	0.39	0.44	0.04
1946-1964	0.40	0.45	0.13
1964-1982	0.55	0.60	0.19
1982-2000	0.60	0.83	0.14

Table C5

Relative corruption scores by regime type and temporal intervals

Bucket	Autocracies	Anocracies	Democracies
1820-1838	1.04	1.66	-
1838-1856	0.49	1.80	0.35
1856-1874	1.37	1.08	-
1874-1892	2.52	3.97	0.09
1892-1910	1.12	1.27	0.29
1910-1928	0.85	0.85	0.39
1928-1946	0.95	0.87	0.02
1946-1964	1.46	2.00	0.25
1964-1982	3.39	1.93	0.44
1982-2000	2.03	1.43	0.17

Table C6

Wilcoxon rank test results comparing temporally segmented, regime specified buckets for absolute and relative corruption scores

Comparison: absolute corruption	
Autocracy to Anocracy	
Test Statistic	21
N	10
Anocracy to Democracy	
Test Statistic	0***
N	8
Autocracy to Democracy	
Test Statistic	0***
N	8

Comparison: relative corruption	
Autocracy to Anocracy	
Test Statistic	22
N	10
Anocracy to Democracy	
Test Statistic	0***
N	8
Autocracy to Democracy	
Test Statistic	0***
N	8

*Where *** indicates significance at the 0.01 level.*

Table C7

Mann-Whitney tests comparing absolute corruption scores by regime types

Comparison: Autocracy to Anocracy				
Ranks	Group	N	Mean Rank	Sum of Ranks
	Autocracy	79	116.5	9200.5
	Anocracy	131	98.9	12954.5
	Total	210		
Test Stats	Mann-Whitney U	4308.5		
	Z Score	-2.0		
	P-Value (1-Tailed)	0.021		

Comparison: Democracy to Autocracy				
Ranks	Group	N	Mean Rank	Sum of Ranks
	Autocracy	79	97.6	7712.0
	Democracy	64	40.4	2584.0
	Total	143		
Test Stats	Mann-Whitney U	504.0		
	Z Score	-8.2		
	P-Value (1-Tailed)	0.000		

Comparison: Anocracy to Democracy				
Ranks	Group	N	Mean Rank	Sum of Ranks
	Anocracy	131	117.9	15449.5
	Democracy	64	57.2	3660.5
	Total	195		
Test Stats	Mann-Whitney U	1575.0		
	Z Score	-7.1		
	P-Value (1-Tailed)	0.000		

Table C8

Mann Whitney tests comparing relative corruption scores by regime types

Comparison: Autocracy to Anocracy				
Ranks	Group	N	Mean Rank	Sum of Ranks
	Autocracy	79	107.9	8521.5

	Anocracy	131	104.1	13633.5
	Total	210		
Test Stats	Mann-Whitney U	4987.5		
	Z Score	-0.4		
	P-Value (1-Tailed)	0.331		

Comparison: Democracy to Autocracy				
Ranks	Group	N	Mean Rank	Sum of Ranks
	Autocracy	79	92.8	7329.0
	Democracy	64	46.4	2967.0
	Total	143		
Test Stats	Mann-Whitney U	887.0		
	Z Score	-6.7		
	P-Value (1-Tailed)	0.000		

Comparison: Anocracy to Democracy				
Ranks	Group	N	Mean Rank	Sum of Ranks
	Anocracy	131	118.0	15455.0
	Democracy	64	57.1	3655.0
	Total	195		
Test Stats	Mann-Whitney U	1575.0		
	Z Score	-7.1		
	P-Value (1-Tailed)	0.000		

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