VICTORY AS A SERVICE (VaaS): AN ANALYSIS OF US AID TO UKRAINE AND ITS EFFECTIVENESS IN PRODUCING RUSSIAN PERSONNEL LOSSES, PREVENTING UKRAINIAN CIVILIAN DEATHS, AND RECAPTURING OCCUPIED TERRITORY

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Abstract

What effect does aid to Ukraine have on battlefield success against the Russians? Are the billions of dollars in military aid and financial assistance sent by the United States substantially contributing to the factors that lead to victory? The provision of aid to Ukraine has been a complex and contentious issue, with strongly differing perspectives on both sides. In order to better understand the relationship between US aid and positive effects on the war effort, this study uses detailed information on aid to Ukraine along with estimates of Russian soldiers killed in action (KIA), Ukrainian civilians killed, and territorial gains and losses of the Russian occupation in order to quantify the relationship between these variables. Utilizing OLS regression techniques, this research finds a statistically significant relationship between total cumulative US aid and promoting both Russian KIA and territorial losses to the occupation, as well as a slightly weaker relationship to reducing Ukrainian civilian deaths. The findings demonstrate that even in stalemate conditions, US aid has a positive effect on the trajectory towards victory. As policymakers, warfighters, and the broader American citizenry grapple with decisions and opinions regarding foreign assistance to allies, this research provides a data-driven understanding of the impact of US aid, and is of great importance as we risk entering a historical era of increased competition, conflict, and war.

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1.0 Introduction

The ongoing conflict in Ukraine has captured global attention and raised significant questions about the role of external actors, particularly the United States, in providing support to Ukraine. The goal of this study is to investigate the relationship between US aid to the war in Ukraine and the promotion of factors that contribute to victory- specifically, Russian battlefield losses in terms of personnel, the reduction of Ukrainian civilian deaths, and the recapture of occupied territory. By achieving a better understanding of the effect of US aid on each of these factors, policymakers, warfighters, and US Citizens alike can make more informed decisions and support their views from a position of fact. This research question is of paramount importance in understanding the dynamics of the conflict and its broader implications for future US efforts of a similar nature.

1.1 Neo-Soviet Aggression and Violent Expansionism at the Edge of NATO

The ongoing Russian pursuit of violent expansionism along the edges of NATO and neighboring regions has been a source of concern for international security. This behavior is deeply rooted in historical and geopolitical context, often characterized by Russia's efforts to maintain influence and territorial control over what it sees as its rightful fiefdom. In order to lay the foundation for the following analysis, we must understand the frame of mind that drives such decision-making and the historical context of the Russian invasion of Ukraine.

The framework for this worldview is largely provided by Aleksander Dugin, an influential thinker among Russians, and outlined in his book “Foundations of Geopolitics.” Dugin’s primary vision is to replace the unipolar world he sees as dominated by Western hegemony with a multipolar one consisting of unified "Atlantic" and "Eurasian" societies competing for dominance. Naturally, Dugin sees Russia as the leader of the Eurasian pole and the United States as the leader of the Atlantic pole. He makes the case for a Russian-controlled sphere of influence in the former Soviet Union, which he refers to as a “zone of special privilege.” In order to bring this dream to reality, Dugin proposes several lines of effort, including information operations designed to sow subversion in “Atlanticist” societies, regional destabilization

campaigns to shake the West's grip globally, and asymmetric, or hybrid warfare operations led by the Russian special services. A substantial component of this proposed strategy is the use of gas diplomacy to deliver a "carrot and stick" approach to coerce the targets of Russia's policies to bend to its will. A lesser, though more alarming, component includes the use of what Dugin calls "Special Military Operations" to conquer nations of the former Soviet Union by conventional military force. "Foundations of Geopolitics" has been used as a textbook in the Russian Armed Forces Academy of the General Staff, as well as many other levels of the Russian military. It is impossible to understate the importance of Dugin's work when seeking to understand the goals and motivations of Russian behavior on the world stage, specifically its actions in Ukraine.[1]

There are several historical examples of putting this theory into practice through Russian military aggression, led by Vladimir Putin, as part of an ongoing campaign to restore a new vision of the former Soviet superpower. During the 1990s, Russia waged brutal wars in Chechnya, seeking to suppress Chechen separatism. The excessive use of force and human rights abuses perpetrated by the Russian Armed Forces in the Caucuses demonstrated Moscow's willingness to use suffering and humanitarian atrocities to maintain control over restive regions. Russia was successful in dominating the Chechens, and the hostilities ended when the largest separatist faction, under the leadership of then-30-year-old Ramzan Kadyrov, pledged fealty to Putin.[2]

The series of conflicts that followed included a war with Georgia in 2008 that was successful in capturing South Ossetia and Abkhazia, the 2014 annexation of Crimea, and the ongoing, current conflict in Ukraine. This conflict epitomizes Russia's use of human rights violations and undisciplined aggression to pursue its goal of recreating the false memory of Soviet glory through territorial conquest. Moscow's

[1] Aleksander Dugin, "Foundations of Geopolitics," (Moscow, Russia: Arktogeja, 1997), https://agdugintranslate.gitbook.io/foundations-of-geopolitics/.
[2] John Russell, "Kadyrov's Chechnya- Template, Test or Trouble for Russia's Regional Policy?." Russian Regional Politics under Putin and Medvedev, pp. 149-168. Routledge, 2014.

desire to maintain control over Ukraine and prevent its alignment with Western institutions like NATO and the EU has resulted in a protracted and violent struggle that continues to this day.[3]

Russia's tactics in Ukraine have raised concerns about its ambitions in neighboring regions as well. The use of Belarus as an intermediate staging base (ISB) to deploy troops from as well as stage attacks, in combination with the subservience of Belarusian President Aleksandr Lukashenko, represents the bloodless defeat of the nation, and a win for the neo-Soviets. The possibility of defeating Ukraine and subsequently pursuing a similar course of action in Moldova, specifically emerging from Russian-occupied Transdniester, is a worrisome prospect. Continued unchecked expansion will lead to further attempts to absorb former Soviet territories into the Russian Federation by force, threatening Europe.[4]

Russia's expansionist ambitions are not limited to the former Soviet Union either- Russia has displayed an increased willingness to project force beyond its "zone of special privilege." Its military involvement in Syria, supporting the Assad regime, and its presence in the Central African Republic highlight Moscow's efforts to expand its global footprint and challenge Western interests, and are marked with Russia's signature use of human rights atrocities in an attempt to break down their enemies.[5]

To counter this pattern of aggression and prevent further escalation, the international community, led by the United States, must respond to the invasion of Ukraine with a coordinated effort. Military aid to Ukraine is a crucial component of this response, providing support to resist external aggression and reinforcing Ukraine's territorial sovereignty to deter further advances. A well-strategized comprehensive aid package that includes both financial assistance and military aid can strengthen Ukraine's ability to defend its sovereignty, serving as a deterrent against potential future aggression in the region. This approach aligns with the global imperative to promote stability, security, and adherence to international norms in the face of Russian aggression.

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[3] Samuel Charap et al., "Russia's Military Interventions," RAND Corporation, 2021. 75.
[4] Andrew Higgins, "Once He Kept Russia at a Distance- Now He Is a Docile Putin Satrap." International New York Times (22 Feb 2022): n.p.
[5] Hasan Selim Ozertem, "Russia Rising. Putin's Foreign Policy in the Middle East and North Africa: Dimitar Bechev, Nicu Popescu & Stanislav Secrieru (eds), London & New York, NY: IB Tauris, 2021, x+ 214pp." (2023): 1588-1590.

1.2 Hypothesis

While US aid produced well-publicized, spectacular effects during the early phases of the war in Ukraine, the effects of aid in the current stalemate condition of the conflict are reduced overall. This is especially true concerning the recapture of territory, which this research will quantify. By additionally calculating the effects of US aid on Russian service members killed in action (KIA), as well as the effect on preventing civilian deaths, we can determine the efficacy of American support in contributing to Ukrainian victory.

It is the author's hypothesis that within the unique environment of the Ukrainian conflict, US aid has been producing statistically significant positive effects that contribute to victory, and it is critically important to continue through to Russian defeat and withdrawal. This necessary outcome will have wide-reaching effects on the future of the region and global stability as we risk entering a historical era of increased competition, conflict, and war.

2.0 Literature Review

The following section of this research paper serves as a comprehensive exploration of the existing knowledge landscape surrounding the conflict in Ukraine, with a particular focus on the role of US aid, the theoretical framework of proxy war, and factors contributing to victory in war. This review aims to distill what is currently known and identify gaps in understanding that this research endeavors to fill with quantitative results through data analysis. By delving into the significance of aid and assistance to Ukraine and establishing a robust theoretical framework, this literature review lays the groundwork for the analysis which follows. The exploration of existing research not only contextualizes the author's study within the broader academic discourse but also identifies the unique contributions it brings with respect to addressing the complexities of the conflict and the effectiveness of US aid through the analysis of available data. In performing this comprehensive review, we aim to enhance our understanding of the conflict dynamics and contribute novel insights to inform future policy considerations and opinions regarding the conflict, as well as future research in this area.

2.1 Significance of Aid and Assistance to Ukraine

The significance of aid and assistance to Ukraine- especially in the form of war materiel- cannot be overstated, particularly in the context of Russian battlefield losses, prevention of civilian casualties, and the recapture of occupied territory across the timeline of the conflict thus far. Military aid in the form of weaponry, ammunition, and equipment bolsters Ukraine's capacity to defend its sovereignty and territorial integrity. Financial assistance allows for the continuity of government function and the delivery of services that relieve domestic pressure and lay the foundation for military success.[6] This support enhances the Ukrainian military's ability to deter further Russian aggression and protect their citizens against a much larger adversary with far greater resources.

The supply of weapons, ammunition, and military equipment to Ukraine also has direct practical implications for Russian battlefield losses. Increased Ukrainian military capabilities via modern, Western weapons lead to more significant Russian battlefield losses, as well as presenting operational challenges that shift the balance and alter Moscow's strategic calculus in the conflict. In practical terms, these weapons are responsible for delivering the daily total KIA that has depleted the combat power of the Russian Armed Forces and left them reliant upon mercenary organizations such as the Wagner Group, poorly trained conscripted citizens, convicted criminals in prison, and international volunteers such as the Chechen factions loyal to Ramzan Kadyrov.[7] Some of the weapons provided, such as the Javelin Anti-Tank Guided Missile (ATGM), have had an outsized impact on the course of the war. Highly regarded by Ukrainian fighters, the Javelins were used to destroy a large number of both wheeled and tracked vehicles employed by Russia in the initial offensive, forcing them to dig deep into stockpiles to resource their effort using vintage Cold War equipment. Many of these older vehicles have since been destroyed as well,

[6] Nicholas Marsh, "Responding to Needs: Military Aid to Ukraine During the First Year After the 2022 Invasion." Defense & Security Analysis 39, no. 3 (2023): 329-352.
[7] Jack Watling et al., *Preliminary Lessons from Russia's Unconventional Operations During the Russo-Ukrainian War: February 2022-February 2023*. Royal United Services Institute for Defense and Security Studies, 2023.

leading to a shortage on the Russian side that can not be addressed due to a lack of resources resulting from sanctions.[8]

In addition to the immediate effects of military aid, a secondary benefit is the development of improved tactics, techniques, and procedures (TTPs) for the employment of these weapons on the modern battlefield. The Ukrainian Armed Forces have developed unique methods for using small unmanned aerial systems (UAS) to provide forward observation for the M777 155mm artillery pieces provided by the US. The integration of SpaceX Starlink satellite internet capabilities into military operations- in the spectrum-contested environment, no less- is also groundbreaking. There are also new methods of data collection, and new tools for intelligence processing, exploitation, and dissemination (PED) that have benefitted greatly in their development due to the provision of US aid to Ukraine.[9]

Russia's military interventions in the former Soviet Union have raised concerns among the free world regarding its expansionist ambitions. Another important element of aid to Ukraine is that it serves as a counterbalance to the Russian military presence in the region, signaling that international support is available to nations facing Russian aggression- regardless of NATO membership. In addition to demonstrating to the Russian regime that such activities are not tolerated and should not be pursued in the future, the most direct benefit is the decimation of Russian combat power among its armed forces. This is visibly demonstrated in their use of refurbished Soviet-era equipment, the inability to produce modern weapons and equipment due to sanctions, and the reliance on external partners such as the Islamic Republic of Iran to provide modern weapons to fuel the Russian war effort.[10]

Overall, the significance of aid and assistance to Ukraine, especially in the context of war materiel, extends beyond immediate military support. It plays a critical role in Ukraine's efforts to defend itself, counter Russian aggression, and potentially regain control of lost territories while displaying a tangible symbol of solidarity among the free world. Additionally, it has practical implications for the

[8] Jeff Abramson, "West Rushes Weapons to Ukraine" Arms Control Today; Washington Vol. 52, Iss. 3, (Apr 2022): 29-31.
[9] John Logan, "Acquiring Targets in the Bear's Backyard." Naval War College, Newport, RI. May 13, 2022.
[10] Oleh Semenenko et al., "Forecast of Economic Consequences of the First Stage of the Russian-Ukrainian War for Russia:(Loss of Personnel and Weapons and Military Equipment, Costs, Possible Consequences)." *Social Development and Security* 12, no. 2 (2022): 31-43.

dynamics of the conflict and applications for similar conflicts in the future. For this reason, the research in this study, which analyzes and quantifies the specific effect of US aid on the war effort, is extremely valuable to policymakers and warfighters alike.

2.2 Theoretical Framework

Having established the goals and motivations of Russian violent expansion, briefly reviewed the relevant history of such acts since the fall of the Soviet Union, and discussed the importance of the provision of US aid to counter such actions, we now have a foundation upon which to base a theoretical framework for the analysis of the effectiveness of such aid. The knowledge gaps present in the current research exist primarily due to the use of foreign policy theory and partisan affiliation to substantiate the position with respect to providing US aid. A boundary exists in the body of research due to the limitations of this approach, in that it lacks quantified, evidence-based supporting material rooted in the available conflict data. This research will fill the gaps by providing a quantitative analysis of the effects of US aid on the factors which contribute to victory- producing enemy casualties, protecting the lives of noncombatants, and recapturing occupied terrain.[11]

2.2.1 Foreign Policy Theory of Proxy War

Proxy wars are a well-established foreign policy strategy in which a state engages in a conflict by supporting a third party, often a non-state actor or a surrogate state, to pursue its strategic objectives without direct involvement in the hostilities. This approach has been a cornerstone of international relations- allowing powerful nations to exert influence and pursue their interests across the globe in a manner that mitigates the risk of direct confrontation as well as the associated costs. This strategy allows the sponsoring state to achieve its goals- whether territorial, economic, or geopolitical- while minimizing the potential for retaliation and often maintaining some level of plausible deniability. Proxy wars have played a significant role in the dynamics of international conflict throughout history, with some examples ranging from the Cold War-era conflicts in Vietnam and Afghanistan to more recent instances, such as the

[11] J. Boone Bartholomees, "Theory of Victory." Parameters 38, no. 2 (2008): 25-36.

subject conflict in Ukraine. In each of these examples, the West, or what Dugin refers to as the Atlantic pole, is in conflict with the Eurasian pole represented by the Soviet Union/ Russia, pitting the interests of liberty and democracy against totalitarian or communist rule.

At the most basic level, proxy warfare emphasizes the instrumental use of proxies to advance a state's interests while avoiding the direct costs to life and land, and the risks of full-scale military engagement. Realist foreign policy theories argue that great powers employ proxy wars as a means of expanding their sphere of influence or containing rival states, leveraging surrogates to achieve their strategic objectives. On the other hand, perhaps more optimistically, constructivist foreign policy perspectives emphasize the ideological and normative factors that drive states to support proxy actors. These theories emphasize that the choice of proxies is often driven by shared values, such as ideology or cultural affiliations. In practice, states engage in proxy wars for a variety of different reasons- including geopolitical positioning, control of key resources, and regional domination. While proxy wars offer states strategic advantages, they also carry complex challenges, including the risk of unintended consequences (blowback), the potential for escalation, and the erosion of the rules-based international order.[12,13]

2.2.2 Factors and Metrics Contributing to Victory in War

There are a multitude of complex elements existing on the tactical, operational, and strategic levels of war that contribute to victory. As many historians have noted, it is possible to win almost every battle on the tactical level while losing the overall war if the strategic goals are not met, and the desired end state is not achieved.[14] While the battlefields of the Global War on Terror (GWOT) presented military leaders and policymakers with unique challenges related to the definition of victory and the desired conflict endstate, the goal in the subject conflict is far more straightforward- to drive out the Russian occupation and restore full territorial sovereignty to Ukraine. Some of the elements involved in producing victorious outcomes in war include operational planning, military capability, logistics and support,

[12] Stephen Baldwin Watts et al., "Proxy Warfare in Strategic Competition: State Motivations and Future Trends." RAND Corporation, 2023.
[13] John Bellamy Foster, "The US Proxy War in Ukraine." Australian Socialist 28, no. 1 (2022): 11-15.
[14] Bartholomees, "Theory of Victory." 25-36.

intelligence and information warfare, economic and manufacturing capacity, morale and cohesion, political support, and others.[15]

Among the many factors and metrics we use to measure the effectiveness of these elements, delivering enemy personnel losses is among the most important. Indisputably, inflicting significant losses on enemy personnel is a critical component of achieving victory in warfare. A high number of casualties directly weakens the enemy's military capabilities, disrupts their ability to command and control their forces, and heavily erodes morale and the will to fight. The strategic importance of delivering enemy personnel losses lies in its potential to incapacitate key leaders, disrupt operational planning, and diminish the overall military capability of the adversary. By targeting and eliminating Russian forces occupying Ukrainian territory, a decisive battlefield advantage can be gained in pursuit of conditions conducive to achieving the broader strategic objectives of the conflict. This not only weakens the adversary on a tactical level, but also acts as a strategic deterrent, dissuading future aggression and destroying the perception of Russian military superiority in the face of motivated, well-trained, and equipped opposition forces, backed by committed allies.

Another important metric affecting several of the supporting elements, including economic and manufacturing capacity, morale and cohesion, and political support, is the level of civilian casualties in the conflict. The protection of noncombatants on both sides of a conflict is both a moral imperative and a strategic necessity in warfare. Civilian populations play a crucial role in sustaining a nation's resilience and stability. Ensuring the safety of civilians builds international support for military operations, fosters goodwill, and upholds the principles of international humanitarian law. The strategic significance of protecting noncombatant civilians from harm lies in its impact on public opinion, both local to the conflict and on the world stage. Military success that is accompanied by a commitment to minimizing civilian casualties can contribute to long-term stability, mitigate potential humanitarian crises, and facilitate post-conflict reconstruction. Military and financial aid that is found to produce a positive effect on suppressing

[15] Allan R. Millett et al., "The Effectiveness of Military Organizations." International Security 11, no. 1 (The MIT Press: 1986): 37–71. https://doi.org/10.2307/2538875.

civilian casualties not only garners increased support but also contributes to overall victory. Additionally, providing effective protection for the civilian population can help maintain ownership of the "hearts and minds" of the people, stabilizing the population as a center of gravity in war and undermining the enemy's attempts to exploit civilian fear and discontent for strategic gain.

The recapture of occupied territory from the enemy stands as the paramount metric in the trajectory toward victory in armed conflicts. Beyond its strategic significance in disrupting the adversary's lines of communication and denying their freedom of maneuver, regaining lost territory is instrumental in changing the momentum and reshaping the narrative of the conflict. The liberation of occupied areas not only symbolizes a tangible shift in power dynamics but also carries profound psychological implications. It bolsters the morale and determination of friendly forces and their allies, instilling a sense of achievement and progress. Simultaneously, it undermines the morale of the occupying forces, sowing seeds of doubt and diminishing their confidence. As we have seen in the Ukraine conflict, the ability to retake and control territory is closely intertwined with the overall narrative of success and, consequently, plays a pivotal role in shaping the course of conflicts and driving them toward victory.

3.0 Data and Methods

This analysis leverages available open-source data to explore the dynamics of US funding to Ukraine within the context of Russian battlefield losses in terms of personnel, the suppression of Ukrainian civilian casualties, and the recapture of occupied territory. This study aims to shed light on the broader implications of US aid in conflict settings and assess its effectiveness in achieving victory. This research contributes insights into the impact of foreign aid in proxy warfare and its role in shaping conflict outcomes, which provides policymakers, warfighters, and American citizens alike with a clear understanding of the conflict, leading to an informed and factually qualified position from which to engage in discussions on the provision of US aid to Ukraine.

3.1 Data Sources

In order to analyze the impact of US funding on the war effort in Ukraine, data has been collected from various sources available for academic research, aggregated, and enriched into a common dataset keyed on date. The accuracy of this data represents the author's best effort to collect from reputable open sources. The quality of this data has been improved through enrichment and feature engineering conducted as part of the analysis. No data used in this study was sourced from the US government, and no classified material was used in any part of this research, including in development of the background, methodology, analysis, or interpretation of the results.

3.1.1 US Aid Delivered

The primary data source utilized is the U.S.-specific portion of the Kiel Institute's records of foreign assistance to Ukraine by country, known as the "Ukraine Support Tracker." This dataset offers comprehensive information on financial and material support provided by the United States, including details on the type, quantity, estimated value, delivery date, and links to relevant information for both military aid and financial assistance. While this dataset includes a large number of variables, many were not relevant to the study and have been excluded.

The dataset is structured with individual aid disbursements as the unit of analysis, measured in US dollars. The unit of observation is days, and it comprises a total of 572 observations. Although the dataset covers several years leading up to the conflict, this study focuses on the period from the start of the invasion in February 2022 to 08 October, 2023.[16]

3.1.2 Russian KIA

In addition to the US funding data, details regarding Russian battlefield losses in Ukraine have been sourced from Dr. Petro Ivaniuk, a data scientist based in Lviv. This dataset is comprised of personnel totals, with the principal variable of interest being members of the Russian Armed Forces

[16] Cristoph Trebeschet al., "The Ukraine Support Tracker: Which Countries Help Ukraine and How?" No. 2218. KIEL Institute, 2023, Release 13.

Killed in Action (KIA). It is important to note that the Russian daily KIA figures provided in this dataset are estimates, and potential bias may be present in the information. Similar to the US funding data, the unit of analysis in this dataset is days, encompassing a total of 591 observations. Despite the potential limitations, Dr. Ivaniuk's dataset offers valuable insights into Russian military casualties on a daily basis, contributing to a more comprehensive understanding of the productive results of military operations in Ukraine.[17]

3.1.3 Ukrainian Civilians Killed

The data source for Civilians Killed in this study is the Office of the UN High Commissioner for Human Rights (OHCHR), a reputable and authoritative organization in the field of human rights monitoring. The OHCHR provides a comprehensive and meticulously documented dataset that encompasses monthly totals of civilians killed in the ongoing conflict in Ukraine. This dataset is particularly valuable due to the UN's commitment to impartiality, accuracy, and transparency in reporting human rights violations. The OHCHR's role as a neutral observer enhances the credibility of the Civilians Killed variable, offering a reliable foundation for analyses examining the impact of conflict dynamics on civilian casualties. The monthly granularity of the data further allows for a summarized exploration of temporal patterns, providing insights into the ebb and flow of civilian casualties throughout the duration of the conflict. While this data source contributes valuable information to the study, it is essential to acknowledge the potential limitations associated with the inherent complexities of collecting accurate and real-time data in conflict zones.[18]

3.1.4 Territorial Gains and Losses

Data on Russian territorial gains and losses in Ukraine were sourced from The Institute for the Study of War and the American Enterprise Institute's Critical Threats Project. While the recapture of occupied territory may seem like the most obvious and direct metric contributing to victory, it must be

[17] Petro Ivaniuk, "2022 Russia Ukraine War: Equipment Losses, Death Toll, Military Wounded, and Prisoner of War of Russians." Kaggle, accessed 07 October 23, https://www.kaggle.com/datasets/piterfm/2022-ukraine-russian-war.
[18] Office of the UN High Commissioner for Human Rights (OHCHR), “Ukraine: Civilian Casualty Update, 11 September 2023” OHCHR, accessed 07 October 23, https://www.ohchr.org/en/news/2023/09/ukraine-civilian-casualty-update-11-september-2023.

acknowledged that it is extremely difficult to reliably calculate territorial control across a highly dynamic front such as the one that still exists in parts of Eastern Ukraine. Fueled by information warfare on both sides of the conflict, disputes among open-source analysts regarding the zones of control are common. Many of these discrepancies also concern unpopulated or uninhabited areas that are neither completely under the control of the Russians nor the Ukrainians. Since the introduction of stalemate conditions, the data has shown no definitive gains or losses for many consecutive months.[19]

3.2 Methods of Analysis

The primary goal of this analysis is to quantify the impact of US aid on producing Russian KIA, suppressing Ukrainian civilian deaths, and recapturing occupied territory. Specifically, this research aims to determine if continued US aid to the conflict in Ukraine is expected to make measurable contributions to the factors that lead to victory, and if so, it seeks to quantify the level of impact.

The primary method used to guide the analysis in this study is Ordinary Least Squares (OLS) linear regression. Regression analysis will be employed to assess the relationship between the variable of interest, US aid to Ukraine, and the target outcomes, including increasing Russian KIA, decreasing Ukrainian civilian deaths, and recapturing occupied territory.

Data visualization tools are used to illustrate key findings and trends in a clear and accessible manner. This informs and guides the analysis as well as provides a visual representation of the data and its implications.

In order to isolate and examine the effects of aid provided, we must align with the operational phases of the conflict, each of which contain a unique mission, set of goals, and desired endstate within the overall campaign. Through employing feature engineering of this type, we are better able to understand the alignment of the data with mission objectives and the battlefield situation at different points in time. The phases of the conflict are depicted in Table 1, below.

[19] Institute for the Study of War & AEI's Critical Threat Project, "Russian-held Territory in Ukraine, Control Shift." accessed 30 September, 2022. https://www.criticalthreats.org/analysis/ukraine-conflict-updates-ctp-isw.

Phase	Begin	End
Prelude		23-Feb-22
Phase 1: Initial Invasion	24-Feb-22	7-Apr-22
Phase 2: Southeastern Front	8-Apr-22	28-Aug-22
Phase 3: Ukrainian Counteroffensives	29-Aug-22	11-Nov-22
Phase 4: First Stalemate	12-Nov-22	28-Mar-23
Phase 5: Second Stalemate	29-Mar-22	8-Oct-23

Table 1 - Phases of the Conflict in Ukraine

4.0 Results

This study investigates the impact of US aid on producing Russian KIA, suppressing Ukrainian civilian deaths, and recapturing occupied territory. The hypothesis is that within the unique environment of the Ukrainian conflict, US aid has been producing significant positive effects on the factors that contribute to victory, and it is critically important to continue through to Russian defeat.

What we arrive at through analysis of the data is statistically significant evidence to support the author's hypotheses regarding the impact of US aid for two of the three factors contributing to victory- that the provision of US aid is yielding positive effects in both producing Russian KIA and recapturing occupied territory. As a result of the complexity surrounding the factors which drive civilians killed in war, US aid is currently producing a less statistically relevant effect concerning the third factor contributing to victory- reducing the number of noncombatant deaths resulting from the conflict.

4.1 Preliminary Data Visualizations

For contextual purposes, we begin with a visualization of daily Russian KIA across the phases of the conflict, shown below in Figure 1. While we predictably observe high daily losses during the initial invasion (when the Russian advance on Kyiv was halted and effectively repelled), we see a period of low daily KIA totals leading into Phase 3 of the conflict (the fall Counteroffensive of 2022 that recaptured a great deal of territory in northeastern Ukraine). An interesting observation is that daily Russian KIA continued to rise into the first stalemate and remained significantly higher during both stalemate phases

(Phase 4 and Phase 5) than it was during the campaign along the Southeastern Front that included the siege of Mariupol (24 February 2022 - 20 May 2022) and the accompanying battle for the Azovstal plant.

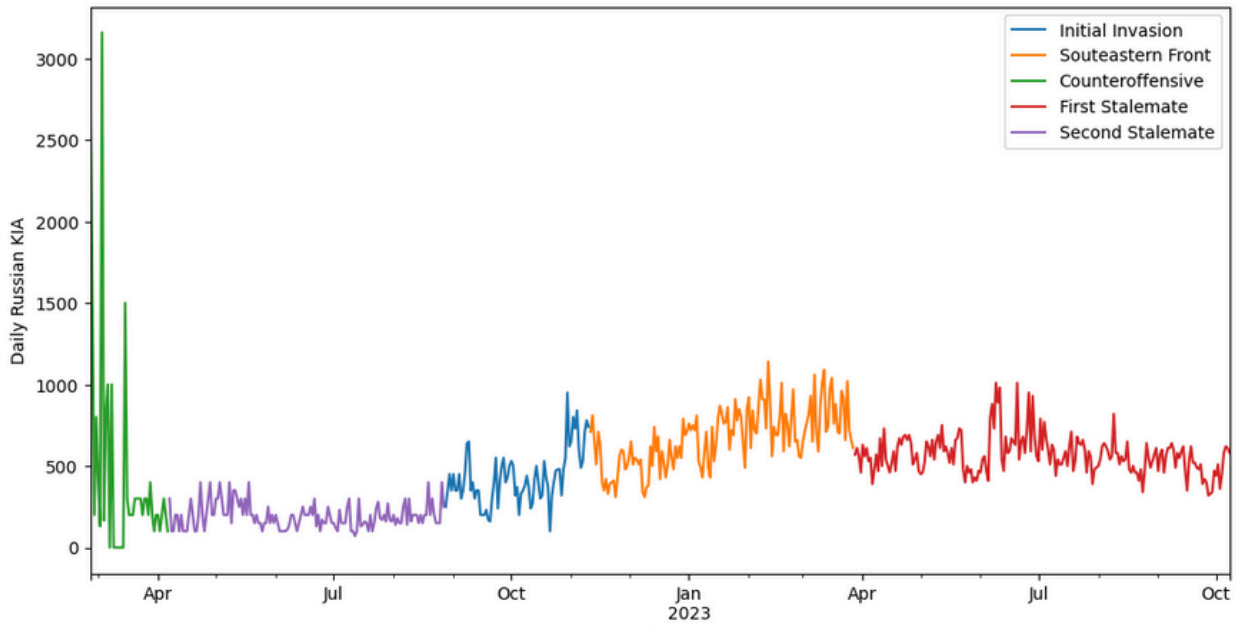

Figure 1 - Daily Russian KIA Over Time by Campaign Phase

When overlaid with the log of total US aid (both military aid and financial assistance), it becomes apparent that a relationship exists between the two variables such that an infusion of aid corresponds with an increase in daily Russian KIA approximately a month and a half from the date of delivery. This could be due to the time it takes for military aid to arrive at the front lines, or by slowly easing the level of austerity in governance operations once financial aid resources trickle down to the requiring offices and activity sites. This is displayed in Figure 2 below, which truncates the initial invasion phase to exclude both abnormally high daily Russian KIA and infusions of US aid.

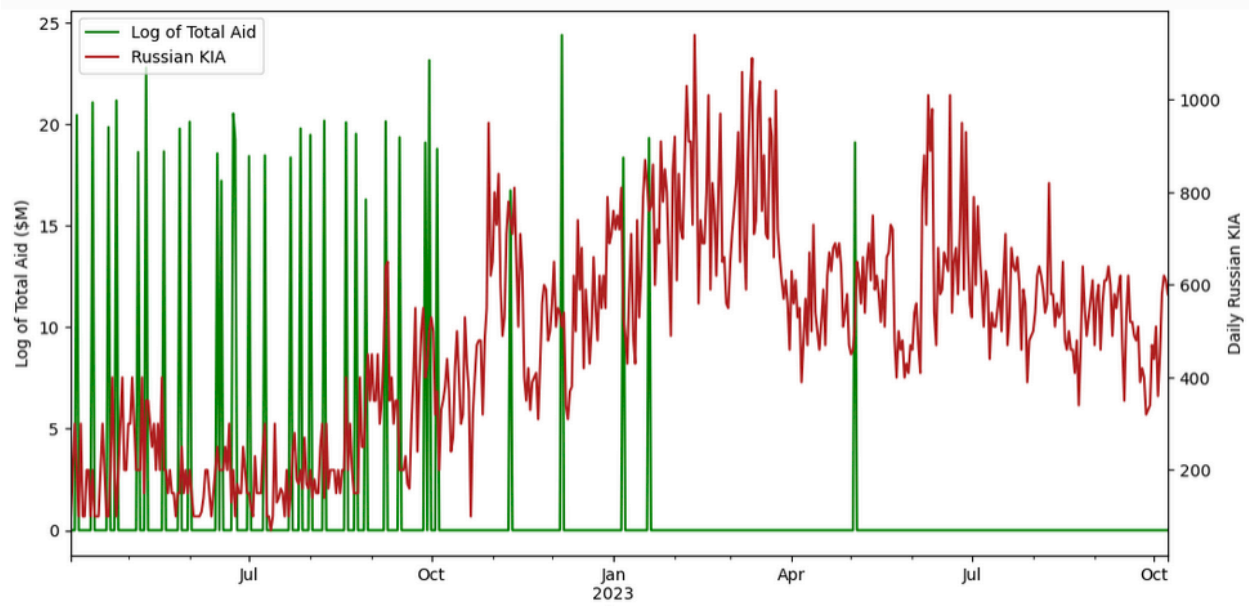

Figure 2 - Log of Total Aid and Daily Russian KIA Over Time

4.2 Regression Results

We assess the impact of US aid by employing a series of OLS regression models on the aggregated and enriched data. Model 1 solely compares the effects of cumulative US Aid (Total- both military aid and financial support) on daily total Russian KIA. The detailed results of Model 1 are contained in Appendix A.

Model 2 incorporates a 42-day time shift to account for the lag between the arrival of aid and positive effects on Russian KIA, as witnessed in the preliminary visualization of the data. This results in a better fit and improved R-squared. The detailed results of Model 2 are contained in Appendix B.

Regarding the effect of total US aid on civilian casualties, the relationship is weaker but still present. Model 3 compares the effects of cumulative US Aid on Ukrainian civilian deaths using an OLS regression model and dispensing with the 42-day time shift due to the monthly granularity of the civilian casualty data obtained. The results of Model 3 are contained in Appendix C.

Model 4 compares the effects of cumulative US aid on recapturing occupied territory and exhibits a similar R-squared to Model 3. The results of Model 4 are contained in Appendix D.

Key values from the results of each model are contained in Table 2 below:

	Model 1	Model 2	Model 3	Model 4
Independent Variable Examined	Cumulative US Aid (Total)	Cumulative US Aid (Total)	Cumulative US Aid (Total)	Cumulative US Aid (Total)
Dependent Variable Examined	Daily Total Russian KIA	Daily Total Russian KIA	Monthly Total Civilians Killed	Russian Territorial Losses
Independent Variable Coefficient	9.38E-08	1.10E-07	-5.70E-09	1.33E-07
Constant Coefficient	1585.0935	2314.0901	588.6691	3.55E+04
R-squared	0.698	0.760	0.675	0.668
F-statistic	90.33	114	29.07	28.16

Table 2 - Summary of Model Results

4.3 Descriptive Analysis of the Results

In examining the relationship between cumulative US aid to Ukraine and the total Russian KIA, Model 2 is superior to Model 1, revealing a robust statistical significance. The R-squared value of 0.76 suggests that approximately 76% of the variance in Russian KIA can be explained by the model. The F-statistic of 114 further supports the overall model's statistical significance (p-value < 0.0001). The model's coefficients indicate that for each additional $10,000,000 of total US aid to Ukraine, there is a predicted increase in total Russian service members killed in action by approximately 1.104 lives. This substantiates the author's hypothesis regarding the substantial predictive power of total US aid over daily Russian KIA and its significant effect.

In contrast, when examining the relationship between cumulative US aid to Ukraine and the number of civilians killed in Model 3, the findings are less conclusive. The R-squared value of 0.675 indicates that approximately 67.5% of the variance in civilian casualties can be elucidated by the model, suggesting a moderate but not overwhelmingly robust predictive capacity. The F-statistic of 29.07, while not attaining conventional statistical significance levels with a p-value of 0.0752, still implies a noteworthy relationship. The coefficients suggest that for each additional $10,000,000 of total US aid to Ukraine, there is a predicted decrease in Civilians Killed by approximately .05703 lives. The modest R-

squared value and non-significant F-statistic, however, caution against placing too much confidence in this model for predicting civilian casualties. The regression results imply that while cumulative US aid may exert some mitigating effect on civilian casualties, the complex nature of the dynamics of warfare and the multitude of potential contributing factors necessitate a more comprehensive exploration of the relationship. This cautionary note is reinforced by the relatively low F-statistic and the possibility of numerical issues indicated by the large condition number, suggesting potential challenges such as multicollinearity that warrant further investigation.

Turning to Model 4, which assesses the relationship between cumulative US aid to Ukraine and cumulative Russian loss of occupied territory, the results present revealing insights in light of the stalemate. The similar R-squared value of 0.668 suggests that approximately 66.8% of the variance in Russian territorial losses can be explained by the model, indicating a moderate predictive capacity. The F-statistic of 28.16, coupled with a p-value of 0.000111, attains conventional statistical significance levels, reinforcing the robustness of the relationship. The coefficients reveal that for each additional $10,000,000 of total US aid to Ukraine, there is a predicted increase in Russian Territorial Losses by approximately 1.332 km^2. This implies that as cumulative US aid to Ukraine rises, there is still an associated increase in the territorial losses suffered by Russian forces, even after two phases of majority stalemate conditions overall. While the results present a statistically significant relationship, the cautionary note from the relatively large condition number is present here as well, indicating potential numerical challenges such as multicollinearity may be present. Further investigation into the complex dynamics shaping Russian territorial losses, as well as accounting for various additional factors influencing conflict outcomes, is needed to unpack the intricacies of this relationship and enhance the usefulness of the model to predict the recapture of occupied territory.

In summary, while Model 2 demonstrates a significant association between total US aid and Russian military casualties, Model 3's predictive power regarding civilian casualties appears limited, though a relationship still exists. Model 4 displays a more robust relationship between the variables, but additional

data is needed to clarify the relationship. These results underscore the complexity of the relationship between aid and the factors that contribute to victory, prompting the need for careful interpretation and potential avenues for additional data gathering, further analysis, or model refinement.

4.4 Relevance of Results

This research seeks to deepen our understanding of the dynamics of the conflict in Ukraine, US foreign policy implications, insights into Russia's motivations, and the factors that contribute to victory in relation to US aid provided to date. The analysis, grounded in a theoretical framework utilizing Ordinary Least Squares (OLS) regression models, has provided intriguing findings.

The results of Model 2 demonstrate a significant positive relationship between total US aid to Ukraine and total Russian KIA. This suggests that increased aid is associated with higher Russian military casualties, implying a potential impact on battlefield success for Ukraine. This aligns with the broader context of the conflict, illustrating the effectiveness of US military aid in bolstering Ukraine's defense capabilities against Russian aggression. It provides empirical support for the author's hypothesis that increased aid contributes significantly to more effective and productive military operations.

In contrast, the limited predictive power of Model 3 for Civilians Killed speaks to the complexity of the dynamics of war. While US aid appears to more directly influence the offensive aspects of the conflict, its impact on the defense, and civilian deaths is less pronounced. This finding suggests the need for a more balanced approach to US foreign policy, indicating that a comprehensive strategy addressing both military and humanitarian aspects beyond the provision of aid is imperative. There are also certainly more factors than US aid affecting this variable, including proximity to medical care at an adequate level to handle trauma patients.

In contrast to the relationship observed in Model 3, the results of Model 4 shed light on the interplay between US aid to Ukraine and Russian territorial losses despite the well-known stalemate conditions of the current conflict. The significant positive relationship, as indicated by the statistically

significant coefficients and F-statistic, suggests that higher cumulative US aid is associated with increased territorial losses suffered by Russian forces, though at low levels per ten million dollars of aid.

In the broader context, these analytic results contribute to the ongoing discourse on Neo-Soviet aggression, highlighting the adaptability of Russia's military strategy in response to external assistance to Ukraine and the persistence of their occupation despite suffering five-figure personnel losses. As the conflict evolves, Russia may need to reassess its tactics in light of increased losses in areas receiving significant US aid or where advanced weapons are present. The findings also emphasize the need for a multifaceted understanding of victory in warfare, encompassing not only military-focused metrics but also the protection of noncombatant civilian lives. Continuity of governance, economic function, and preservation of infrastructure all play important roles as well.

This discussion resonates with the theoretical framework reviewed concerning the foreign policy theory of proxy war, elucidating how US aid functions as a strategic tool in countering Russian aggression and achieving US foreign policy goals. Additionally, it aligns with the factors contributing to victory in war, where total cumulative aid emerges as a significant determinant of battlefield success overall. This study contributes to the literature reviewed by offering empirical insights into the calculation of victory beyond basic ideological discussions, shedding light on the evolving nature of contemporary warfare.

4.5 Limitations of the Study

Despite the insightful findings presented in this study, it is crucial to acknowledge and consider several limitations that may impact the robustness and generalizability of the results. Firstly, the study encounters challenges stemming from the uneven levels of authority and reliability between the data sources for different variables. While the dataset for total US aid to Ukraine stands out for its meticulous detail and precision, down to the actual penny, the daily Russian Killed in Action (KIA) totals rely on estimates derived from the intensity of fighting rather than official, verifiable sources. This introduces a potential source of uncertainty and subjectivity in assessing the true impact of aid on Russian military

casualties. Moreover, the dataset for Civilians Killed, though better documented than Russian KIA, is reported by OHCHR on a monthly basis, introducing a temporal misalignment that may influence the accuracy of the analyses. Furthermore, variations in the levels of fidelity between data sources present another limitation. While total aid is documented daily, it exhibits sporadic patterns, in contrast to the daily and consistent reporting of Russian KIA. These variations in data fidelity and reporting frequency necessitate a cautious interpretation of the results and underline the need for further research that integrates data with greater uniformity and reliability across the variables analyzed.

4.6 Potential Avenues for Further Research.

This study lays the groundwork for further research avenues that can deepen our understanding of the complexities surrounding conflict dynamics and US foreign policy in the context of Ukraine. One promising avenue is the exploration of additional independent variables that contribute to victory, extending beyond the scope of US aid. Weather data, for instance, could be integrated to assess its impact on the intensity and outcome of military operations, considering the influence of climatic conditions on both offensive and defensive strategies. Furthermore, sentiment analysis of social media postings could offer valuable insights into the morale of soldiers on each side, as well as that of the civilian population, providing a nuanced perspective on the psychological dimensions of the conflict. Additionally, an intriguing avenue for exploration involves investigating the provision of US aid to other geopolitical conflicts, such as the Israel-Palestine war, and assessing the reverse coefficient for civilian deaths. Examining scenarios where the provision of US aid might lead to higher rather than lower numbers of noncombatant civilian deaths can shed light on the complex calculus between the factors contributing to victory and the factors contributing to defeat in conflict settings, resulting in a more comprehensive understanding of foreign aid on outcomes in war. These potential avenues for further research offer exciting opportunities to refine and expand upon the insights garnered from this study, addressing the complex nature of contemporary conflicts.

5.0 Conclusion

In conclusion, this research advances our comprehension of the complexities surrounding US aid to Ukraine and its ramifications for the success of the ongoing conflict. These important findings underscore the need for a resolute foreign policy approach, recognizing the multifaceted nature of victory in war. As US policymakers navigate these complexities, research of this type can fuel informed decision-making in order to align foreign policy actions and objectives with the evolving dynamics of modern warfare.

5.1 Application of Findings - American Opinions on Aid

Public sentiment in America regarding aid to Ukraine is polarized, with partisan narratives shaping the discourse. These viewpoints are often not grounded in the facts of the current tactical situation or the broader strategic landscape. Information campaigns significantly influence public opinion on the efficacy of aid in the conflict, both for and against continuing support. The findings of this study deliver to the American public a snapshot of the quantified results of the cumulative total aid delivered thus far and, more importantly, a projection of what effect future aid is predicted to have at this phase in the conflict. This data can be reviewed and contemplated by the individual to better inform their decision to support or oppose continued aid.

Arguments favoring American intervention center on humanitarian concerns, emphasizing the moral imperative to address the conflict's devastating impact on civilians. Proponents stress the importance of aid in addressing immediate needs and contributing to Ukraine's victory. Additionally, support for democracy and self-determination underpins the case for aid, highlighting its role in resisting foreign domination and upholding democratic principles.[20] Advocates assert that a robust response, encompassing military and economic assistance, serves as a deterrent against further Russian aggression, contributing to regional stability. They emphasize the global security interest in maintaining stability in the region, considering potential ramifications on neighboring countries and the international environment.

[20] Robert Kagan, "A Free World, If You Can Keep It: Ukraine and American Interests." Foreign Affairs. 102 (2023): 39.

This research reveals that US aid does, in fact, both drive Russian KIA and the recapture occupied territory at a statistically significant level. Further, there is a relationship between US aid and the protection of noncombatant civilian lives in Ukraine, though at a low coefficient of lives per ten million dollars of aid.

Opponents argue against aid provision, citing concerns about potential escalation, the risk of drawing major powers into a new World War, and the need to prioritize domestic issues.[21] Isolationists contend that resources should be directed inward to address pressing domestic challenges, emphasizing problems such as the opioid crisis, immigration, economic disparities, healthcare, and infrastructure. Critics also raise concerns about corruption in Ukraine, pointing to Transparency International's Corruption Perceptions Index.[22] They caution that aid may inadvertently benefit corrupt officials and contribute to the global arms trade. Skeptics highlight the unpredictability of aid outcomes and the potential for unintended consequences, appealing to fears of uncertain repercussions. This research has additionally revealed that in the current stalemate condition, US aid is still a predictor of the successful recapture of occupied territory on some level.

5.2 Application of Findings - Calculating Pyrrhic Victory

Determining whether a proxy war is heading toward a pyrrhic victory- where the costs outweigh the benefits- can be a complex and challenging assessment for the sponsoring state. One of the earliest signs of a potential pyrrhic victory is when the sponsoring state finds itself expending vast resources, both financial and material, with diminishing returns. If the costs of supporting the proxy begin to outweigh the perceived benefits or strategic gains, it may signal a pyrrhic outcome. While American economic impact lies outside the scope of this research, the findings of this study do provide a specific calculation of the effects of US aid on the factors that contribute to victory and a projection of their effectiveness in the future.

[21] John J. Mearsheimer, "Playing With Fire in Ukraine. The Underappreciated Risks of Catastrophic Escalation." Foreign Affairs 17: 2022.
[22] Transparency International, "Corruption Perceptions Index: 2022." Accessed 21 October 2023. https://www.transparency.org/en/cpi/2022

A long and protracted proxy war can have severe economic consequences for the sponsoring state. These adverse effects include inflation, decreased economic growth, and increased debt. If these economic impacts become unsustainable or carry on for too long, it may indicate that the costs outweigh the benefits.[23] The results of this research are invaluable to policymakers as they seek to calculate the effectiveness of US aid as well as define some point where victory achieved would be defined as pyrrhic. Further, continual analysis of this type involving specific regions receiving aid and the mix of military aid and financial assistance is critical to fact-based decision making in this arena.

5.3 Final Remarks

This research has explored the complex dynamics of the conflict in Ukraine and the pivotal role of US aid in shaping its outcomes. By examining the relationship between US aid and key factors contributing to victory, such as Russian battlefield losses, the reduction of Ukrainian civilian deaths, and the recapture of occupied territory, the findings of this study offer valuable insights for various stakeholders. As policymakers, warfighters, and the broader American citizenry grapple with decisions and opinions regarding foreign assistance to allies, a data-driven understanding of the impact of US aid is of critical importance.

[23] Ruth Endam Mbah et al. "Russian-Ukraine 2022 War: A Review of the Economic Impact of Russian-Ukraine Crisis on the USA, UK, Canada, and Europe." Advances in Social Sciences Research Journal 9, no. 3 (2022): 144-153.

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Appendices

Appendix A: Model 1 - Results and Visualization of Fit

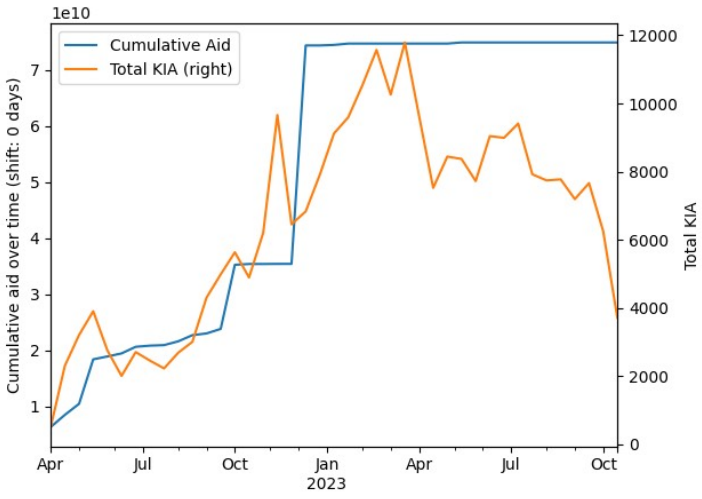
OLS Regression Results

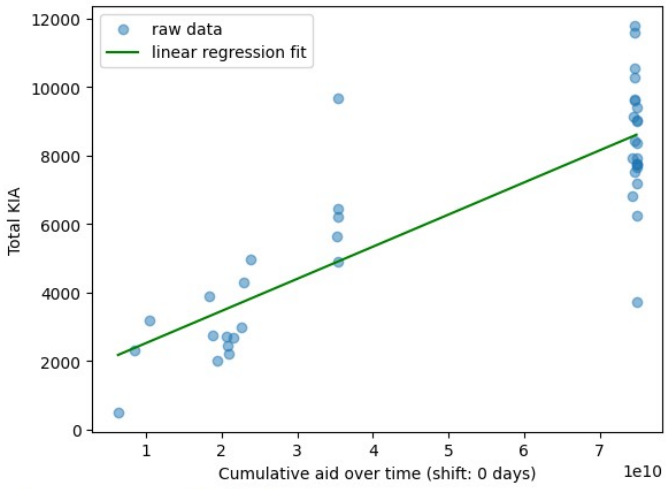
Dep. Variable:	Total KIA	**R-squared:**	0.698
Model:	OLS	**Adj. R-squared:**	0.691
Method:	Least Squares	**F-statistic:**	90.30
Date:	Sun, 26 Nov 2023	**Prob (F-statistic):**	1.06e-11
Time:	15:04:36	**Log-Likelihood:**	-361.38
No. Observations:	41	**AIC:**	726.8
Df Residuals:	39	**BIC:**	730.2
Df Model:	1		
Covariance Type:	nonrobust		

	coef	**std err**	**t**	**P>|t|**	**[0.025**	**0.975]**
const	1585.0935	575.256	2.755	0.009	421.528	2748.659
Cumulative Aid	9.376e-08	9.87e-09	9.503	0.000	7.38e-08	1.14e-07

Omnibus:	5.057	**Durbin-Watson:**	0.696
Prob(Omnibus):	0.080	**Jarque-Bera (JB):**	5.582
Skew:	0.196	**Prob(JB):**	0.0614
Kurtosis:	4.764	**Cond. No.**	1.29e+11

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 1.29e+11. This might indicate that there are strong multicollinearity or other numerical problems.






```
coefficient: 9.375832152918603e-08
intercept: 1585.0934820558687
```

Appendix B: Model 2 - Results and Visualization of Fit

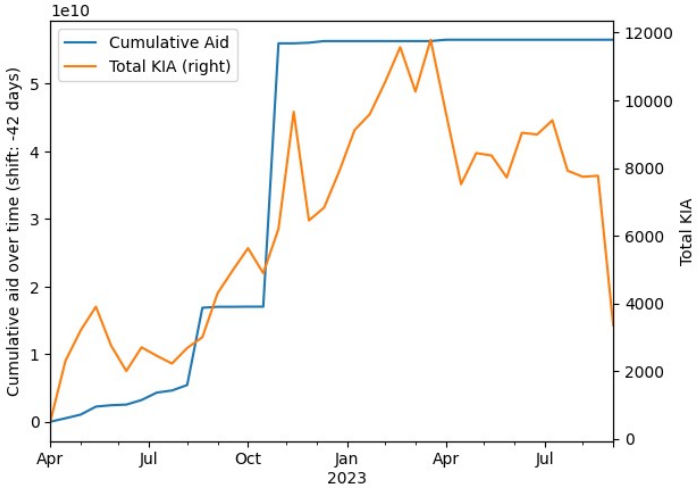
OLS Regression Results

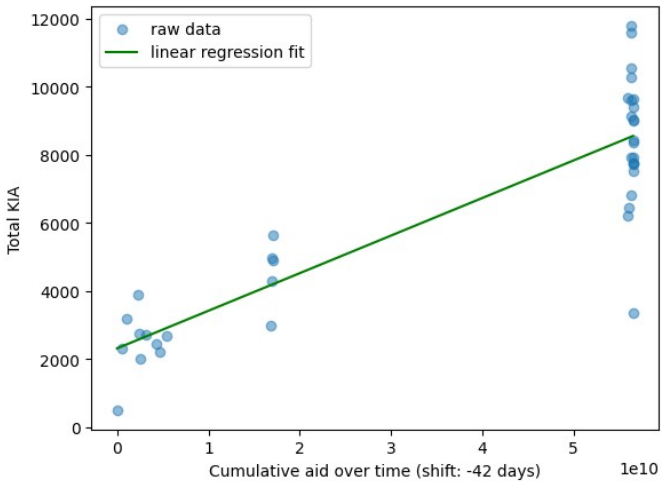
Dep. Variable:	Total KIA	**R-squared:**	0.760
Model:	OLS	**Adj. R-squared:**	0.753
Method:	Least Squares	**F-statistic:**	114.0
Date:	Sun, 26 Nov 2023	**Prob (F-statistic):**	1.05e-12
Time:	15:04:37	**Log-Likelihood:**	-332.04
No. Observations:	38	**AIC:**	668.1
Df Residuals:	36	**BIC:**	671.4
Df Model:	1		
Covariance Type:	nonrobust		

	coef	**std err**	**t**	**P>|t|**	**[0.025**	**0.975]**
const	2314.0901	458.196	5.050	0.000	1384.826	3243.355
Cumulative Aid	1.104e-07	1.03e-08	10.675	0.000	8.94e-08	1.31e-07

Omnibus:	9.425	**Durbin-Watson:**	0.985
Prob(Omnibus):	0.009	**Jarque-Bera (JB):**	11.191
Skew:	-0.688	**Prob(JB):**	0.00372
Kurtosis:	5.275	**Cond. No.**	8.08e+10

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 8.08e+10. This might indicate that there are strong multicollinearity or other numerical problems.



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coefficient: 1.1038074175832679e-07
intercept: 2314.0900754208924
```

Appendix C: Model 3 - Results and Visualization of Fit

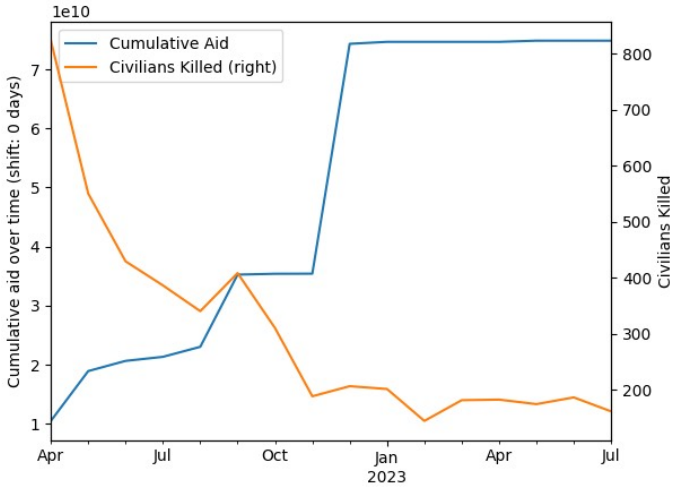
OLS Regression Results

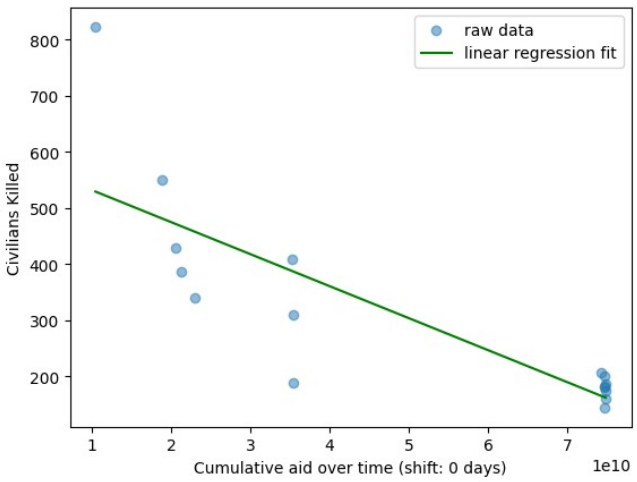
Dep. Variable:	Civilians Killed	**R-squared:**	0.675
Model:	OLS	**Adj. R-squared:**	0.652
Method:	Least Squares	**F-statistic:**	29.07
Date:	Sun, 26 Nov 2023	**Prob (F-statistic):**	9.50e-05
Time:	15:04:37	**Log-Likelihood:**	-96.589
No. Observations:	16	**AIC:**	197.2
Df Residuals:	14	**BIC:**	198.7
Df Model:	1		
Covariance Type:	nonrobust		

	coef	**std err**	**t**	**P>|t|**	**[0.025**	**0.975]**
const	588.6691	59.281	9.930	0.000	461.524	715.814
Cumulative Aid	-5.703e-09	1.06e-09	-5.392	0.000	-7.97e-09	-3.43e-09

Omnibus:	9.199	**Durbin-Watson:**	1.049
Prob(Omnibus):	0.010	**Jarque-Bera (JB):**	6.544
Skew:	0.920	**Prob(JB):**	0.0379
Kurtosis:	5.535	**Cond. No.**	1.23e+11

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 1.23e+11. This might indicate that there are strong multicollinearity or other numerical problems.



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coefficient: -5.702598392785775e-09
intercept: 588.6690858691935
```

Appendix D: Model 4 - Results and Visualization of Fit

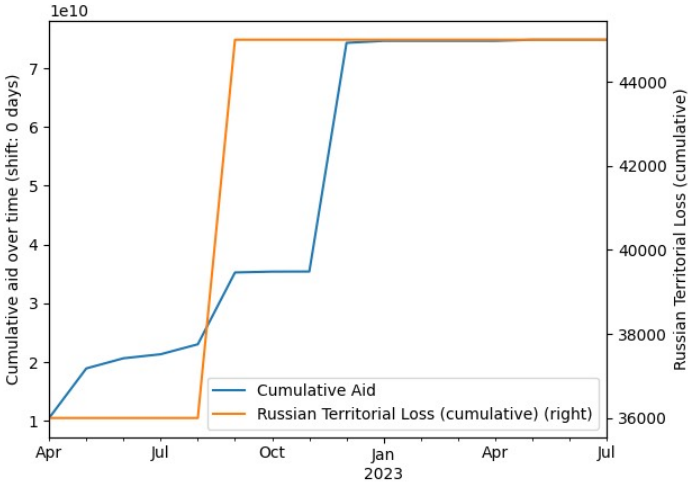
OLS Regression Results

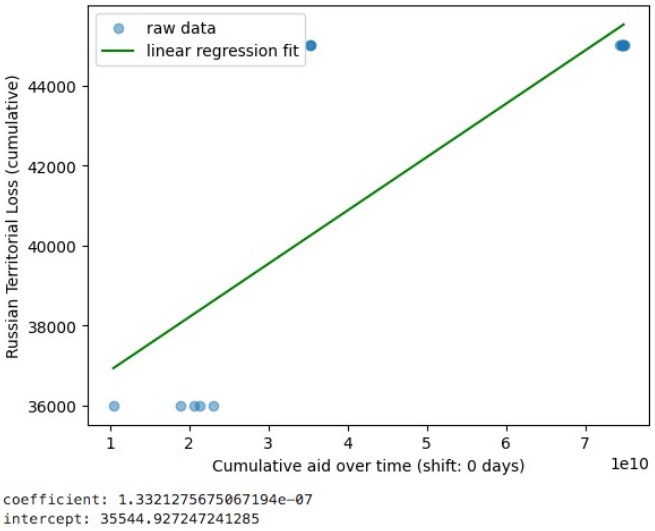
Dep. Variable:	Russian Territorial Loss (cumulative)	**R-squared:**	0.668
Model:	OLS	**Adj. R-squared:**	0.644
Method:	Least Squares	**F-statistic:**	28.16
Date:	Sun, 26 Nov 2023	**Prob (F-statistic):**	0.000111
Time:	15:04:37	**Log-Likelihood:**	-147.26
No. Observations:	16	**AIC:**	298.5
Df Residuals:	14	**BIC:**	300.1
Df Model:	1		
Covariance Type:	nonrobust		

	coef	**std err**	**t**	**P>|t|**	**[0.025**	**0.975]**
const	3.554e+04	1407.069	25.262	0.000	3.25e+04	3.86e+04
Cumulative Aid	1.332e-07	2.51e-08	5.306	0.000	7.94e-08	1.87e-07

Omnibus:	5.756	**Durbin-Watson:**	0.893
Prob(Omnibus):	0.056	**Jarque-Bera (JB):**	3.867
Skew:	1.203	**Prob(JB):**	0.145
Kurtosis:	3.090	**Cond. No.**	1.23e+11

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 1.23e+11. This might indicate that there are strong multicollinearity or other numerical problems.





Curriculum Vitae

Kevin Ryan is a defense industry executive with 15 years of experience supporting technical projects including AI/ML products, cybersecurity, cloud infrastructure, unmanned aerial systems (UAS), and wireless communications. His non-technical professional experience involves multifunctional logistics support and work with the Intelligence Community (IC). Prior to his civilian career, he served in the United States Army from 1998 to 2009 with two deployments to Operation Iraqi Freedom (OIF). He holds a Bachelor of Science in Management from the A.B. Freeman School of Business at Tulane University and a Master of Business Administration from the Pamplin College of Business at Virginia Tech. He resides in Arlington, Virginia.