GLOBALIZATION AND THE DIFFUSION OF MILITARY CAPABILITIES

by

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DEDICATION

To my parents Ed and Tracey Stokes, none of this would have been possible if not for your endless emotional, intellectual, and financial support.

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ABSTRACT

I analyze the effects of economic and informational globalization on the diffusion of military capabilities in the 20th and 21st centuries. To test these relationships, I use the KOF Swiss Economic Institute's data on economic and informational globalization and the Correlates of War data on National Material Capabilities for all states of the international system from 1970 to 2011. Using an Ordinary Least Squares (OLS) regression of all states with standard errors clustered at the state-level, I find that economic globalization negatively correlates with increases in military capabilities; while informational globalization positively correlates with increases in military capabilities. These findings suggest increases in economic globalization leads states to pursue an antithetical approach towards military capabilities, thereby lending support to the argument that economic interdependence decreases the likelihood of interstate conflict. However, the augmentation of informational globalization appears to validate previous arguments which posit that the prevalence of information technology systems is enlarging the military capabilities of states.

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LIST OF ABBREVIATIONS

CINC	Composite Indicator of National Capabilities
COW	Correlates of War
C^4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
DCA	Defense Cooperation Agreement
GDP	Gross Domestic Product
GNP	Gross National Product
NMC	National Material Capabilities
RMA	Revolution in Military Affairs

INTRODUCTION

The rise of globalization is widely heralded as one of the most fundamental transformations of the 20th and 21st centuries. While the process of globalization is an ongoing historical force, the culmination of communication, transportation, and technological advances have ushered in more academic attention than at previous points in history. Globalization, or the free flow of trade across global markets, has led to a myriad of profound changes within the international system. For instance, in 1999 only 4.0% of the total global population had reliable access to the internet, whereas today that number has risen precipitously to 48% (Individuals Using the Internet 2019). Telecommunications is another sector of technology that has grown rapidly in the past decade; in the United States, 96% of Americans own a cell phone (Demographics of Mobile Device Ownership 2019). Some of the world's largest multinational corporations (MNCs) are those which offer internet or telecommunications services. Writing in 1999, Kenneth Waltz stated, "one feels that the world has become a smaller one. International travel has become faster, easier, and cheaper; music, art, cuisines, and cinema have all become cosmopolitan in the world's major centers and beyond" (1999, 693). A significant portion of past research focuses on the impact of globalization and the spread of socio cultural values throughout the world, with special attention devoted to states in the developing world (Mistree 2017). Less studied, however, is the relationship between globalization and military capabilities. In this study, I hope to rectify this deficiency in

the academic knowledge by arguing and testing that more globalized states tend to represent a larger portion of the world's military capabilities.

Previous research concerned with globalization and military power focused on the effects of military spending on economic growth (Galvin 2003; Yakovlev 2007). Others have observed the connection between increased military spending and militarization, finding that globalization is at least partially responsible (Staples 2000; Acemoglu and Yared 2010; Irandoust 2018). While these studies have been beneficial for expanding our knowledge on these topics, little has been said about the effects globalization has on the development of military capabilities. Those who have covered this topic typically link increasing military capabilities to the Revolution in Military Affairs (RMA), which has been gaining momentum as a field of study since the 1950s. For the United States, "Korea reopened the budgetary taps and initiated a period of heroic technological ventures. A continuing push for superior weapons to offset the numerically larger ground forces of the Soviet Union replaced the attritional strategies of past US wars" (Alic 2007, 29). Crucially, the role that IT-based networks and weapons played in the success of allied troops during the 1991 Persian Gulf War followed this RMA. The effects of these weapons and technologies remain widely debated by military practitioners and academics alike regarding its implications on future iterations of military capabilities (Biddle 1996; Mahnken and Watts 1997; Cordesman 2014). The continual integration of information technology systems into 21st-century militaries has reignited the RMA debate about the future of war. Integrated command, control, communications, computers, intelligence, surveillance, and reconnaissance (C^4ISR) networks coordinate troop movements on the battlefield. Fourth-generation fighter aircraft equipped with supercomputers capable of

processing more than 87 billion instructions per second, dominate the skies of aerial dogfighting ("F-15's New Advanced High-Speed Mission Computer" 2016). Nuclear powered aircraft carriers accompanied by surface warships with advanced radar control suites coordinate oceanic combat and peacetime humanitarian operations. Ironically, some who have first-hand experience with advanced military capabilities in combat are also the same people who warn against relying too heavily on them in military operations ("A Conversation with Lieutenant General" 2014). Likewise, others argue that weapon systems alone, no matter the level of technological sophistication, do not provide states with a guaranteed formula for success. Only when these systems have been wedded to much larger theories of strategy and policy can objectives combine to form a coherent approach to international conflict (Gray 1993). While these arguments are important for understanding resistance to the RMA, they do not provide answers as to why states continue to invest large sums of money and energy into developing and adopting new military capabilities.

There are numerous reasons that explain why a state might seek to expand on its existing military capabilities by adopting an innovative piece of technology. Strategic necessity, international norms, offense-defense considerations, cultural openness, the need for interoperability with allies, and national growth are some of the main considerations of states when deciding to pursue a major military innovation (Goldman and Andres 1999; Horowitz 2010). Realists center their explanations concerning the spread of military capabilities often on the desire of states to maximize security and insulate themselves from potential threats. The cultural similarity between states, particularly allies, may also drive a state towards pursuing an expansion in its military

capabilities (Young 2003). However, there is a common thread that links these theories together, and that is diffusion. The process of diffusion emerges as a more likely explanation, since technological improvements of the past several decades mean information is communicated expeditiously to attentive actors in the international system. Both Goldman and Eliason (2003) and Horowitz (2010) have linked the concept of diffusion to military capabilities. The work of Goldman and Eliason (2003) merges theories concerning the RMA with historical examples of specific military innovations, painting a broad picture about the diffusion of military capabilities over time. For instance, Chris Demchak's essay on the global diffusion of the information technology-based military model suggests the future path of the world's modernizing nations is being led by the field-defining actions of the US military's ambitious plans, budget size, defense industry support, international visibility, and the speed and ease of global commercial communications (Demchak 2003). This closely aligns with previous theories that proclaim that states tend to emulate the successful patterns of others (Waltz 1979). The work of Horowitz (2010) offers the adoption-capacity theory as an explanation as to why certain states succeed in adopting innovative military capabilities where others fail. Horowitz identifies the organizational capacity of a state and financial intensity of weapons programs as playing a key role in determining the spread of these capabilities over time. These studies on the diffusion of military power provide a solid foundational analysis to build upon. I believe that more globalized states tend to represent a greater share of the world's military capabilities, suggesting that they are more likely to adopt innovations and spend more on their militaries in the process.

In this manuscript, I find that economic globalization negatively correlates with military capabilities, while informational globalization positively correlates with military capabilities. These results suggest that there are differentiating factors that contribute to whether states can increase their share of global military power. Bearing this in mind I proceed as follows: First, I start by examining what the literature says about globalization, military capabilities, and the diffusion of innovations with respect paid to the diffusion of military power. Tracing the historical roots of globalization will help give us a better idea about how it has progressed to become one of the most studied topics of academic inquiry in the past half-century. Next, I observe arguments pertaining to economic interdependence and globalization, which suggest a decline in the frequency of interstate wars. This leads me to explore the different methods of measuring military power, since a vast gulf exists between those who argue in favor of outcomes and those who argue in favor of the quantifiable attributes of a state's military forces. Next, I turn to the studies on innovation, diffusion, and the role of military doctrine in expanding military capabilities. Once I address these arguments of the literature, the next sections cover my quantitative analysis. The methodology section conducts quantitative analyses using measures of capabilities and spending as a function of globalization. Together, this data covers all states in the international system for the period of 1970-2011. The subsequent sections discuss the results and conclusions of these tests.

LITERATURE REVIEW

The Roots of Globalization

In its most simplistic form, globalization "is generally understood to include two inter-related elements: the opening of international borders to increasingly fast flows of goods, services, finance, people and ideas; and the changes in institutions and policies at national and international levels that facilitate or promote such flows" (World Health Organization N.d.). Although one is likely to encounter minor differences in definition within the literature on globalization, the consensus is one that stresses the opening of markets to the world. In political science literature, globalization studies now constitute a major portion of the extant research. In order to make better sense of this research, some have sought to add qualifying terminology to delineate between the several fields of emphasis. For instance, the globalization of markets and trade refers to economic globalization. As a field of study economic globalization now covers everything ranging from the economic policies of the developing world (Arndt 1999) to studies on the increasing role of Multinational Corporations (MNCs) in the international economy (Mathews 2006). Alternatively, differences among political systems, notably the spread of democracy, refer to political globalization. And, if one is interested in studying the uniqueness of cultures then we could say it would be beneficial for them to refer to the literature on cultural globalization. Therefore, tracing the historical roots of globalization will help illuminate some of the complexities surrounding this topic.

That globalization is not a new phenomenon is widely agreed upon, however, less agreed upon is the point in history where globalization became a topic of widespread recognition (O'Rourke and Williamson 2002). Some trace globalization back to the empires of antiquity, such as that of the Romans, who traded with their immediate neighbors in Europe (Geraghty 2007; Pitts and Versulys 2014). A disparate view links the rise of globalization to the 19th century (Buzan and Lawson 2013). Still, others argue the period from 1870 to 1914 represented the high-water mark of globalization (Daudin et al 2008). The majority, however, agree that the first wave of globalization ended at the onset of WWI in 1914 (Daudin et al 2008; Ortiz-Ospina, Beltekian, and Roser 2019). Nonetheless, first-wave globalization is widely recognized as having major implications on future iterations of globalization. Indeed, the global order of things such as they exist today is an extension of the economic, political, and social events of these earlier periods. However, it is also important to realize as a field of study globalization had been widely overlooked until the end of the Second World War.

The second wave of globalization brought with it the rise of a new superpower, the United States, and a global order largely crafted in its own image. This image values free trade, liberalism, and the spread of democracy to distant regions of the world. The postwar years saw countries rebuilding the global economy and a large effort to establishing international institutions and agreements that sought to increase the free flow of trade across global markets (Horowitz 2004). For instance, The United States and its allies established the United Nations (UN), the International Monetary Fund (IMF), and the General Agreement on Trade and Tariffs (GATT) before 1950. The second wave of globalization has also been described by some scholars as the 'long peace' due to the lack

of major interstate war during its existence (Gaddis 1986). Institutions and agreements, like the ones mentioned above, have also helped create an international environment conducive to the spread of information and technology. However, as a concept, globalization remained largely understudied well throughout the 1950s. It is not until the 1960s that we finally get a concrete definition of globalization added to most dictionaries (Waters 2001; James and Steger 2014). Yet, even as economic growth continued to expand well throughout the 1960s and into the early 1970s, globalization remained as a field of study, frequently overlooked.

The 1990s onwards marked a major shift in globalization trends. The amount of published scholarly work on the subject rose by astronomical rates. For instance, published scholarly articles that include the word globalization for the period of 1950-1989 is just 741, compared to 94,766 for the period of 1990-2019. This period is also highly relevant to the study of globalization because the rapid spread of information technology systems increased the speed and ease with which international trade and commerce was conducted. The work of Roser and Ritchie (2019) maps out the technological progress and sophistication of these systems over time. The current era of technological globalization is sometimes referred to as the age of informatization, or "the process through which new communication technologies are used to further socioeconomic development as a nation becomes more and more an information society" (Rogers 2003, 71). But, informatization stretches beyond merely the commercial aspects of technology diffusion. As Arquilla (2003) puts it, "advanced information technologies clearly improve productivity and profitability, but they are almost all inherently 'dual-use'-that is, they can generally be used for a wide variety of military activities, from

improving long-range missile guidance systems to facilitating the design and manufacture of better hardware, such as tanks, planes, and even submarines" (349). In 2004, China altered its military strategy to reflect the growing importance of informatization in war, "through the application of information technology to all aspects of military operations, including sensors and electronics on weapons systems and platforms, automated command and control systems, and nonlethal information operations [such as information, cyber, electronic, public opinion, psychological, and legal warfare]" (Fravel 2016, 219). The United States military currently operates numerous different types of aircraft that make use of these dual-use technologies. Perhaps most important to the success of US military operations are its advanced command and control aircraft. Some of the most notable types are the Boeing RC-135 Rivet Joint, with an onboard sensor suite, which allows the crew to detect, identify, and geo-locate signals throughout the electromagnetic spectrum (2012); the Boeing P-8 Poseidon, which possesses an active multi-static and passive acoustic sensor system, inverse synthetic aperture radar, new electronic support measures system, new electro-optical/infrared sensor and a digital magnetic anomaly detector (2019); and most infamously the Boeing E-3 Sentry AWACS (Airborne Warning and Control System), with a mission suite that includes more than 13 consoles capable of displaying computer-processed data in graphic and tabular format on video screens (2015). Advances in American weaponry and others like these represent the global transition from the industrial revolution to the information revolution. Max Boot (2006) argues this point precisely as he traces the evolution of commercial technology and its application in modern system militaries. "Commodities such as microprocessors, the global positioning system (GPS), and wireless telephony, have all

been incorporated to some degree in military platforms by the world's leading superpower, the United States" (2006, 309). This provides America with a notable qualitative advantage over hostile armed forces stuck in the ideological and strategic dispositions of the industrial age. However, as other countries continually pursue attempts at frustrating and negating the advantages of the US military, the spread of these systems has increased rapidly over the past few decades. More importantly, few states show any signs of potentially halting their weapons programs focused on researching the progression of these advanced capabilities. In this way, globalization is having a tremendous impact on the quality of weapons by increasing their levels of accuracy and lethality; ramifications that are explored later in this paper. For now, I turn to the literature on globalization and economic interdependence.

Economic Interdependence and National Security

Prior to determining the best method for measuring military capabilities for my study, I need to first address arguments which challenge the notion that military capabilities are the predominant metric that states use to gauge the intentions of others in the international system. Globalization has no doubt increased trade between states and across them through a variety of public and private diplomatic channels. Supporters of the economic interdependence theory find that globalized trade and monetary vulnerability explains why states are less likely to fight costly wars. Although it is true that globalization has driven the economies of countries closer together, critics of interdependence believe that states still focus on their domestic economic and political needs, even to the neglect of the world system and occasionally to peace.

As the world approached the end of the 20th century, economic expansion reached new heights following the dissolution of the Soviet Union and the incorporation of numerous eastern European countries into the global economy. Notably, Francis Fukuyama (1989) believed that the collapse of the Soviet Union signaled 'the end of history' since liberal democracy would eventually come to be the predominant form of governance. Globalization studies of the 1990s and early 2000s reignited interests in academic circles about theories pertaining to the increasing prevalence of international cooperation and economic interdependence between states. As in, supporters of interdependence see conflict as less likely because of the costs associated with fighting (Gartzke 2007). It is worth examining these arguments, because they challenge the belief that states base their international economic and political choices upon domestic preferences.

The work of Russett and O'Neal (2001) expands on the idea of economic interdependence, by proposing that it forms one of the three foundational elements for Kantian Peace thereby decreasing the likelihood of interstate war. Following the logic of Kant, they state:

> democracy, by its recognition of individual liberty and responsibility, encourages entrepreneurship and the expansion of commerce, ultimately beyond the boundaries of a single state. As the economic activities of citizens make countries more and more interdependent, there is an increasing need for institutions that can regulate and facilitate trade and investment. Thus, international law and institutions are established in response to the actions of the citizens of democratic states pursuing their interests over a constantly expanding

> geographical area. The three elements of the Kantian peace are, therefore, part of a whole that contributes to a stable peace (Russett and O'Neal 2001, 157).

The three factors work towards creating an international environment free of vicious cycles and instead, attempt to create a virtuous cycle out of international interactions. Over time, increased interactions contribute to reinforcing the virtuosity of the system and help promote peace, ultimately reducing the likelihood of interstate conflict.

Yet, Waltz (1999), through the lens of neorealism, contends that the actions of states very much do matter in determining the outcome of international political events. Rather, domestic political choices have a major influence on international economic globalization, not vice versa, as some interdependence theorists might suggest (Waltz 1999; Hiscox 2010). For instance, were the world as globalized as advocates of interdependence theory maintain, then one should expect the ease with which trade is conducted domestically to be equivalent to what it is internationally. Yet, this has not always been entirely true,

> U.S. output is about one-fourth of gross world product. The output of producers in other countries is thus about three-fourths of gross world product. If Americans were prone to buy goods and services from foreign producers as easily as from domestic producers then foreign products would constitute a share of US spending equal to that of the spending of the average resident of the planet. The US import-GDP ratio would equal .75. The same would be true of the US export-GDP ratio. And yet these ratios are only about one-sixth of this hypothetical level. In other words, globalization would have to increase another six-fold, as

> measured by the trade ratio, before it would literally be true that Americans did business as easily across the globe as across the country (Frankel 2011, 308).

The rise in economic interdependence or globalization over time has not altogether prevented states from continuing to pursue radically different domestic policies, some of which have contributed to damaging the international system. Using WWI as an example, Waltz shows that mere economic interdependence alone was not enough to prevent the states of Western Europe from going to war in 1914. Additionally, Barbieri (1996) finds that increased levels of economic interdependence between dyads increases the likelihood of militarized interstate disputes. The results of these studies suggest that domestic political considerations play a dominant role in the international ambitions of states. Additionally, it suggests that economic interdependence alone does not appear to be enough to prevent states from occasionally perceiving the utility associated with the use of armed violence.

Economic interdependence theories offer a mixed bag of conclusions concerning the possibility of interstate conflict. Copeland (1996) adopts an approach that argues both liberal and realist explanations fail to account for why states choose to go to war when economic interdependence is high, or abstain from war when interdependence is low. As such, Copeland combines the two positions to create "a consistent deductive theory of state decision-making showing the conditions under which high interdependence will lead to peace or war" (1996, 17). Under this new theory, he posits that states expecting high levels of trade to continue well into the future will be less likely to sever ties and view dependence as threatening to their security. However, should a state find itself in a position wherein future trade could decrease, and thereby amplify the effects of

dependence, war may be the more likely outcome. Although Copeland's approach is novel in the sense that it acutely blends both theoretical perspectives regarding economic interdependence, it suffers from its own setbacks. A major problem with Copeland's theory is that it relies heavily on the availability of perfect information about actors' preferences. Often, this type of information is only available ex post, making it difficult to predict state desires in a contemporaneous setting.

The proposition that states with higher levels of trade and integration to the world economy are less likely to become embroiled in conflict is a theory that finds ample support within the political science research. However, it is not without its limitations, namely because domestic political actors have a significant say in the economic policies of their respective countries. The results of these studies suggest that experts are divided on the topic of interdependence as a stabilizing force in international relations. It is true that globalization has increased rapidly in recent decades and contributed to increased levels of interdependence, especially among most the world's democracies. However, the potential for violent conflict persists as a reality of the international environment, thus it remains crucially important to account for the differences in military capabilities between states.

Measuring Military Capabilities

The military capabilities of states, like any other unit of analysis in the international system, are constantly being compared to one another. For instance, during the height of the Cold War, the United States Defense Intelligence Agency (DIA) released yearly reports of Soviet military capabilities from 1981 until the collapse of the Soviet Union in 1991 (DIA 2019). In 2018, the DIA began publishing a yearly catalog on

China, now commonly seen as the rising hegemonic power in Asia, and its increasingly diverse assortment of weapons (Garamone 2019). Since 1959, The International Institute of Strategic Studies (IISS) has been releasing an annual assessment of the military capabilities for 171 countries from around the world (Sixty Years of the Military Balance, 2019). Military capabilities occupy a unique position within international relations because capabilities are a crucial determinant for the balance of power between states. As Waltz suggests, "The most important events in international politics are explained by differences in the capabilities of states, not economic forces operating across states or transcending them" (2000, 52). But how does one go about properly measuring military capabilities? What are the types of power, and more importantly, what does it mean to have power over others? What are the most important factors to consider when attempting to accurately evaluate the military capabilities of a state? Is it troop performance, the sophistication of military technology, the latent production capacity of a state, or a combination of these factors that form the foundational basis of power? These questions and more are the driving force behind many of the disagreements that populate the literature on military capabilities. To answer these questions, I start by examining the different types of power states possess and whether these can translate into political outcomes.

A state has access to a wide variety of tools to help it achieve its foreign policy goals. The single most prominent tool is military power because it affords states the possibility to coerce opponents. To accomplish this task states can use military power either implicitly or explicitly. Art (2015) provides a convincing comparison, "the war-waging use of military power is akin to a powerful flood: it washes away all before it.

The peaceful use of military power is akin to a gravitational field among large objects in space: it affects all motion that takes place, but it produces it affects imperceptibly" (3). Military power is the cornerstone upon which international relations is built and manages most interactions between states in the system. A state's primary concern pertains to matters of its own security; therefore, it is keenly aware of the military capabilities of others, especially potential adversaries. However, accurately gauging the capabilities of others is a difficult task because military power takes on a variety of different forms and has an equally wide range of applications. The use of military force need not always be explicitly ordained in the deployment of troops, ships, or aircraft to hostile territory. Instead, states can express military power implicitly through diplomatic channels or internationally recognized threats. Realist arguments stress the use of hard power, while liberals tend more towards those of soft power; both play an important role in international relations.

Advocates of soft power present it as providing elements of utility not always available to strategies that emphasize solely a hard power approach (Nye 1990, 2011). The benefits of soft power are that a state may successfully achieve its foreign policy objectives without needing to expend many resources or energy to do so. Nye (2011) envisions soft power as having the ability to either directly or indirectly influence international outcomes. In a scenario where soft power has a direct influence, Nye argues that the actions of one elite decision-maker can persuade another politically important figure to undertake a specific action in response. In this example, the relationship between elites is critically important because the message is directly from one head of state to another. An indirect use of soft power attempts to influence public and third party

attitudes rather than the opinions of an elite. However, these forms of soft power are heavily reliant on the ability to wield diplomacy with a level of adroitness, often not found in most political leaders.

The benefits of a soft power approach are well documented but neglect to mention some of its limitations. For instance, soft power often works best when two actors share a similar cultural or historical connection, an absence of such a connection can make it difficult for important figureheads or populations to connect on important issues. This is a fact that even Nye concedes. He states "thus, a given cultural artifact, such as a Hollywood movie that portrays liberated women acting independently, may produce positive attraction in Rio but revulsion in Riyadh" (2011, 93). Furthermore, the utility of soft power is largely context-specific, meaning there are periodically instances in history where it is of no benefit whatsoever. Recall for a moment that the nature of the international environment is competitive and states sometimes resort to the use of force or violence to achieve their political goals. In such cases, undesirable states or leaders act with malign intentions and brutality to subjugate innocent populations. Military hard power, whether by economic sanctions or tactical combat operations, may be the only plausible course of action in such a scenario. As Colin Gray argues, "there are conflicts that cannot be resolved politically, sufficiently alleviated by diplomacy or any other non-military means, or settled by some tolerable compromise" (2011, 47). Therefore, "in a world in which states must still ultimately look to their own defenses, 'hard power'—the capacity to coerce, deter, defend, and destroy—remains the essential currency of international politics" (Friedburg 2012, 215).

There are also wide-ranging disagreements concerning the proper way to quantify military capabilities. Those who argue in favor of measuring capabilities as outcomes do so because it combines elements of utility often not captured by measures focused solely on measuring weapon and troop preponderance. Defining power in terms of outcomes often means including non-material factors such as troop morale, cultural identity, tactical training, and education levels, all of which can have a significant effect on determining whether a military is victorious in battle. For instance, Kenneth Pollack's excellent examination of Arab military ineffectiveness is best explained, not by military doctrine or material capabilities, but rather by the culture of Arab armed forces (Pollack 2019). One of the foremost pieces on military outcomes is Stephen Biddle's *Military Power: Explaining Victory and Defeat in Modern Battle* (2004). The main premise of Biddle's book is that previous explanations pertaining to battlefield outcomes do not provide a definitive answer to questions regarding what makes some militaries more powerful than others. Neither the theories that stress numerical preponderance nor those that observe the relative sophistication of technology can account for why weaker states occasionally defeat far stronger and better-equipped powers in war. Instead, Biddle argues that it is how forces are deployed onto a battlefield that matters most. In modern war, weapons can more easily defeat poorly organized troops than armies that make use of tactics such as cover, concealment, dispersion, suppression, and other techniques necessary for avoiding large-scale decimation. He argues that:

> a particular pattern of force employment—the modern system—has been pivotal in the twentieth century and is likely to remain so. I argue that since at least 1900, the dominant technological fact of the modern battlefield has been increasing

> lethality. Subsequent technological change has only increased over which exposure can be fatal. To perform meaningful military missions in the face of this storm of steel requires armies to reduce their exposure, and since 1918 the central means of doing so has been the modern system of force employment (Biddle 2004, 2-3).

Through case study and quantitative analysis alike, Biddle finds support for his hypothesis that the technological improvements of the early 20th century onwards "forces armies to maneuver strategically on the battlefield to avoid becoming cannon fodder" (2004, 52). The results of his studies show that force employment is a crucially important aspect that militaries must consider when engaging in combat, especially against a well-equipped and modern adversary. However, since the purpose of my paper is to examine the effects of globalization on military capabilities, it makes little sense to define capabilities in terms of outcomes. Instead, measuring capabilities as the attributes of a state's military and economic forces is a better fit for my model.

A disparate view of military capabilities, though common in the field of international relations, looks to the resources at a state's disposal and compares these against those of others in the international system. Sometimes referred to as latent power or power potential, these measures are usually comprised of factors such as a state's population, wealth, production capacity, military personnel, and other socio-economic factors. Unlike studies that focus on outcomes as a measure of capabilities, this method attempts to provide statesmen and scholars with an accurate approximation of the balance of power between states in the international system during peacetime. An advocate of this approach is John Mearsheimer who argues that states have two types of power, latent and

military. While not synonymous, both measures are important for properly gauging the overall power of competitors. To Mearsheimer, latent power is important because, "great powers need money, technology, and personnel to build military forces and to fight wars" (2014, 55). To do this, Mearsheimer looks to Gross National Product (GNP) as an indicator of a state's latent power. However, there are some potential pitfalls for using GNP, namely because states with similar levels of GNP can simultaneously be at different levels of development. "Previously, China's GNP looked very similar to that of the United States and Japan's, while roughly 10 percent of China's wealth remained tied up in agriculture" (2014, 63-65). When it comes to military power, Mearsheimer believes ground forces to be of the greatest importance for accurately measuring military capabilities, because only states with formidable land power can conquer and control territory. To be sure, he recognizes that air and naval forces are a crucial component of military capabilities, but their mission primarily centers on supporting ground forces.

Mearsheimer's conception of power, both in its latent and military form, closely mirrors the Correlates of War's dataset on National Material Capabilities. The COW (Correlates of War) data looks at six material factors of state capacity: military expenditure, military personnel, energy consumption, iron and steel production, urban population, and total population. Some of these factors overlap neatly with those identified by Mearsheimer as salient to any measure of latent or military power. In fact, the COW dataset expands on the underlying arguments of Mearsheimer and addresses some of the shortcomings associated with his GNP specific approach to quantification. For example, including factors such as energy consumption and urban population allows for a better approximation of a state's level of development. Increases in energy

consumption could be the result of a few things, such as an equivalent increase in population, or more importantly a rise in the proportion of the population that has access to technology that requires greater amounts of energy. Studies on this topic tend to support the theory that higher levels of energy consumption are analogous with increases in economic growth (Dolgopolova, Muhhamad Hye, and Stewart 2014; Gozgor, Lau, and Lu 2018). Urban population closely ties to development, evidenced by the rapid growth of people across the globe living in urban areas over time (Spence, Annez, and Buckley 2009). According to the United Nations, "the urban population of the world has grown rapidly from 751 million in 1950 to 4.2 billion in 2018" (68% Of The World Population, 2018). This leads me to believe that higher levels of energy consumption and urban population are sufficient measures of latent power. The COW dataset also contains relevant measures pertaining to military power, including the important component of military personnel. Although there is a minor difference between the COW measure of military power and Mearsheimer's interpretation, the two are still closely linked. Unlike Mearsheimer who believes in measuring military power solely in terms of a state's ground forces, the COW dataset on military personnel covers all branches of a state's military. However, this should not be much of a problem for measuring the size of a state's ground forces, because it is unlikely that states with large air and naval forces would have a miniscule army by comparison. Overall, the COW data provides a good measure of power since it controls for several important explanatory factors regarding military capabilities, and more importantly address some of the deficiencies associated with a single-variable approach to measuring military capabilities.

For modern states, military capabilities remain the essential currency of foreign policy. States with greater levels of military power, both hard and soft, have access to a wider variety of options when dealing with other actors in the system. To be able to influence the actions of others without directly deploying troops is an art of power that not all states have mastered yet. As such, the tangible elements of military capabilities in the form of ground troops, aircraft, tanks, submarines, and destroyers are some of the most potent forms of military hard power currently available. The mere presence of these systems and forces can make states behave with a degree of caution. Capturing the difference in aptitude between militaries is often a difficult task, especially in the absence of combat outcomes that can provide us with discernable conclusions about the balance of power. However, as political scientists like John Mearsheimer have shown, it is possible for states to approximately assess the relative power of others without needing to engage in war to do so. But what explains why these capabilities spread throughout the international system? What is the process by which they spread from one state to another in a different corner of the globe? The literature on diffusion provides a perspicacious examination of these questions.

The Diffusion of Military Capabilities

Existing research on the spread of military capabilities tends to focus on the proliferation of nuclear weapons following the end of World War II. A great many debates have been had on the threat nuclear weapons pose to the stability of the international system (Gartzke and Kroenig 2009; Sagan and Waltz 2013; Bell and Miller 2015; Sechser and Fuhrmann 2017). The developments of the late 1960s and the signing of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) also suggests that the

development of nuclear weapons is not inevitable. Further, proliferation studies tend to focus solely on nuclear weapons—evidenced in the historical comparison between American and Soviet nuclear arsenals—to the neglect of relevant conventional military capabilities (Santoro 2005, 2006). Thus, diffusion, which focuses on the spread of any novel technology or idea, provides a better fit for studying the spread of military capabilities. The preeminent scholarly work on the process of diffusion comes from Everett M. Rogers *Diffusion of Innovations* (2003). In his book, Rogers defines diffusion as the process by which "(1) an *innovation* (2) is *communicated* through certain *channels* (3) *over time* (4) among the members of a *social system"* (2003, 11). At first, a singular actor will invest in researching and developing an innovation. Once the innovation is communicated to other members of the social system, a take-off period occurs whereby more actors begin to adopt the technology. As the popularity of the innovation increases over time, so too does the number of users. Eventually, it reaches most actors, which leads to a gradual tapering off as it becomes more common. It is worth focusing with greater attention on the second attribute of Rogers's definition, namely how information is communicated to other actors in the social system. Rogers states, "mass media channels are usually the most rapid and efficient means of informing an audience of potential adopters about the existence of an innovation—that is, to create awareness-knowledge" (2003, 18). Globalization has exaggerated this process by creating several new mass media channels that globally broadcast important information about another state's capabilities in a near instantaneous manner. This is especially true when speaking of military capabilities and defense related issues. Although other actors may not know the details of a new weapons systems at first, the very existence of a new weapon may

lead other countries to pursue parallel capabilities. Thus, the proliferation of mass media in the era of second-wave globalization, whether through internet or wireless telephone channels, is likely to have a profound impact on how states manage their own military capabilities in relation to those of others.

The process of diffusion as depicted by Rogers is evident in historical examples regarding the spread of military technology, ideas, strategy, and capabilities. For instance, Emily O. Goldman and Leslie C. Eliason's *The Diffusion of Military Technology and Ideas* (2003) which includes, Thomas Durell-Young's study on cooperative diffusion through cultural similarity and Thomas Mahnken's chapter on the diffusion of blitzkrieg strategy during World War II is representative of this relationship. Additional studies such as Michael Horowitz's *The Diffusion of Military Power* (2010), helps build on previous research by creating a theoretical framework through which the diffusion of military capabilities can be studied more intensely over time. This framework, proposed by Horowitz, focuses on two factors critical for determining whether a given military innovation will diffuse throughout the international system. First, the financial intensity associated with pursuing an innovation may hinder the diffusion process.

The costs associated with building and maintaining military capabilities in the modern system are exorbitantly high. Developing entirely new capabilities is a high-risk, high-reward enterprise that requires a great deal of investment for potential gains to be realized. The United States F-35 fighter program has attracted a significant amount of controversy due to its projected lifetime cost, which amounts to roughly $1.196 trillion spent over the course of six decades (Capaccio 2019). Considering the rate at which technology continues to proceed, the more than one trillion-dollar stealth fighter program

risks becoming obsolete prior to its estimated deadline. Technological improvements in over the horizon radar (OTHR) and hypersonic missiles create a threat environment that almost entirely negates the preexisting advantages of the F-35 (Speier, Nacouzi, Lee, and Moore 2017; Yoshihara and Holmes 2018). The contemporary nature of these weapons systems means most are extremely financially exhaustive to produce, requiring states to spend a greater amount on their military in the process. To further put current global military spending into perspective, the $1.822 trillion spent in 2018 works out to roughly $4.9 billion spent each day (SIPRI 2019). Financing a capable and well-equipped military in the modern system can be extremely burdensome, especially for states with limited economic potential. Therefore, wealth and population are imperative factors to consider in any study measuring military capabilities. As such, high costs associated with many of these programs serve as an impediment to the spread of these systems globally. This is precisely one of the main considerations of Horowitz's adoption-capacity theory. The costs of adopting a military innovation may prevent a state from doing so, even if it can identify the benefits of acquiring the innovation. This leads Horowitz to hypothesize "the greater the financial intensity required to implement the innovation, the slower the spread of the innovation at the system level and the lower the probability that a state will attempt to adopt the innovation" (2010, 39). Through case study analysis, Horowitz can conclude that financial barriers prevent states from adopting costly weapons platforms. Legacy weapons like aircraft carriers pose a substantial challenge to states due to the immense amount of financial capital and investment required to produce such systems.

Additionally, Horowitz (2010) believes that the organizational capacity of states can serve as an impediment to the diffusion of military capabilities. This argument

closely aligns with those who posit that military doctrine prevents militaries from adopting new strategies or weapons. Governments are populated by a diverse set of organizations and individuals with interests often closely aligned to the policy preferences set by the government itself, the military included. In democracies, civilian oversight of the military can sometimes lead politicians to have an even greater influence on the organizational doctrine of the armed forces. For instance, the United States Senate Armed Services Committee frequently holds hearings concerning matters of national security strategy, foreign threats, and defense spending among other relevant topics. The implications of such hearings are that US military generals and admirals must be acutely aware of their government's preferences and prepared to rationalize how new capabilities coincide with their government's interests. Hence, "Now as always, the most important problems are not tactical but strategic and political. Over what issues, and where, should we be prepared to threaten the use of military force? What kinds of military judgments are reasonable in a nuclear age? These and other questions of like moment will determine the major parameters within which major weapon-systems choices will be made; but far more important are the effects of the pertinent answers upon the life and well-being of the state" (Brodie 1976). Most military doctrines are molded by the immediate threats a state expects to face soon, making sure that the programs and weapons required to do so are in-line with government interests. However, not all military doctrines form a rigid and intransigent ideological conviction regarding such matters. Rather, militaries much like the governments they serve, have some degree of decisional latitude. Just as a government can support and pass a new tax policy, so too can militaries invest in a new weapon or strategy. Therefore, it is helpful to think of militaries as existing within the

structure of a government, bound to some degree to pursue its initiatives, but not without its own ability to experiment. To think of a military as an entirely archaic and immovable force would be to miss much of the inventive characteristics of this organization.

Yet, Posen (2015) argues militaries are unlikely to deviate from an established doctrine because a process of institutionalization gives its members an incentive to preserve things as they currently exist. To Posen, this means innovations will rarely be sponsored by the organization itself, since innovations potentially threaten the established organizational rules. However, one reason militaries may innovate despite internal pressure not to, must do with how loosely the organizational doctrine is structured. All organizational doctrines, be they military or business, operate based on a set of rules meant to guide their members in completing certain duties critical to the success of the institution. This is known as critical task focus; the more loosely defined the critical task the easier it should be for the organization to incorporate new ideas. As Horowitz (2010) explains, "the more specifically a military organization defines its critical task, the harder it should be for a military to adopt an innovation. An organization with a broader critical task focus will find it easier to justify, within the organization, how the innovation fits within the regular 'actions' of the organization" (2010, 36). Rogers (2003) uses Lockheed Martin's famed skunkworks weapons laboratory as an example of how states bargain to maintain organizational doctrine whilst simultaneously balancing research and development needs without sacrificing either. He argues, the bureaucratic rigidity of the US military's established doctrine has not been extremely conducive to the experimentation of new weapons systems, but it has allowed for some leniency historically. "A skunkworks provides a means of getting the best of both" bureaucratic

stability and innovation (2003, 150). This is the same skunkworks that manufactured the highly influential F-117 Nighthawk, which was instrumental in the success of allied airpower during the 1991 Persian Gulf War. In describing the production of the F117, Boot writes, “the stealth work cut through normal Pentagon red tape. The first prototype of the first F-117A stealth fighter was ready to fly in 1977 and the first production-line model was delivered in 1981-a remarkably fast procurement cycle” (2006, 328). This example shows how states are sometimes capable of managing both military doctrine and researching innovations.

Moving the Research Forward

The literature on globalization, interdependence, military capabilities, and diffusion are linked in ways that past research has neglected to explore fully. Historically, studies on globalization have focused on tracing its lineage over time, documenting its idiosyncrasies across a wide range of topics. For instance, an attribute of the second wave of globalization is increased economic, democratic, and institutional interdependence which leads some scholars to suggest that interstate war is decreasing in likelihood, as domestic political needs become subservient to international outcomes. Yet, it is quite clear that states still focus primarily on domestic considerations first, prior to acting upon their international ambitions (Waltz 2000). The powerful influence that domestic considerations play in world politics means that states find utility in investing heavily in military capabilities. Some actors find greater benefit in the methods of soft power, while others contend that there is no substitute for hard power in the form of overt coercion or military force. However, an extremely tactful political leader is likely to make good use of both strategies, skillfully maneuvering from one to the other as the situation warrants

it. Yet, how does one measure military capabilities? Like the division between soft and hard power, political scientists argue from two diametrically opposed perspectives on how best to capture the military capabilities of a state. To measure capabilities through battlefield outcomes is beneficial because it separates the truly powerful from the weak. War is a rare occurrence in international relations and its presence helps politicians, generals, and academics alike separate the adept military forces from the inept. A second approach to measuring military capabilities stresses the econometric factors of state capacity that go into building strong military forces. These factors are helpful for gauging the approximate power of the actors in the international system during peacetime. Finally, the spread of these capabilities over time has been helped along by the process of globalization and the rise of information technology networks such as the internet. The research has shown us that states may occasionally experience hurdles when attempting to innovate militarily, but these can be overcome by ascertaining how new capabilities fit within the existing parameters of a state's military doctrine. Together, these studies highlight how globalization works to foster an international environment conducive to the spread of wealth and technology, two features paramount for building an adept and modern military fighting force.

THEORY AND HYPOTHESES

The study of political science is characterized by an abundant number of theories that offer differing and insightful approaches to domestic and international issues. For international relations scholars, the theories of realism, liberalism, Marxism, and constructivism are some of the most established doctrinal approaches. Of these theories, realism is a dominant and recurrent method of study with a substantial body of research underpinning its arguments. The utility of realism, in its various forms, is its unique ability to explain in clear and concise terminology the relationship between the actions of states and international outcomes. However, this approach to international relations theory is sometimes cited by critics as being overly simplistic and rigid in its characterization of how states view the international system. This is because realist arguments concerning state actions center on the premise that states are fundamentally concerned about matters of their own security (Waltz 1979; Mearsheimer 2001). Further, realism stresses that the absence of an overarching global politico-military authority capable of punishing malevolent actors, accentuates the self-reliant nature of international relations. As such, states will do just about everything within their faculty to increase their share of power and security. Hence, it becomes easy to see how military capabilities factor in as a crucial component that states use for evaluating the complexion of the international environment. My analysis operates in accordance with realist assumptions about international relations, by arguing that states will pursue increases in military capabilities whenever possible as a means of enhancing their security. Consequently,

there are a few reasons that lead me to believe that economic and informational globalization have a significant impact on military capabilities.

Principally, globalization correlates highly with economic growth. That is, more globalized states on average tend to be wealthier than their less globalized counterparts (Rodrik 2018). An increase in industrial capacity and productivity are some of the major factors that contribute to a rise in economic growth. As a state becomes more economically globalized, information regarding more efficient means of production become available. At the same time, these new methods of production are incorporated more broadly into manufacturing sectors, which causes a rise in industrial output. China represents a good example of this relationship, where its rise in steel production corresponds neatly with its rise in economic globalization. “In 2009, China accounted for about 46% of the world’s total crude steel output, which represents a considerable increase from its share of 16% in 1999” (Tang 2010, 4). During that same period of 1999 to 2009, China’s economic globalization increased by 8.41 that was nearly twice the global average increase of 4.96. Yet, why is economic growth, measured in the form of industrial productivity, important for studying military capabilities? Because economic growth generates money, a fungible asset capable of being converted into various other forms of power. In Robert J. Art’s words, “in rank order, the three most fungible power assets appear to be wealth, political skill and military power” (2015, 6). He continues by stating, “wealth is also integral to military power. A rich state can generate more military power than a poor one. A state that is large and rich can, if it so chooses, generate especially large amounts of military power” (2015, 6). This argument echoes that of Mearsheimer’s conception of military capabilities, which is closely linked to the Gross

National Product (GNP) of states, because “a state cannot build a powerful military if it does not have the money and technology to equip, train, and continually modernize its fighting forces” (2010, 61). Given these points, economic globalization should make it easier for wealthier states to shoulder the financial burden associated with equipping modern military forces, by enlarging their financial and capital assets.

However, states may benefit economically from increased globalization, while deciding not to devote a greater amount of money towards defense spending. Rather, these countries may instead opt to spend a greater portion of their wealth on domestic social programs. The decision to spend more on social programs as opposed to defense is known throughout the literature as the guns versus butter argument. It states, that political leaders, constrained by a finite amount of financial resources, must decide between devoting a larger portion of these resources towards defense or social programs. Scholars have explored the relationship and shown empirically to have an impact on defense spending (Allen, Flynn, and VanDusky-Allen 2016). Thus, it may be true that as a state becomes more economically globalized it simultaneously becomes more inclined to spend a greater amount of resources on social programs, not defense.

Moreover, research on the topic of economic interdependence suggests there are reasons to believe economic globalization may negatively correlate with military capabilities. Supporters of this theory find that the more economically globalized states become the more they rely on each other for goods and services important for maintaining economic stability. Additionally, states involved in this process benefit from increasing levels of trade and should therefore be less likely to view conflict as an effective means of achieving their economic or political objectives. Thus, economic

interdependence reduces the need to for states to spend heavily on military capabilities, since all states are better off maintaining the status quo and continuing to trade with one another. Yet, historical examples suggest this theory is not without its limitations. On occasion, economic interdependence has not been enough to prevent major powers from engaging in attritional struggles of extreme interstate violence. Therefore, given that states are primarily concerned about matters of their own security, I expect the following to be true:

Hypothesis 1: Economic globalization positively correlates with increases in military capabilities.

There is also good reason to believe that informational globalization influences the military capabilities of states. An increasingly large portion of global trade now focuses on the production and exportation of advanced information technology networks and components. The spread of these advanced technologies is transforming global trade, and more importantly, the characteristics of modern militaries. In the postindustrial age of military competition, information technology systems are now ubiquitous across the world's major and minor military powers. For instance, "the B2 designed in the 1980s, carries 200 digital processors; a replacement designed today might have 2,000. Pilots will fly the F-35 Joint Strike Fighter with the aid of 22 million lines of code. Software requirements for the Army's Future Combat System have risen to nearly 65 million lines of code, nearly doubling the initial estimate" (Alic 2007, 134). Similarly, Friedburg argues "the enormous advantages that the United States now enjoys are the product of its long-standing lead in the development and deployment of new technologies, and the unmatched ability of its huge and dynamic economy to carry the costs of military

primacy" (2013, 215). These systems have become so important to modern military capabilities, that some experts believe the outcome of the next great power war may depend entirely on which state possesses more of these weapons (Goure 2018).

A secondary pathway may have to do with how information pertaining to military capabilities is communicated in an era of expanding globalization. As mentioned previously, mass media channels are the most effective method of communicating technological innovations to other actors in a social system. Thus, given the rise of mass media channels in the 21st century and the increasingly large portion of the world's population with access to such information, we should expect a development in one state's military capabilities to have a significant effect on actions of other states in the international system. Moreover, because developments as it pertains to military capabilities often have important geopolitical ramifications, states are especially attentive to developments in military technology that could threaten their security. A consequence of this process may be that increased information concerning an actor's capabilities may lead a state to pursue development in a military capability that, until recently, it had no intention of producing. Thus, in the current age of information, characterized by a rise in mass media channels, we should expect such a process to have significant repercussions as it pertains to the military capabilities of states. Given this proposition and what the literature says about the importance of information technology systems to modern military capabilities, I expect the following to be true:

Hypothesis 2: Informational globalization positively correlates with increases in military capabilities.

RESEARCH DESIGN

The empirical section of my study tests my hypotheses by conducting an Ordinary Least Squares (OLS) regression of all states from 1970 to 2011, with standard errors clustered at the state-level. This quantitative approach allows me to determine if there is systematic variation between measures of globalization and military power in the way that my hypotheses predict. To begin, I operationalize the concept of globalization by using the KOF Swiss Economic Institute's data on economic and informational globalization. These two variations of globalization are the key independent variables of my study. The composition of each measure of globalization differs in ways that makes it important to separate the two variables, although I expect both to positively correlate with increases in military capabilities.

The KOF measure on economic globalization is comprised of several different variables, with different weights that combine to form a cohesive measure for economic globalization. First, the data separates economic globalization between de jure and de facto measures. These types of economic globalization are as the labels imply. The de jure economic globalization variable includes tariffs, trade regulations, and international investment agreements; while the de facto economic globalization variable includes trade in goods, trade in services, and foreign direct investment. When further broken down, both economic globalization de facto and de jure are in two subsections. Among these subsections are trade globalization and financial globalization, each weighted 50% so that together they account for 100% of their respective de jure or de facto economic

globalization variable. For this study, economic globalization de facto (*KOFEcGIdf*) is more applicable because it focuses more on the statistical trade and financial measures of states, rather than the legal aspects of economic globalization de jure. In effect, this measures how trade is actually happening as opposed to just measuring the rules that enable it to happen; the former measures activity while the latter would measure rules that have variable implications. De facto trade globalization is decidedly relevant since it accounts for trade in goods, trade in services, and trade partner diversity. As explained previously, we should expect that as states globalize economically, they also become wealthier and more capable of spending large sums of money on defense. The same goes for de facto financial globalization, which considers five variables relevant to this study; foreign direct investment, portfolio investment, international debt, international reserves, and international income payments. Increases in these variables, except for international debt, should also correlate with increases in military capabilities. Thus, the KOF economic globalization de facto variable appears an appropriate measure for economic globalization, especially as it relates to the theoretical underpinnings of my study.

Unlike economic globalization, informational globalization is itself a component of the variable social globalization. Informational globalization is separated into de facto and de jure measures, which consider different elements related to the spread of information. Again, the de facto measure of this variable (*KOFInGIdf*) emerges as the better fit for my study. It is composed of the measures used internet bandwidth, international patents, and high technology exports. Previous arguments concerning the importance of information technology systems to military capabilities make this an appropriate variable. I expect that countries with high levels of all three measures will on

average possess a greater portion of military capabilities, because high levels of each suggest technological prowess. In the current era, states without the ability to develop advanced information technology systems will suffer in terms of capabilities, due to the importance of such technological innovations.

Since scholars often portray military power as a malleable concept capable of varying configurations, identifying a proper quantifiable measure with an equally robust degree of analytical rigor presents a challenge. Some argue that the most advantageous method of measuring capabilities is through observable battlefield outcomes, notably whether a given state won or lost a war (Biddle 2004). However, the problem with this approach is that it relies too heavily on ex post results to sketch an identifiable pattern between military capabilities and battlefield outcomes. Additionally, these studies suffer from a lack of observations that stems from the relative infrequency of major interstate war. Therefore, a better method is one that properly accounts for changes in a state's military capabilities as it reacts to fluctuations in the international environment. Waltz believes the ranks of states in the international system "depends on how they score on *all* of the following items: size of population and territory, resource endowment, economic capability, military strength, political stability, and competence" (1979, 131). Thus, for my main dependent variable, I measure capabilities by using the Correlates of War dataset on National Material Capabilities (NMC) for all states in the international system for the period of 1970 to 2011 (Singer 1987). This data is particularly useful because it accounts for both the preponderance of military forces, as well as other relevant econometric factors of state capacity. The COW data evaluates the national capabilities of a given state in the international system by combining six factors to create a

Composite Indicator for National Capability (*CINC*) score. The six figures are military expenditure, military personnel, energy consumption, iron and steel production, urban population, and total population. Together, these figures provide a rigorous quantification of the elements of state power most relevant to the study of military capabilities. The Correlates of War NMC data is currently the best available measure of capabilities that captures many factors considered important to any study primarily interested in attempting to quantify military power.

One issue with the CINC variable is that it is a proportion relative to all other states within the system. While this has an intuitive appeal for my theory, states should rise in power relative to other states based on their globalizing process, each observation is dependent on other observations and may cause unintended errors in my estimation of a state's capabilities. To test the robustness of my analysis, I alternatively replace CINC scores with military expenditures as a percentage of GDP (*Military/GDP*) for the main dependent variable in my second equation. To accomplish this, I use Kristian Skrede Gleditsch (2002) Expanded Trade and GDP data that covers all states for the years relevant to my study. Measuring military spending as a percentage of a state's GDP is common practice among both the international community and the professional literature on security studies. The most prominent example of this internationally is NATO, which pushes its member-states to spend at least two percent of their respective GDP on defense each year; scholars likewise look at this dependent variable regarding NATO (Allen, Flynn, and VanDusky-Allen 2016). Further, including military spending as a percentage of GDP provides a measure of military spending that is distinct from that which is present

in the CINC variable. If both versions of my dependent variable are significant, then I can reasonably conclude that the results of such relationships are robust.

Additionally, measuring a state's gross military expenditure does not provide an accurate representation of trends in defense spending over time. To say that a state spends more in 2018 on defense than it did in 1985 says little about how much of a state's available resources are being devoted to its military. States that spend a greater portion of their GDP on defense could do so for several reasons, ranging from an increase in militarization internationally to the existence of interstate conflict. States that spend less on defense as a proportion of their GDP may view the international environment as more peaceful, and therefore as a policy matter of secondary importance. Including military spending as a percentage of GDP allows me to identify the rank importance of military expenditure across a multitude of states with differing interests. Second, states with higher levels of globalization typically have higher GDPs, making it easier to increase military spending without having to sacrifice financial capital for domestic political needs. A state with a GDP of $1 trillion that spends 6.0% on its military amounts to $60 billion in annual defense spending, whereas a country like the United States with a GDP of $20 trillion that spends 3.0% on its military amounts to a staggering $615 billion in annual defense spending. This difference in spending allows wealthier states more options for making use of the available funds, including investing in important programs such as research and development. For example, "the $78.1 billion the United States military spent on research and development in 2016 was 25 times the amount spent by the next highest-funder, South Korea; 33 times the amount spent by the United Kingdom; 70 times the amount spent by France; 73 times the amount spent by Japan; and 80 times

the amount spent by Germany" (Sargent 2018). The need to capture military spending as a percentage of GDP is important for illuminating certain aspects of the international environment. States differ geographically, culturally, economically, politically, and militarily; any study that fails to consider these differences would suffer tremendously from erroneous conclusions about the similarities, or dissimilarities, among states of the international system.

To assess further the impact of economic and informational globalization on military capabilities, I include several control variables. First, using the Correlates of War data on interstate war I control for whether a state is involved in an ongoing conflict. This variable appears in the data as (*Ongoing War)*. I expect interstate war to drive expansions in a state's military capabilities to make up for battlefield losses and to ensure its victory. Second, I include a dummy variable (*Cold War*), which codes 1 for any year during the Cold War period and 0 for any year in the post-Cold War period. Military capabilities and expenditures during the Cold War were dominated by the United States and the Soviet Union as the two hegemonic powers vied for influence throughout the world. Therefore, most other states during the Cold War years comprise less of the total global share of military power. This leads me to believe the post-Cold War period should positively correlate with increases in military capabilities, since the fall of the Soviet Union opened new pathways for states to compete for a larger share of the global military capabilities. Next, I control for states that are major powers by utilizing the Correlates of War dataset on State System Membership (*Major)*. For a state to qualify as a major power it "must be a member of the League of Nations or United Nations, or have a population greater than 500,000 and receive diplomatic missions from two major powers" (Singer 1987). I expect

major powers to have a greater share of the global military capabilities, for obvious reasons, such as their tendency to have far larger economies and greater population sizes, both crucial elements for building a solid foundational basis of power. Finally, for the variable (*Defense)*, I use the Correlates of War dataset on Defense Cooperation Agreements (DCA), which is helpful for determining whether states with bilateral defense treaties are more likely to experience increases in military capabilities. Studies throughout the literature on the diffusion of military capabilities suggest that defense treaties increase the capabilities of states through the sharing of information and the need for interoperability. I expect that states with higher DCAs should also see increases in military capabilities. Because I also suspect that the type of governance may have a significant effect on the military capabilities of states, I use data from the Polity IV project that captures the regime type of all states in the international system for the years of 1970 to 2011. "The 'Polity Score' captures this regime authority spectrum on a 21-point scale, ranging from -10 (hereditary monarchy) to +10 (consolidated democracy)" (Marshal, Gurr, and Jaggers 2019). I label this variable as *Polity*) in my models. I suspect that autocratic governments, because of their tendency to exhibit attributes of praetorianism and self-preservation, should correlate positively with increases in military capabilities. Furthermore, because democratic states must balance their military ambitions against domestic political programs, i.e. the guns vs. butter argument, increases in democracy should correlate with a decrease in military capabilities. Lastly, I include a variable for GDP in Models 5 and 6 because I suspect that due to the nature of how CINC scores are measured, doing so will help me determine if there are problems regarding the significance between variables. Notably, because CINC incorporates military

expenditures as part of its formula and is a numerator, this may correlate highly with GDP scores on the opposite side of the equation in the denominator, reducing the significance of several other variables in the process. To capture this variable, I use Gleditsch (2002) Expanded Trade and GDP dataset, with the variable represented in models as (*Log/GDP*). The results of my empirical exercise are presented and discussed in greater detail in the following section.

RESULTS AND DISCUSSION

Table 1 provides the estimations of my OLS models. Models 1 and 2 examine the CINC score as the dependent variable while models 3 and 4 examine defense spending as a percentage of GDP. Further, Models 5 and 6 observe the effects of CINC lagged and Military/GDP lagged with the additional variables Polity and Log/GDP as a test of robustness. Models 1, 3, 5, and 6 use current year independent variables while models 2 and 4 lag all independent variables by one year. The findings of these analyses provide insightful revelations about the effects of economic and informational globalization on military capabilities. Contrary to the first hypothesis of this study, Models 1 and 2 suggest that economic globalization correlates negatively with military capabilities. The implications of this finding are substantial for a few reasons. First, that economic globalization is significant and negative reveals that, as states become more economically globalized, they are less likely to experience increases in their military capabilities. Those who argue in support of the assumption that economic interdependence decreases the likelihood of interstate conflict appear to find validation in this belief. One explanation as to why states' military capabilities may decrease because of increases in economic globalization may be due to changes in the international threat environment. As economic globalization increases within and among states internationally, they are potentially less inclined to view other states as threatening to their survival. Past research demonstrates that among the world's democracies, fighting altogether evaporates as countries align politically and economically (Friedman 1999). Second, these results also lend support to

the guns versus butter argument whereby states choose between increasing spending for either defense or social programs, but cannot increase spending for both concomitantly. The results of my study show that as economic globalization increases the likelihood states will opt for greater spending on butter, rather than my predicted hypothesis that states would use a greater portion of this newfound wealth for increasing defense spending and procuring new military capabilities, bears true.

Alternatively, Models 1 and 2 present the finding that increases in informational globalization correlates with increases in military capabilities. Thus, a one-point increase in informational globalization corresponds with a 0.015 percent increase in military capabilities as captured by the CINC variable. These findings are in line with my second hypothesis, which posits that a rise in informational globalization leads to an increase in a state's military capabilities. This finding emboldens the arguments of past researchers who proclaim that information technology systems are altering the way states go about building military capabilities.

Table 1 The effect of globalization on military capabilities, 1970-2011.

	(1)	(2)	(3)	(4)	(5)	(6)
	CINC	CINC lagged	Military/GDP	Military/GDP lagged	CINC lagged	Military/GDP lagged
KOFEcGIdf	-0.0002416***	-0.000243***	0.0000123	0.00001	-0.0000929*	-0.0000651
	(0.0000642)	(0.0000646)	(0.000076)	(0.0000263)	(0.0000454)	(0.0001823)
KOFInGIdf	0.0001552**	0.0001554**	0.0000957	0.0000974***	-7.57e-06	0.000264
	(0.0000424)	(0.0000429)	(0.0000793)	(0.000026)	(0.000031)	(0.0001564)
Ongoing War	0.0001332	$-8.7x10^{-7}$	0.004262	0.0007919	-0.0023121	0.0017881
	(0.0016222)	(0.0015932)	(0.0056753)	(0.0037349)	(0.0017591)	(0.0038142)
Cold War	-0.0017596**	-0.0017565**	0.0060389**	0.0064655***	0.0001182	0.0055166*
	(0.0007004)	(0.0006871)	(0.0018107)	(0.0008606)	(0.000802)	(0.0027341)
Major Power	0.0188292***	0.0185179***	0.014117**	0.0143018***	0.0131492***	0.0157863**

	(0.0029453)	(0.0028797)	(0.0041606)	(0.0011403)	(0.0031762)	(0.0051434)
Defense Pact	-0.0020198	-0.0020025	-0.0305581	-0.029773***	-0.0040309	-0.0265069
	(0.0013243)	(0.0013181)	(0.0170752)	(0.0066416)	(0.0027369)	(0.0163155)
Polity					9.77e-06	0.0000785
					(0.0001176)	(0.0002948)
Log/GDP					0.0029085***	-0.0025711
					(0.0005741)	(0.0029026)
Constant	0.0098687**	0.0099335**	0.0350699	0.0342182***	-0.0186448***	0.0554318
	(0.0030576)	(0.0030476)	(0.0146776)	(0.0060517)	(0.0048606)	(0.0331441)
N	2218	2162	2046	1991	1799	1722
R^2	0.4999	0.4939	0.1424	0.1436	0.6212	0.1689

OLS coefficients with standard errors clustered at the state-level in parentheses.

*p < .1; ** p < .05; *** p < .01

There is a caveat to these findings: the observable increases/decreases in CINC scores as captured by the commensurate measures of globalization appear small due to the immense number of states in the international system. Because CINC scores spread across more than 190 countries, we should not expect considerable variations in the changes of CINC scores. It would be surprising if states experienced major fluctuations in capabilities because a substantial increase in one state's CINC score would have to be offset by a substantial decrease in the capabilities of one or more states for the same period. Nevertheless, the relationship between informational globalization and military capabilities is positive and significant is a novel finding of this study. Technological innovations, particularly those relevant to military capabilities, do appear to serve in some capacity as force multipliers. That is, when states are willing to invest the time and resources into researching and developing advanced information technology systems, and more importantly, pursue policies that emphasize the critical role of these systems, they are likely to benefit from these capabilities.

To further test the robustness of these relationships, Models 2 and 4 displays the results of the linear regressions with lagged independent variables. The findings of these models are for the most part consistent with those displayed in Models 1 and 3, the only difference being a change in significance for economic globalization when the main dependent variable is military spending as a percentage of GDP. These results suggest that the previous year's economic and informational globalization measures affect the value of a state's CINC score in the current year. However, when the main dependent variable reflects military spending as a percentage of GDP, only informational globalization attains significance. In Model 3, both economic and informational

globalization fail to attain statistical significance. The only variables that reach significance at the 0.05 level are the control variables Cold War and major power. The results of Models 5 and 6 display the finding that polity never achieves statistical significance, while Log/GDP reaffirms my previously mentioned concern that the relationship between CINC scores and GDP washes out the significance of other variables in the equation due to the methodological nature of how each is quantified. Because CINC scores include military expenditures as a component of national capabilities in the numerator, and GDP is capturing the similar measure on the right side of the equation in the denominator, the two variables are highly significant and work to undermine the relationships of other variables.

For most of my models, the defense variable fails to attain significance, with the only exception being in Model 4, where it is negative. This suggests that Defense Cooperation Agreements (DCAs) do not influence a state's military capabilities. While states may strive for interoperability with allies, the results presented here do not lend support to the argument that defense agreements increase a state's military capabilities through information sharing. The Cold War variable is in line with my hypothesis that the capabilities of states decrease for years during the period that was dominated by the two world's leading superpowers, the Soviet Union and the United States. The dissolution of the Soviet Union, and the Warsaw Pact, allowed former Soviet satellite states in Eastern Europe to explore new opportunities concerning their military capabilities, helping them increase their share of global power in the process. That the variable for major powers is positive and significant across all models is unsurprising. On average, major powers tend to represent a disproportionately large share of global military capabilities. Thus, we

should expect these same countries to be most attentive to their capabilities relative to their opponents, especially since major power war remains plausible even in an era of expanding globalization. The lack of interstate war between the world's major powers means the rate at which their share of capabilities will grow is likely to decline in the future as they become more accustomed to dealing with one another on peaceful terms. However, going forward major powers remain likely to represent a disproportionately large share of military capabilities in relation to other states in the international system, due simply to their size and wealth.

Limitations

This study, like most, is not without its limitations. Perhaps the most prominent limitation of this study must do with the variable used to capture military capabilities (CINC) being a zero-sum measure. The explanatory power of my model is somewhat reduced since all states represent a share of the total military capabilities present in the international system in each year. Thus, even if every country in the system increased its military capabilities over a one-year period, CINC scores would only reflect increases for those who experienced the largest increases in capabilities in net terms. This presents us with the potentially misleading conclusion, that a state's CINC score can decrease despite managing to increase its military capabilities. This happens when other states in the international system increase their own military capabilities by a factor far larger, making it appear that smaller states are losing power.

A variable better suited to capture increases in military capabilities would be a non-zero-sum measure. This way, multiple states could experience increases in their capabilities without it being detrimental to those whose capabilities grow by an amount

less than that of major powers and larger states. The results of economic globalization show us that several states can and often do benefit simultaneously without necessarily forfeiting security in the process.

CONCLUSION

The results of this study suggest that despite the rapid pace with which globalization has advanced in the past several decades, its effects on military capabilities are ambivalent. When further broken down into the subtopics of economic and informational globalization, the corresponding results are telling. Although states benefit from a rise in economic globalization, there is no evidence to suggest they are attempting to translate economic gains into bolstering their respective military power by investing in the appurtenant capabilities. Instead, as states integrate further into the global economy, they experience decreases in their share of global military power. The results are especially beneficial for those who argue that increased economic integration reduces the frictions between states and the likelihood of conflict in the process. Proponents of liberalism should feel justified in their veneration of globalization as a stabilizing force within international relations, as the results of this study specifically elucidates. Yet, many states, especially those in the West, have shifted their military priorities in previous years to combat the growing prevalence of extra-state violence. The rise of asymmetric and irregular warfare by non-state actors and the desire of states to use military capabilities to defend the integrity of the global commons may also play a contributing role in the decrease in traditional measures of capabilities, typically regarded as necessary for combatting interstate violence. Additionally, scholars of the international relations theory liberalism will be pleased to find that economic globalization appears to manifest itself in the findings pertaining to economic globalization.

However, this should not be taken to mean that the explanatory power of realism as a political science theory is altogether irrelevant in attempting to explain the impact of globalization on the nature of the international environment. Alternatively, that informational globalization correlates with increases in military capabilities suggests that realism is still very much a useful theory of political science inquiry. The increasingly important role of advanced information technology systems in modern militaries has been identified previously (Berkowitz 2003; Goldman and Eliason 2003; Boot 2006; Shimko 2010). My research supplements the findings of these earlier studies by suggesting that informational globalization is a driving force behind increases in military capabilities.

Going forward, the most militarily powerful states are likely to be those that make the best use of advanced information technology systems, by incorporating these systems into their existing force structure. The most formidable battlefield adversaries of the future will not be those with the largest bank accounts, but rather the most sophisticated tactical and strategic capabilities. This poses a substantial challenge to the United States military. It is highly unlikely that the United States will be able to spend its next potential hegemonic rival out of existence like it did with the Soviet Union. Instead, the challenge will be to continuously manufacture advances in pertinent information technology systems necessary for maintaining a competitive advantage across the board in military capabilities. Given this possibility, and the rate at which informational globalization continues to spread throughout the international system, achieving this objective will be an arduous task for the United States and its allies. Moreover, America's technical advantage of the last decade is disappearing as other countries like China and Russia pursue similar technological advances (Friedburg 2012; Heginbotham et al 2015; Radin

et al 2019). An additional challenge will be to manage increases in capabilities without exacerbating geopolitical tensions by inadvertently contributing to an arms race with strategic competitors interested in pursuing parallel capabilities.

Furthermore, a principal goal of future research should be to identify a systematic measure of capabilities that captures the most important components of military power, while making sure not to exaggerate the strengths of certain states in the process. Accomplishing this goal will be a difficult task. Fortunately, expert practitioners like Michael Beckley (2018) have already begun to formulate a new measure of capabilities, by accounting for a state's net resources rather than its raw power potential. The centrality of power to international relations means formulating an appropriate measure is crucial for both policymakers and academics interested in examining fluctuations in the balance of capabilities between the world's major and minor military powers. An inaccurate appraisal of military capabilities can lead researchers to fallacious conclusions and politicians to make faulty decisions based on lamentable information concerning matters of national security. A better measure of military capabilities would do much to ameliorate this dilemma by providing an accurate assessment of military capabilities to those who need it most. Whether such capabilities can be converted to meet the geopolitical aspirations of states remains to be seen.

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