UNIVERSITY OF CALIFORNIA SAN DIEGO

Use Their Force: Interstate Security Alignments and the Distribution of Military Capabilities

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in

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by

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The dissertation of Juan Andrés Gannon is approved, and it is acceptable in quality and form for publication on microfilm and electronically.

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DEDICATION

Nikki, I dedicate my life to you. And as this little pamphlet has been a sizable portion of my life, it is also dedicated to you.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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What a day. This dissertation was only possible because of a tremendous amount of luck and privilege. Luck and privilege ensured I followed a protected and well-lit path leading me to graduate school. Luck and privilege granted me ample margin of error within graduate school, giving me the room to experiment and fail over and over again. Luck and privilege brought me an incredible roster of minds and hearts that I thank here.

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the siege weapons. More seriously, being married to a brilliant academic in a field from which political science borrows liberally has had a tremendous impact on the quality of my work, the sharpness of my thought, and the way I see the world.

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Bueno.

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ABSTRACT OF THE DISSERTATION

Use Their Force: Interstate Security Alignments and the Distribution of Military Capabilities

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Why do capable states sometimes possess seemingly inefficient militaries that leave them vulnerable to security threats? Practitioners have long maintained that a full spectrum combined-arms military is the best defense in an unpredictable and anarchic international environment. Yet capable states often either forgo some vital defense capabilities, like the US omitting minesweepers from its planned 600 ship navy in the 1980s, or overproduce some defense capabilities, like Albania developing coastal patrol vessels with a range of 1,750 miles despite having a coastline that is roughly one tenth that size. Are states with seemingly inefficient militaries simply making mistakes? I argue that vulnerable force structures are not just the result of poor planning or resource constraints; rather, these observed "inefficiencies" are often a strategically motivated decision to specialize one's force structure. While there are certainly advantages to a diversified

military portfolio, states can engage in strategically motivated functional differentiation by specializing their militaries when they engage in cooperative security alignments. When a collection of states facing a similar threat environment are able to minimize the risk of defection and ensure effective coordination, they can engage in a division of labor where each state individually specializes in different military capabilities that, when brought together, still comprise a full spectrum military force. I substantiate these arguments with evidence from a new dataset on the distribution of military capabilities from 1970-2020 and find that 1) states in cooperative security alignments have more specialized militaries, and 2) cooperative security alignments with more closely aligned interests and higher vertical integration have a higher division of labor.

Chapter 1

Introduction

This dissertation is about state military capabilities. Despite a recognition that states all arm themselves with different military technologies, military power is treated as a homogeneous bundle of fungible assets that matters because of differences in its size but not its composition. The composition of military capabilities a given state possesses determines how it behaves in the world.

In the first paper in my dissertation Chapter 2 titled "Planes, Trains, and Armored Mobiles: Introducing a Dataset of the Global Distribution of Military Capabilities (rDMC)" I develop the first comprehensive dataset of national military technologies over the past half century. Doing so demonstrates that states are differentiated not just in terms of the size of their militaries, but also in the specific military capabilities in which they have invested. Even states that are similar in economic size and geographic location choose different arms to secure themselves from foreign threats. This identifies seemingly inefficient and strategically unwise decisions states make to underproduce or overproduce some military assets in a way that leaves them vulnerable. In addition to identifying differences in the composition of technologies that militaries buy, this paper demonstrates ways that other researchers can use these data to further understand how the military capabilities available to states impacts important outcomes like who fights and wins wars.

The second paper in my dissertation Chapter 3 is titled "Allies as Armaments: Explaining the Specialization of State Military Capabilities" and finds that vulnerable force structures are not just the result

of poor planning or resource constraints; rather, these observed "inefficiencies" are often a strategically motivated decision to specialize one's force structure. I develop a new theory about a "shared production model of defense" whereby specialization is made possible by the presence of cooperative security alignments with like-minded states. Strong relationships with reliable allies allow states to engage in a division of labor over the production of defense assets in which each participant can forgo some capabilities and instead specializing in others.

In a third Chapter 4 paper titled 'A Division of Defense Labor Across Nations: A Theory of the Shared Production of Military Capabilities" I identify what constitutes a strong security relationship. I apply insight from business organization research on inter-firm cooperation to identify the conditions under which actors can efficiently specialize their own production in a way that complements the production patterns of like-minded actors. In the context of international affairs, such bargaining must address the risk of opportunism and the costs of coordination. States in cooperative security alignments with closely aligned interests and high vertical integration have a higher division of labor. These two factors make it easier to reach an intra-alliance bargain by reducing the risk of opportunism and reducing coordination costs. The result is functional differentiation of states' military force structures driven not just by resource constraints or geography but by the structure and nature of interstate relationships.

The final section Chapter 5 concludes by identifying the main implications from this research and how it serves as a strong foundation for a future research agenda focused around two key motivations; 1) states make different decisions about what arms best serve their interests and that has important implications for how states behave in the world and 2) we should understand the political process by which states make these decisions either because they arrive at different conclusion despite having the same aims, or because their aims differ.

Chapter 2

Planes, Trains, and Armored Mobiles: Introducing a Dataset of the Global Distribution of Military Capabilities (rDMC)

2.1 Abstract

This article introduces the Distribution of Military Capabilities (rDMC) dataset. It begins by explaining the value of collecting data on disaggregated national military capabilities, its scope, and the data collection process. I then identify some initial trends about changes in the distribution of military capabilities across states from 1970 – 2014. I conclude by identifying future research use of the data as both a dependent and independent variable.

2.2 Introduction

The military capabilities states possess are an important instrument of military power, and consequently national power [1]. Yet existing work on both the causes and consequences of military power are limited in empirical identification to coarse measures like military spending or military personnel. Not all soldiers are created equal, and much has been said about the problems of measuring military power using military spending figures [2] or aggregate measures like the composite index of national capabilities (CINC) [3]. While military technology is one of only many components of military power (and military equipment only one dimension of military technology), its effects are significant, if hotly debated. Without denying the importance of non-technological factors like military culture, institutions and doctrine [4, 5], inconsistent findings about the role of technology in conflict stem not from the fact that technology does not matter, but rather it has been improperly identified and coarsely measured [6, 7].

This paper seeks to contribute to ongoing research about the causes and consequences of military power by producing the first comprehensive dataset of the distribution of military capabilities across all states from 1970 – 2014. Disaggregating military power into its component parts is an important, yet underdeveloped, enterprise. While aggregate military spending may help differentiate large and globally capably militaries from smaller ones, it risks conflating differences in the *composition* of nominally equivalently sized militaries. The composition of a state's navy may influence its threats, power projection, and warfighting capabilities in some conflicts, but not others [8, 9], and the relationship between the military technologies a country could acquire, actually possesses, and subsequently uses in a contest could shed light on contrasting findings about the impact of military capabilities on international affairs [10].

This paper proceeds as follows. Section 2 identifies the role that military technology plays as both an important cause and consequence in the study of international politics. Section 3 outlines the scope of the newly produced Distribution of Military Capabilities (rDMC) dataset. Section 4 briefly describes the data collection process. Section 5 identifies some initial trends in variation in the distribution of military capabilities across time and space and section 6 concludes.

2.3 Significance

Most of the research on international conflict has focused on the beginning and end of war – its causes and consequences. However, the conduct of conflict, whether actual or latent, has much to tell us about war's causes and consequences [11, 12]. Regarding its causes, if, as Clausewitz noted, war is the continuation of politics with other means, then the tools used for war *are* the other means. Military means *might* matter, but evaluating whether they do (and if so, the degree and circumstance) is an impossible endeavor without empirical data on the distribution of those means across time and space. If it turns out that military means do matter, then Clausewitz's point is that understanding these means fundamentally shapes our understanding of war as a political process. What a country is able to accomplish with military force in a specific situation is a function of military technology, organization, and doctrine and the manner in which these things relate with the political and geographic circumstances at hand [13]. Regarding war's consequences, the military capabilities available to actors play a role in determining whether bloodshed is preferable to resolving the dispute through a negotiated settlement [14].

The innovation, acquisition, and organization of military technology is an important determinant of national military force since it comprises the tools available for the resolution of international disputes. The combination of capabilities that comprise a military's toolkit determine the operations it undertakes, the types of threats it can credibly make, and the consequences of resorting to force [15]. In other cases, military technology has had contrasting consequences in the same conflict despite prior expectations of consistency. During the 1879 Anglo-Zulu War, the United Kingdom expected their firearms – and the lack of any Zulu contact with firearms – to provide a significant tactical advantage [16]. However, the United Kingdom suffered a serious loss at Isandlwana despite being armed with the Martini-Henry rifle [17]. After this resounding defeat, the British shifted their technological strategy by deploying the recently invented Gatling gun which allowed the much smaller British army to overwhelm the Zulu tribes in a matter of minutes [18, p 33]. Two cases of technological superiority were associated with contrasting outcomes, pointing to the importance of identifying different types of technology in warfare rather than just the presence of innovation.

The wide body of literature studying war has recognized the degree to which these concerns are

shaped by *how* states fight. If scholars understand the process by which states make choices about what military capabilities they possess, they can better understand how different aspects of those capabilities impact outcomes of interest [19]. The tools that comprise national military force influence war's participants [20, 21], victors [22–24], costs [25, 26], location [27, 28], and duration [29–31] as well as power projection [32, 33], what issues are resolved with force [34, 35], what threats are credible [36–39], reputation [40], and the balance of power [41–43].

The portfolio of military capabilities also informs broader questions outside the traditional scope of international security like when coups succeed [31, 44] and civil-military relations [45–47]. In the early 1972, the head of the Bangladeshi government successfully held off a coup by creating a special security force (the Jatio Rakkhi Bahini) of loyal forces. Two years later, however, Balgadesh purchased 30 T-54 tanks from Pakistan which allowed the army to overtake the special security forces in a storm of the president's residence, resulting in his death and an overthrow of the secular government [48, pp 745–747].

The study of domestic politics has also recognized the importance of military capabilities. Tension between political budget constraints and military security desires gets to the heart of the role that military capabilities play in furthering our understanding of national politics [20, 49, 50]. Other domestic issues like inter-branch relations [51], public opinion [52], and interest group lobbying [53–55] all point to the importance of a better understanding of the drivers of a state's military portfolio.

Despite the shortcomings of aggregate measures for explaining concepts of interest, most current research still focuses on variation in the *size* of state militaries [56–60]. Recent work that disaggregates military technology has investigated the relationship between important conflict outcomes and capabilities like naval platforms [61], mechanized armies [23, 62], and air power [29, 63–65]. Despite these data being limited in scope, this existing research highlighted the value of disaggregating military power for understanding the international balance of power.

National militaries are primarily quantified and compared by military spending levels or, in rarer cases, military personnel counts. Yet data on military spending poses known problems as a metric for cross-national and temporal comparison [2]. Since there are no common definitions about what constitutes military spending, some states measure things like pension and R&D while others do not [66]. Exchange rates are often used to standardize all spending to the same currency, but with ill-information applications

of domestic purchasing power [67]. Factors like inflation and varying budget cycles are also difficult to account for and dramatically impact inferences drawn from different data sources [68]. Sources like the IMF, the UN Office for Disarmament Affairs, the US Bureau of Arms Control, Verification, and Compliance, the International Institute for Strategic Studies (IISS), and the Stockholm International Peace Research Institute (SIPRI) all produce annual military spending estimates but they use different estimating procedures, primary sources, and preparation methods [69], meaning theories supported using one data source will often not be supported using comparable data from another source [70].

Military spending data also has a temporal bias, with earlier time periods experiencing higher uncertainty. This has been extensively documented in the case of West Germany military spending during the Cold War, where later research found that West Germany's internal figures differed from what they were reporting to NATO [69, 71]. Even commonly used sources like SIPRI caution researchers on using their military spending data for cross-national comparisons, arguing that it is instead only appropriate to compare any one country over time [72]. Furthermore, military spending measures don't account for what states spend that money on and how variations in factors like geography complicate our ability to compare the production of security across states. While these problems likely exist with military equipment data as well, scholars have not even been able to identify the degree or direction of this bias because the data does not yet exist.

Measurement issues aside, although scholars and practitioners know that defense spending varies across space and time, a second dimension of important and understudies variation is that militaries also vary in their *composition*.[1] Scholars have noted "there is a lack of knowledge about variation between states in their behavior on armaments policy decisions" [74, p 268] because of problems empirically identifying the military capabilities states possess [20]. But in order to identify the drivers of armament decisions, scholars must know what armament decisions have been made [75]. Understanding differences in the composition of military capabilities is vital to understanding military power because these components are not homogeneous. These capabilities differ in what they can accomplish [76] and the fact there are differences in how even similarly-sized states arm themselves is prima facie evidence of the non-fungibility

[1] Of course, these two are not synonymous. Military capabilities are only one component of military spending and the cost of labor is a large component of military spending [57, 73].

of material military power. Military spending itself does not create military power; rather, that money must be translated into capabilities that allow for the exercise of power through a variety of distinct means.

Although scholars of international conflict have paid comparatively little attention to identifying the distribution of military capabilities, the same is hardly true for practitioners. During the Cold War, British diplomat James [77, p 127] described the US as "the only navy with the sheer number of ships, with enough aircraft carriers, ocean-going surface warships, amphibious craft and supply vessels, to undertake every class of operation, in any part of the oceans and for as much of the future as can yet be foreseen. This is the political dimension of force structure decisions – what a states produces and omits in its defense portfolio reflects its political priorities in ways that economic considerations alone cannot explain [78, 79]. As then-Senator Joseph [80] remarked regarding domestic economic policy during his vice presidential campaign, "[d]on't tell me what you value. Show me your budget, and I'll tell you what you value." This also holds true in the military context, where disconnects concerning a state's budget and alleged priorities are missed by looking at top-line spending figures. Despite decades of concern about a Chinese invasion of Taiwan, it was not until 2017 that China began investing in the amphibious assault capabilities that are necessary for that threat to actually be carried out [81, pp 95–99].

2.4 The rDMC Dataset: Scope and Data Generating Process

This paper introduces the first comprehensive dataset of disaggregated military capabilities. Data on military technology portfolios is produced by the International Institute for Strategic Studies (IISS) in the annual Military Balance reports. Different portions of these reports have been used frequently in academic publications. Most of this work has used IISS data on military spending [82–85] or personnel [86–90]. The little work that has looked at IISS data on the distribution of military capabilities has focused on a narrow list of platforms like mechanized vehicles [23, 62], strategic lift aircraft, [91] and fighter jets [65] or a short list of countries like great powers [7] or China and its rivals [21]. The primary reason for this relatively limited use of fine-grained high-quality data is difficulty in converting the data to an easily-usable format and standardizing it across countries and years.

The data represent military capabilities for 173 countries over almost half a century (1970 – 2014).

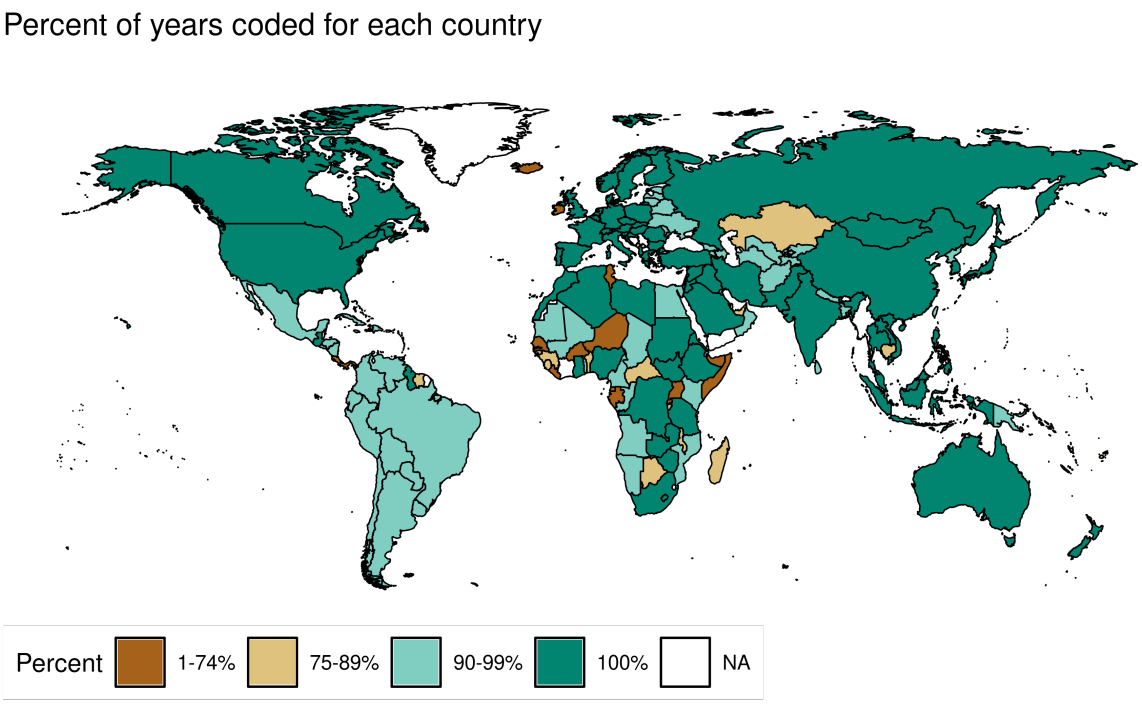

Figure 2.1: Coverage of available data on state military capabilities (1970 – 2014) (Source: IISS)

Although the Military Balance was first published in 1961, prior to 1970 the report focused on NATO and Warsaw Pact states only, with more information provided about the former than the latter [92, 93]. Using 1970 as the cut off, Figure 2.1 shows what percent of years are coded for each country.[2] 54% of countries have no missing data across the entire time span, with the median country having data available for 95% of its years and the mean country having 88% coverage.

The military capabilities are organized hierarchically, with higher levels of organization representing broad categories like helicopters or principal surface combatants and lower levels of organization representing distinct roles within those categories like attack helicopters versus transport helicopters or aircraft carriers versus destroyers. The rDMC codebook accompanying this paper and dataset describes the temporal and spatial scope of the data as well as the military capabilities that are included.

As with much data in international affairs, concerns about data quality and accuracy remain salient. The extensive use of the IISS Military Balance reports by other scholars gives some confidence in its accuracy and also allows for the data codings here to be double-checked with data codings by other

[2] I use percent of years since not all countries exist across the entire duration of the data. 100% of Slovenia is covered, for example, because data exists for all 22 years since since it established independence in 1991.

Table 2.1: Sample of the 10 most comprehensive uses of IISS military equipment data in major political science publications (listed chronologically). A full list of all 20 documented publications, including the list of countries and years used, is available from the author.

Publication	Years	Countries	Technologies
[94]	1	43	Combat aircraft
[21]	20	9	Submarines, surface ships, 4th generation fighter aircraft
[95]	1	32	Naval vessels
[7]	1	6	Submarines, aircraft carrier, combat ships, UAVs, tactical aircraft, satellites, aircraft, helicopters
[96]	1	31	Combat aircraft
[62]	11	150	Armored vehicles
[23]	1	167	Mechanized vehicles
[97]	1	5	Aircraft
[98]	2	1	Ships and aircraft
[91]	6	5	Strategic lift aircraft

scholars to correct data entry and coding errors. An extensive, but not exhaustive list of those publications is provided in the appendix. A list of the most comprehensive uses of IISS military capabilities data is provided in Table 2.1.

Policymakers similarly rely on the IISS Military Balance reports, with former US Army General Petraeus describing it as “the go-to source of unclassified, independent information on defense capabilities around the world", former US Secretary of Defense Robert Gates noting that it “provides essential facts and analysis for decision-makers and for better informed public debate", and former US Secretary of Defense Leon Panetta remarking that it is “widely recognised as the best unclassified source of defense information on personnel, equipment and budgets for every country." Even if the data does not perfectly represent state military capacities, it influences how policymakers behave since they use the data for their analysis. The former Supreme Allied Commander of NATO, Admiral James Stavridis, said “throughout my career, I have relied extensively on The Military Balance produced so expertly by the IISS. It is the "go to" source for serious analysts and warriors facing real world challenges."[3]

The accuracy of the data can also be double checked in certain instances using reliable primary

[3]Quotes come from Testimonials at `https://www.iiss.org/publications/the-military-balance`.

source data from government reports. New Zealand, for example, publishes annual reports on the military's performance targets that describe the resources at the military's disposal [99]. Although such data is not available for all countries nor for all years, checking the data in such a manner where possible should provide face validity about the accuracy of the IISS measures.

2.5 Data Collection and Formats

The data collection process first involved creating a consistent typology of military equipment types, equipment names, and unit names. I create two versions of the data. The first, *rDMC raw*, organizes military equipment true to the original IISS categorizations. The second and third, *rDMC long* and *rDMC wide* produce a new more aggregated classification of military capabilities. Table 2.2 shows the unique values that exist at each nested level in the categorization scheme provided by IISS, how that can be aggregated using IISS categories, and then how that is further aggregated in the final classification. A detailed description of the different data versions follows.

Table 2.2: Description of unit of analysis and variables in the different versions of the rDMC dataset.

Data Version	Unit of Analysis	N	Variables
Raw	Country-year-unit	259,410	Service, disaggregated categories, count
Long	Country-year-tek	561,768	Aggregate category, count
Wide	Country-year	8,010	Technologies

2.5.1 rDMC raw

IISS categorizes military capabilities according to the following levels, in order of increased specificity: equipment types, equipment subtypes, equipment names, equipment subnames, and unit names.[4] Equipment type involves the most aggregate categorizations like aircraft or armoured fighting vehicles. Subtype and subname are auxiliary classifications that exist for some, but not all technologies, like designations of light, medium, and heavy variations of transport aircraft or distinguishing difference classes of aircraft carriers. Equipment names are the next primary IISS categorization and produce information

[4]While these 5 classifications levels are produced by IISS, their labels are the author's.

about classifications like transport or fighter aircraft or main battle tanks as a variety of armoured fighting vehicles. Then at the unit level one can identify, for example, the number of M1A1 Abrahms main battle tanks each country possessed.

The main utility of the *rDMC raw* categorization is in providing an objective and unaltered version of the original IISS data, true to their data generating process. No coding decisions, new equipment categorizations, or ontologies inform this version of the data. Furthermore, this version of the data is unique in providing unit-level information. This level of disaggregation has potential use for studies examining questions like combat effectiveness, arms sales, or interest group lobbying.[5]

For example, scholars have identified the challenges of observable proxies for ex-ante military effectiveness [5, 100–102]. [103, p 135] uses the age of military technology as a proxy for its effectiveness. During Operation Desert Storm, the average date of introduction for US weapons was 1974 while Iraq's was 1962. But until now, broader measures of the age of different components of a state's military portfolio have remained unexamined. Scholars interested in dependent variables like military effectiveness could use this information to differentiate the predicted battlefield performance of a state with 100 M1A2 SEPv2 Abrams main battle tanks (in service since 2013) with a state with 100 T-55 main battle tanks (in service since 1949). As an example, Figure 2.2 shows a broader comparison of the age of introduction for each main battle tank in the data as well as its last recorded year in service. The year of introduction is identified as the first year in which at least one state possessed that type of tank.[6] Since data also exists about the origins and national producers of various military units, research on arms sales would benefit from being to more thoroughly identify patterns in reliance [40, 104].

2.5.2 rDMC long and rDMC wide

From this, the technology categories are aggregated to a new typology representing variety in military technologies of interest to scholars who have less of a need for granular information differentiating M1A1 Abrahms tanks from M1A2 Abrahms tanks and are instead interest in the number of armoured

[5]Matching various unit name string variables is a challenging endeavor. For more information about using the unit-level information in *rDMC raw*, see the appendix.

[6]Since the data starts in 1970, tanks first deployed in 1970 actually likely represent models developed before then. A more thorough analysis would track down the actual deployment date for each tank model, rather than relying on their deployment date as done here.

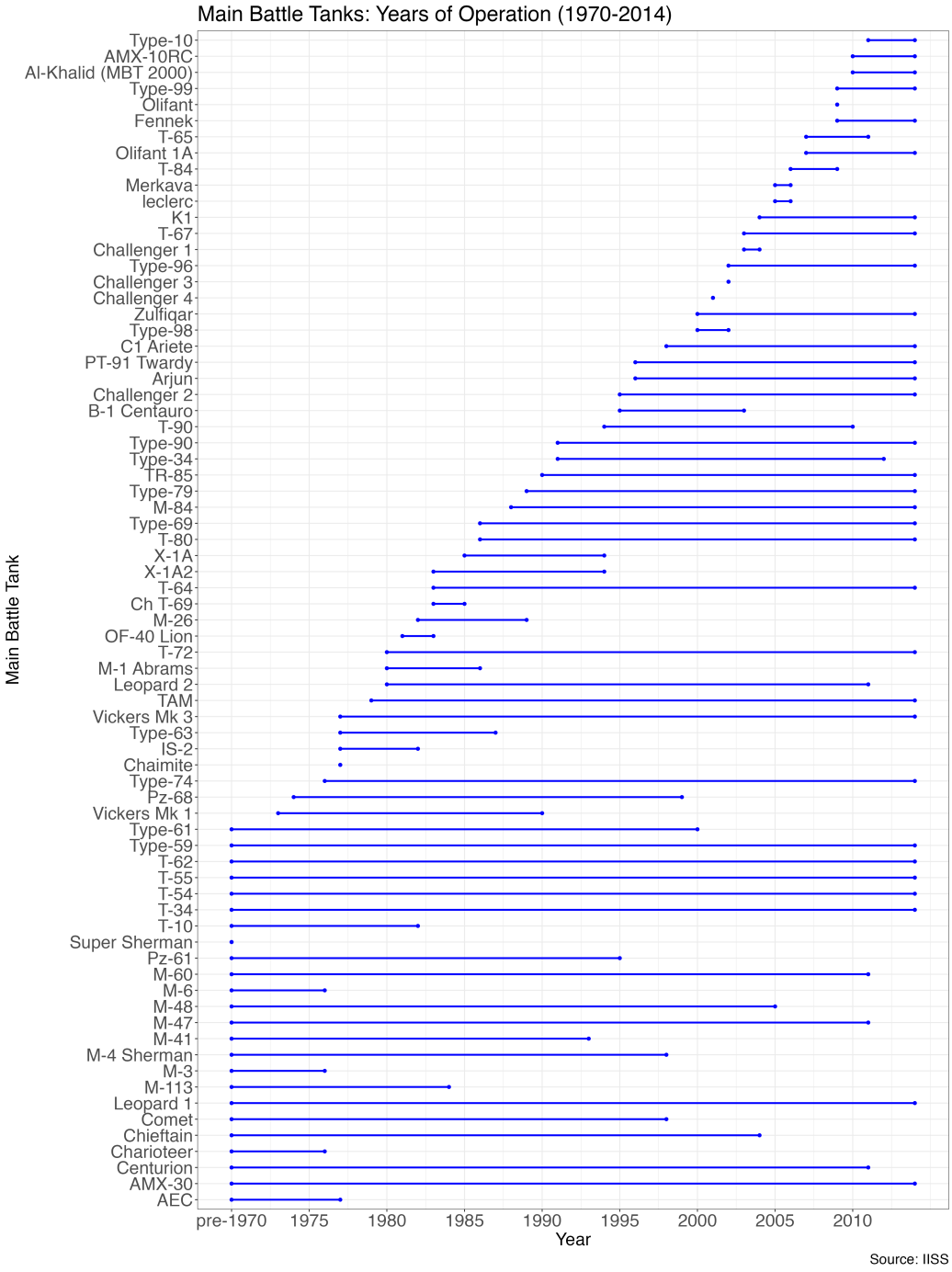

Figure 2.2: The first year in which each type of main battle tank was deployed by any state. The figure is organized chronologically, with the newest main battle tanks at the top.

combat vehicles a state possesses. I first aggregated the technologies to unique triples composed of equipment type, subtype, and name using the IISS categorizations. This typology is consistent across country and year, thus simplifying the process of time series-cross sectional analysis. Where inconsistencies arise, coding decisions were made with reference to external sources and transparently coded in the data available online. This ensure that, for example, the C-130H Hercules is always listed with an equipment type coding of 'aircraft' and an equipment name coding of 'transport (TPT)'.[7] This results in a count for "aircraft – transport" for every country with a value that is the sum of all units that country possessed that had the equipment type, subtype, name, subname, and unit name corresponding to that higher level aggregation.

rDMC long and *rDMC wide* are identical in terms of content and differ only in the unit of analysis. In *rDMC long*, the unit of analysis is the country-year-technology, so the only variable for each row is the numeric count corresponding to the unique identifier. In *rDMC wide*, the unit of analysis is the country-year with each unique technology value becoming its own column. Although both versions are substantively identical, both are provided as reshaped versions of each other to simplify the process of subsetting and merging with other datasets. Given their interchangability, in the section that follows, either version can be used to produce substantively identical figures and summary statistics.

The 55 categories that comprise the technologies are shown in Figure 2.3. Empirically, this aggregation is helpful because the technology categories are definitionally uniform across the data sample. Theoretically, these categories were chosen because they represent weapons categories commonly recognized and used by states in arms reduction agreements like the Treaty on Conventional Armed Forces in Europe (CFE). As a result, national records are most consistent and accurate at this level of analysis since those records were used during international negotiations.

Computationally, aggregating the technology categories also reduces the sparseness of a data set that is already zero-inflated. While most country-years possess armored fighting vehicles, not all possess every kind of armored fighting vehicle (main battle tanks, armored personnel carriers, armored

[7] There are cases where an equipments category changes in ways the data maintains. For example, many aircraft and helicopters are phased out by being shifted to non-combat roles like training before they are fully retired. A country may thus experience a decrease in combat aircraft and an increase in training aircraft from one year to the next without the actual aircraft they possess changing.

infantry fighting vehicles, and reconnaissance vehicles) let alone each of the 1,531 distinct unit names categorized as “armoured fighting vehicles". That is not to say that every type or model is the same; if it was then 6,000+ United States armored personnel carriers would not be split across 5 different models. But those distinctions present computational challenges given that even the militarily-capable United States possesses only a small fraction of all the different kinds of armored personnel carriers that exist. As a result, country-specific units would inflate inferences about between-country variation in military portfolios. Scholars interested in making those sorts of distinctions are advised to use the *rDMC raw* version of the data.

There are, of course, many ways to categorize technologies. Some categories could be grouped together depending on the research interest. “Aircraft – transport" and “helicopters – transport" could be considered somewhat interchangeable to those interested in a state’s ability to move personnel and material via the air. Alternatively, “helicopters – transport" could be grouped with “helicopters – search and rescue" if studying a topic like arms sales or military base location given similarity in their physical make-up. Some categories could also be further disaggregated. The category “aircraft – maritime patrol", for example, include anti-submarine warfare, anti-surface warfare, and maritime reconnaissance which all “patrol" different areas of the sea. Aside from these deductive ways of aggregating or disaggregating the military technologies, inductive methods could identify different sets of similar technologies based on things like rarity, pairwise occurrence, or component parts [10]. Rather than try to create and justify a single definitive ontology of military technologies, the data are constructed so that all aggregations are transparent and, more importantly, modular. By simply selecting new aggregation categories, scholars can produce their own counts with different categories. Scholars who wish to differentiate between those categories can transparently see how those were aggregated, change those aggregations (including creating new technology categories or deleting existing ones), and produce a new dataset consistent with the classifications that suite their research questions.

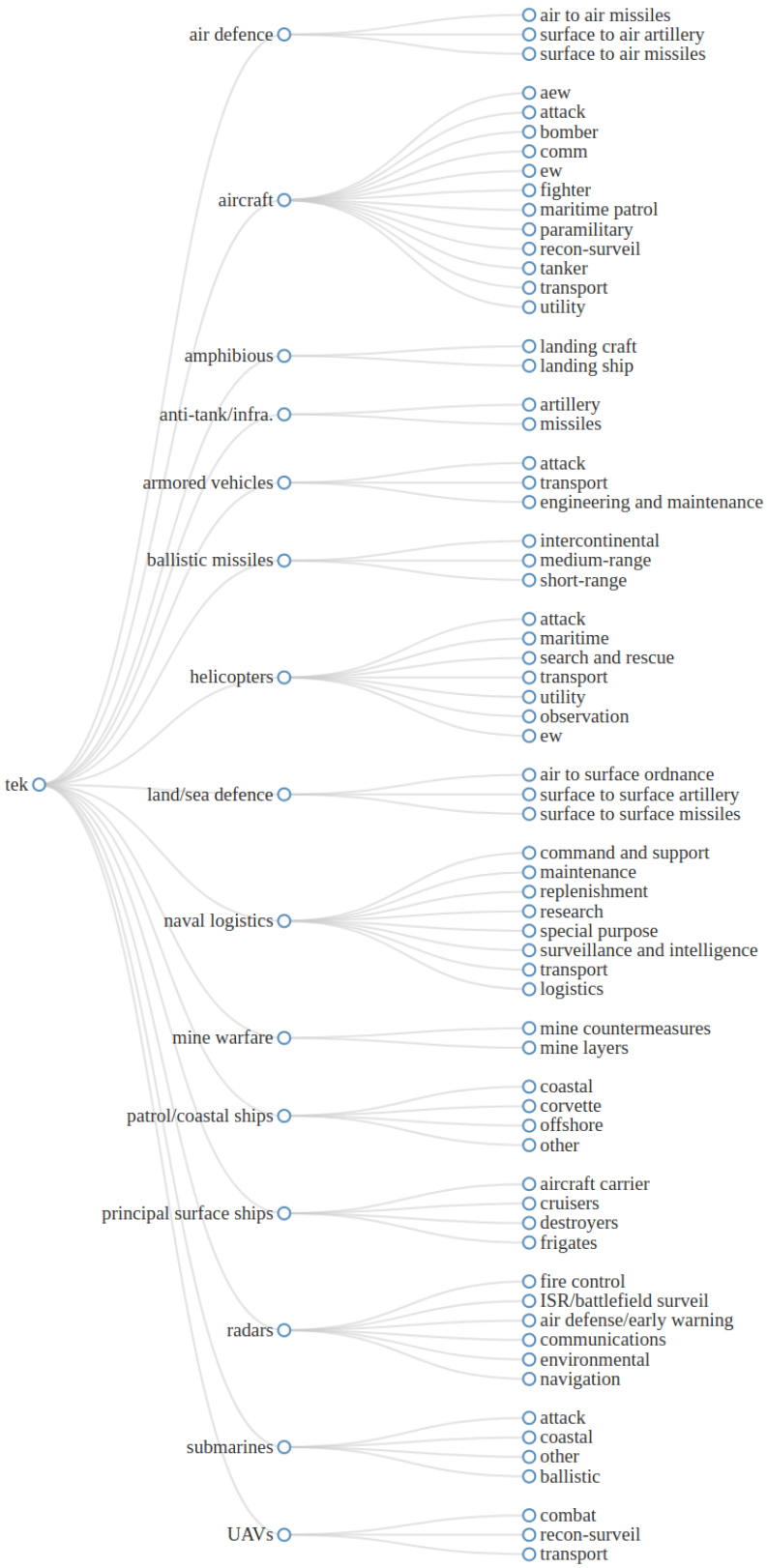

Figure 2.3: Description of the aggregated technologies used to compute the distribution of military capabilities.

2.6 Global Trends

This section identifies some descriptive trends in military capabilities across space and time to highlight ways scholars can use these data to supplement ongoing research on international security.

2.6.1 Technological Trends Across Time

Research on military innovation has investigated both the causes of military innovation as well as its consequences [105]. One way that militaries innovate is in the weapons they choose to fight. This technological innovation (or lack thereof) may be a product of military culture [106–110], bureaucracy [111], experience in past conflicts [22, 112–114], regime type [115, 116], access to foreign technology [54, 117], the nature of the international threat environment [118, 119], or broad political goals [120].

Yet this research on the drivers of technological military innovation has been limited in empirical scope to particular technologies, states, and time periods. Using new data on changes in military capabilities over time could supplement this existing work by helping identify the facts that explain when states buck the pattern of technological innovation as well as how innovation diffuses across time and space [42, 121, 122]. Figure 2.4 shows the number of countries that possessed each military technology in a given year. Although there is a general global trend of innovation, the number of states possessing certain capabilities like surface-to-air and surface-to-surface missiles has increased dramatically since 1970. This is in marked contrast to ballistic missiles, where their diffusion over time has been much more limited.[8]

To identify a more specific example, much has been written about the consequences of aerial bombing campaigns and the effectiveness of air power more generally [29, 63, 125]. Although this research has looked at cases where states used aerial bombing, it does not identify what states have the capacity to conduct aerial bombing or how that changes over time.[9] Figure 2.5 shows the total number of military aircraft across the global annually as well as changes in the average number of military aircraft possessed by each state. The end of the Cold War in 1991 is an important turning point in both respects. The number of total military aircraft in the world dropped from roughly 40,000 to just over 20,000 and the average military aircraft per country went from around 400 to just under 200. What caused this significant

[8]For existing work on missile proliferation, see [123, 124].

[9]New data on combat aircraft has recently been produced by [65].

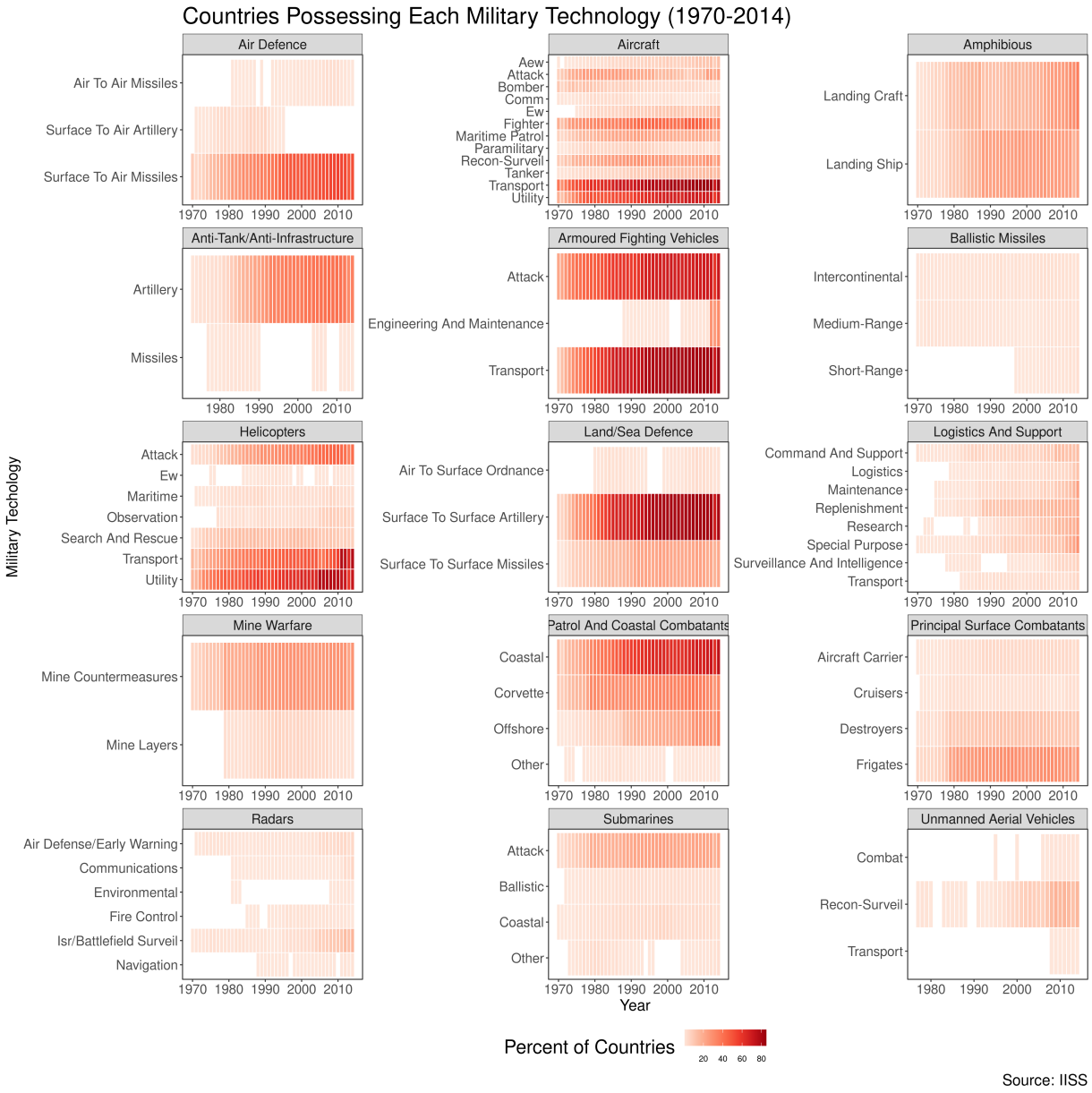

Figure 2.4: The number of countries possessing at least one unit of each major military category of technology. Darker cells mean more countries possessed that technology in that year.

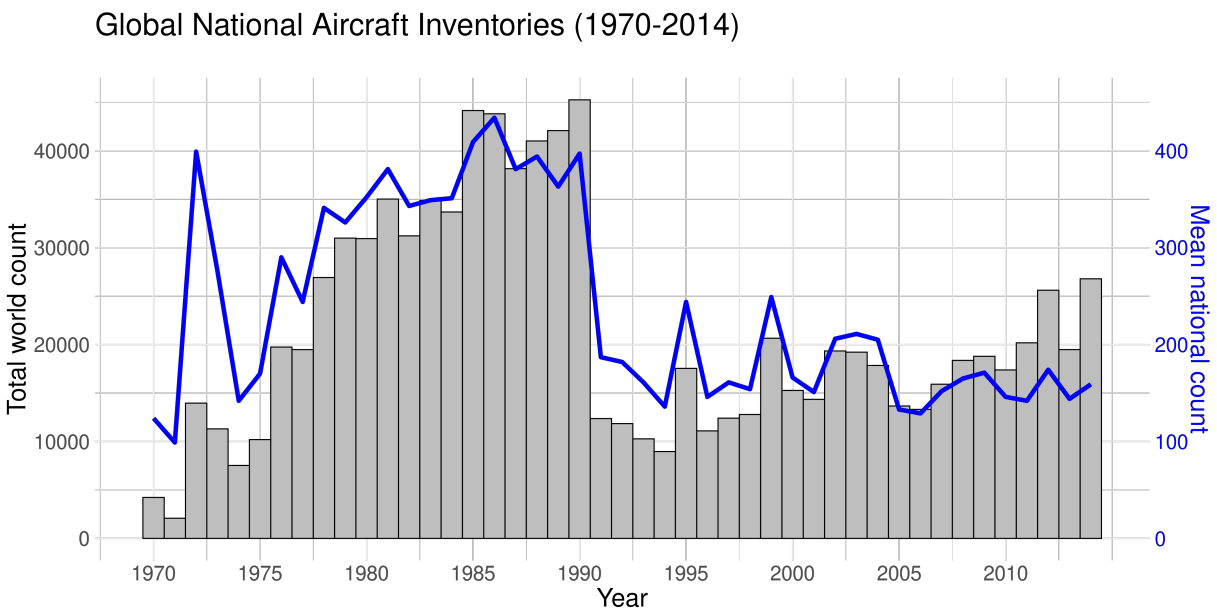

Figure 2.5: Bars represent the total number of military aircraft in the world in each year. The blue line represents the average number of aircraft owned by each national military in each year. Left y-axis values (black) correspond to total military aircraft values and right y-axis values (blue) correspond to national average values.

reduction in the number of combat aircraft worldwide? Part of the explanation may be the Adapted Treaty on Conventional Armed Forces in Europe (CFE) which required NATO and the Warsaw Pact – referred to in the CFE as the “Groups of States" – to each maintain no more than 6,800 combat aircraft [126]. This resulted in the destruction of 69,000 military capabilities designated as Treaty Limited Equipment, with the Warsaw Pact destroying over 30% of its arsenal and NATO destroying 5% [127, 128]. Part of the explanation may also concern difficulty counting capabilities in new former Soviet states that did not yet have the political or security infrastructure to accurately document military holdings. In the same way that new data on military spending and GDP has allowed scholars to explain discrepancies and irregularities in the data, the same can now be done for military equipment data.

2.6.2 Technological Trends Across States

There is a general recognition that military capabilities differ in their purpose [76]. Some capabilities are salient only for states trying to project power while others are relevant for every state’s territorial defense. What capabilities do states produce more or fewer of, all else being equal?

Figure 2.6 shows the distribution of US military capabilities relative to the world average at one decade intervals. Not surprisingly, US capabilities generally dwarf those of the rest of the international system. However, some exceptions exist. For much of the past half century, the United States has had fewer anti-tank/anti-infrastructure capabilities as well as fewer mine warfare capabilities than the average state.

This observation itself could be explained by myriad factors. The international interests of the United States may not necessitate substantial development of these capabilities. Perhaps geography makes these capabilities less salient, as mine warfare may be less salient to states that primarily fight their wars far from home. Military capabilities have substitutes and complements, and it's possible that anti-tank/anti-infrastructure needs are adequately addressed with bombing aircraft and land defense missiles. Quantity is also not synonymous with quality, so it could be that the US is still more than sufficiently capable in these domains. Whatever the theorized explanation, it this new data now allows scholars to empirically examine a claim about why states possess the distribution of military capabilities that they do.

When do states mirror the distribution of military capabilities of other states, and what states do they tend to mimic? During the Cold War, much was written about how the arms race between the United States and the Soviet Union took the form of 'missile matching' where each state tried to develop the same capabilities the other had [129]. Within canonical international relations theory, [130, p 127] posited that "Contending states imitate the military innovations contrived by the country of greatest capability and ingenuity. And so the weapons of major contenders, and even their strategies, begin to look much the same all over the world". Even if the size of state militaries vary as a function of economic and industrial capacity, their configurations may converge on some idealized capability distribution.

Figure 2.7 shows similarity in the configurations of national military capabilities in 2004.[10] As a simple descriptive account, military capabilities are calculated as binary variables indicating whether a state possessed each of the 74 military technologies present in the data. This is then used to create a hierarchical cluster where each state is matched to the state with the most similar military portfolio and distinct clusters of states are inductively determined based on minimized average within-group variation.

What states have military portfolios that most closely mirror those of others? As a simplified proof

[10] I mirror existing research in excluding states with a population below 750,000 [62, 131].

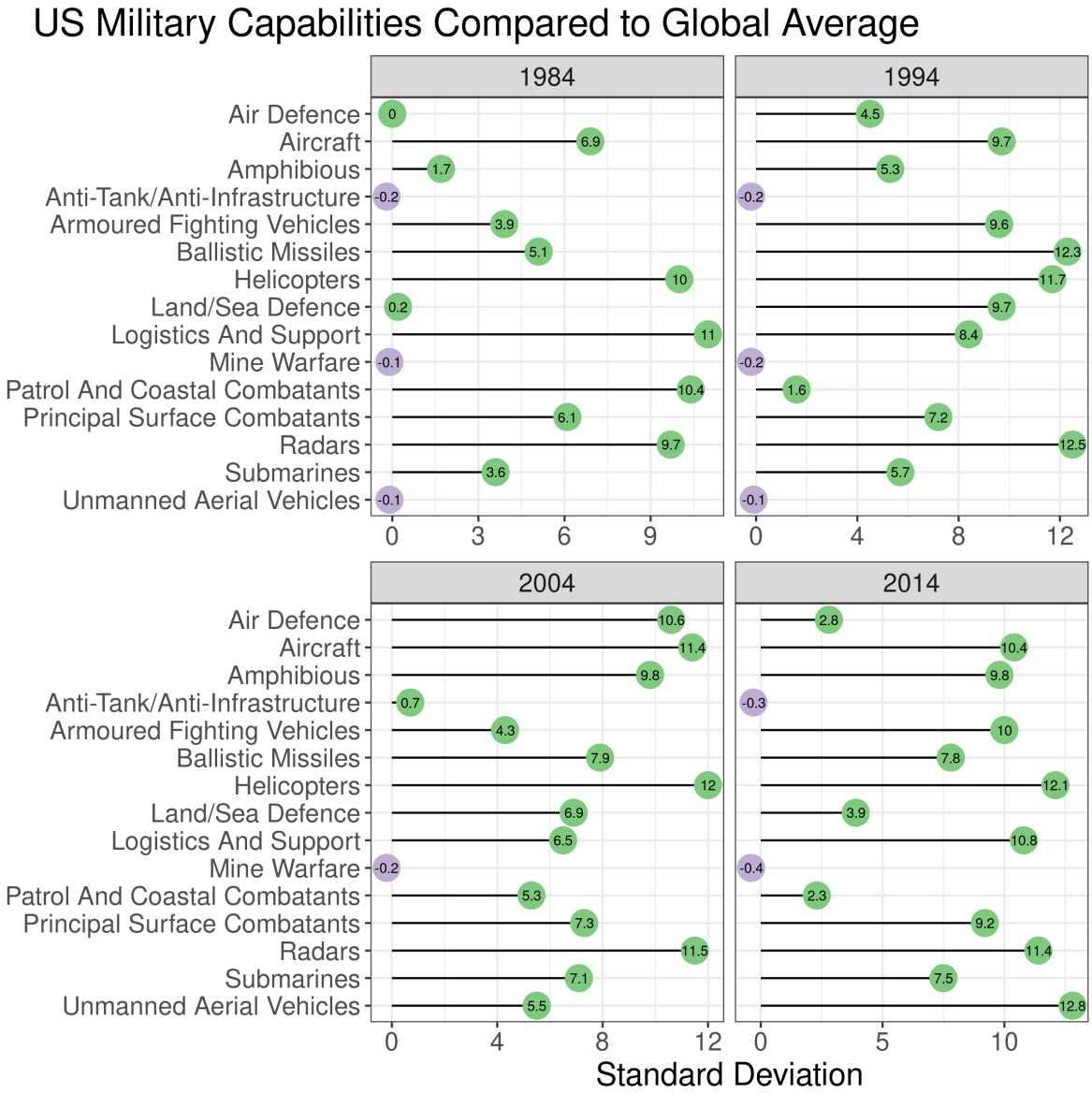

Figure 2.6: Count of US military capabilities relative to other states in decade intervals. Each bar represents the standard deviation of the count of US capabilities relative to the world average. Colors represent positive and negative standard deviations.

of concept, Figure 2.7 shows the results of a hierarchical clustering analysis for all states in 2004 using binary values to indicate whether that state possessed each of the 74 military technologies present in the data.[11] A form of community detection, hierarchical clustering is agglomerative, meaning it identifies the nearest neighbor for each observation, pairing them together into clusters that minimize within-cluster dissimilarity relative to all other possible pairings until the root node connects all clusters to one another.[12]

Cautioning that Figure 2.7 is a simplified example (a single year snapshot and using binary rather than count values), the results nonetheless demonstrate the utility of disaggregating military capabilities for identifying similarity in national defense portfolios in ways military size cannot. This generates testable hypotheses concerning the relationship between military composition and factors like technological capacity, geography, threat environment, and conflict history. For example, the states with the most similar capabilities to the United States (the very bottom branch) appear to be industrially advanced states with global ambitions – China and Russia, followed by the Italy, France, Spain, Brazil, and the UK. By comparison, the cluster of states from Chad and Burkina Faso to Afghanistan and Mongolia (the highest cluster) is the most unique, as splitting states at each level of the tree first involves distinguishing a group of states from that cluster. 10 of the 12 countries in this cluster have a history of civil conflict in the half decade leading up to 2004.[13] Prior research has found an empirical association between a state's history of domestic insurgencies and civil conflict and the degree of military mechanization [23, 31, 62]. Extensions of this research can use rDMC to identify other qualities of a state's distribution of military capabilities that might be associated with civil conflict participation and outcome.

2.7 Conclusion

Heterogeneity in how states arm themselves exists and is significant both in terms of substance and consequence. Identifying the dimensions of this heterogeneity is a necessary precondition for explaining both its causes and consequences in international affairs. To date, explanations of the causes or effects

[11] I exclude states with a population below 750,000 as done by [131] and [62].

[12] This clustering method has been used for community detection of economic industry clusters [132, 133], preferential trade agreement (PTA) membership [134, pp 31–34], military alliances [135, 136], and social media behavior during protest movements [137].

[13] Data on civil war occurrence comes from the UCDP/PRIO Armed Conflict Dataset version 20.1 [138].

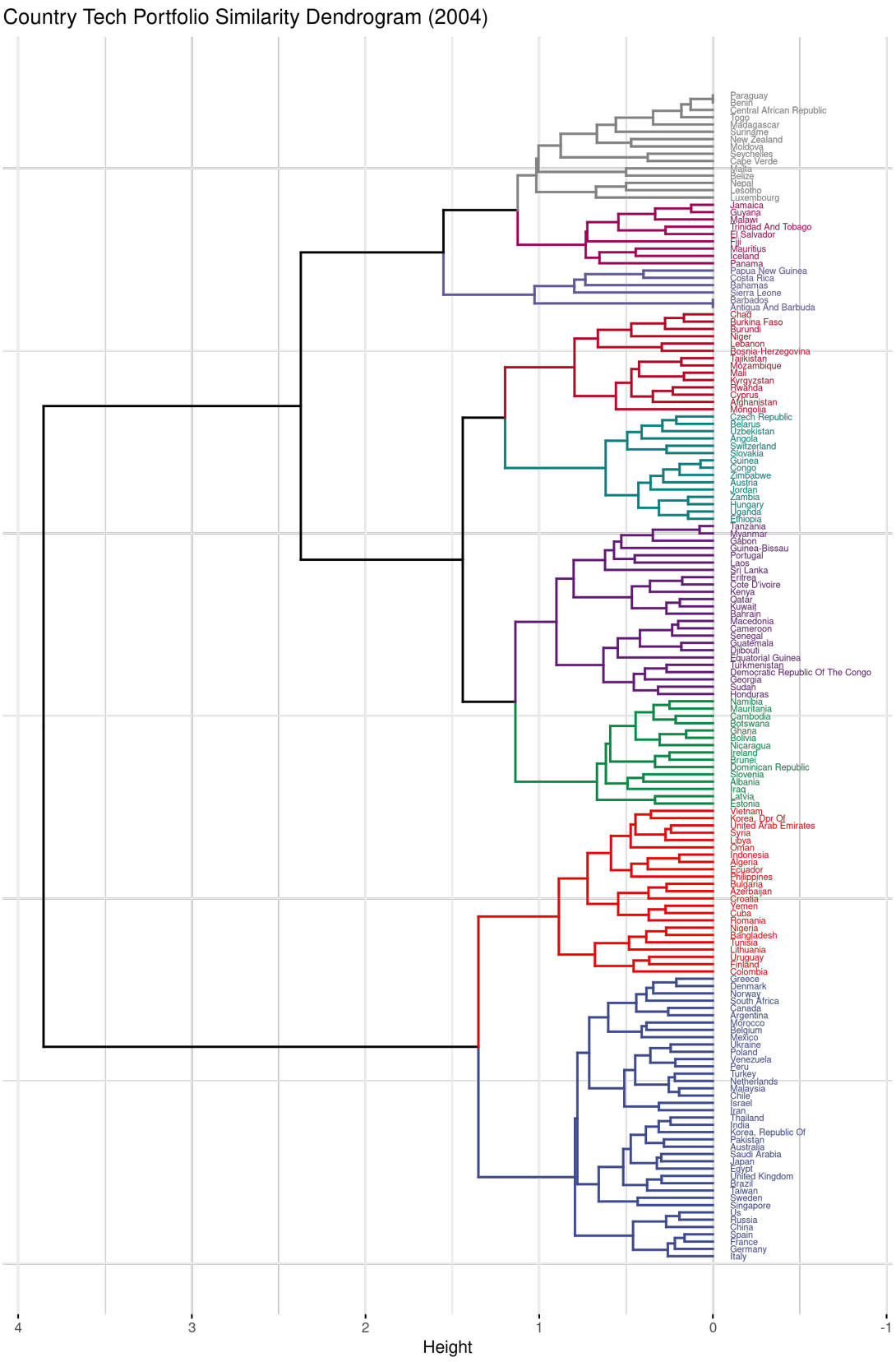

Figure 2.7: Hierarchical cluster showing similarity of military technologies portfolios.

of variation in the composition of a state's military assets has been empirically limited because that data has not existed in a way conducive to systemic analysis. This is not just true for quantitative scholars interested in large cross-national regressions; scholars studying individual countries, regions, or specific time periods have been limited in their ability to provide even descriptive accounts about the balance of military power using any observations more detailed than national military spending, military personnel counts, or outcomes of interests like actualized conflicts. The hope is that the broader scholarly community can use the data created here to answers other questions of interest. While much ink has been spilled debating *whether* military technology matters [13, 22, 139], the discussion should productively shift to *what* military technologies matter and *how*. In transparently presenting the process by which this data was created, that should be easier.

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Chapter 3

Allies as Armaments: Explaining the Specialization of State Military Capabilities

3.1 Abstract

Scholars and practitioners have long maintained that for capable states a full spectrum combined-arms military is the best defense against an unpredictable enemy. Yet some capable states have imbalanced, specialized militaries while others maintain balanced, diversified force structures. Are specialized militaries that forgo the development of vital defense capabilities simply making mistakes? I argue that there are conditions under which states can reap the gains of economic efficiency that come with specialization without sacrificing the security benefits of a full spectrum force. When a collection of states institutionalize their defense relationship in a way that builds trust, minimizes the risk of defection, and ensures effective coordination, they can each individually specialize in different military capabilities that, when brought together, still comprise a full spectrum combined-arms military force. I substantiate these arguments with evidence from a new dataset on state military capabilities since 1970.

3.2 Introduction

Despite being regarded as the world's most powerful navy during the 1980's, the US began the decade with only 3 operational minesweepers. This seems like a peculiar omission given President Reagan was in the midst of new acquisitions for a planned 600 ship navy [1], the cost of new minesweepers was marginal and the technology relatively unsophisticated, and 13 of the 15 US ships sunk since the end of World War II had fallen victims to mines, a threat that was unlikely to diminish given the low cost of sea-mining. Belgium, by comparison, had 27 high quality minesweepers that they built during the 70's and early 80's. Predictably, when the United States got involved in the Tanker War that erupted during the Iran-Iraq war a few years later, the United States was nearly defenseless against Iranian mining of the Persian Gulf. Failure to acquire anti-mining capabilities appeared to have been a costly omission in US force structure.

This is exemplary of a broader phenomenon of interest to international relations scholars. Why do capable states possess seemingly sub-optimal militaries – under-producing some capabilities or over-producing others – in some cases but not others? Assuming that the primary purpose of a state's military is to provide security against perceived threats [2, pp 102–114], most states should optimize their force structure by diversifying their capabilities because it compensates for the inherent weaknesses of any one set of capabilities and helps deal with unanticipated or opaque threats [3, 4]. States behave as like-units with diversified military portfolios such that differences in their defense capabilities are largely attributed to non-political attributes like factor endowments and geography [5]. Conversely, states facing the same threat environment should consequently cooperate with one another to gain economies of scale by individually specializing their military portfolios [6, 7]. So why do we see specialization in President Reagan's aircraft carrier-oriented 600-ship navy (the hierarchy-oriented prediction) while Western Europe began rolling back their previously specialized air forces around the turn of the century (the anarchy-oriented prediction)? More broadly, why do some capable countries have gaps in their militaries that they could fill, but choose not to, while other capable countries appear satisfied with those gaps?

My central argument is that when it comes to defense, states are not like-units and the global distribution of resources is an insufficient explanation for their unlike-ness. I theorize that some of

the variation in defense portfolios can be explained by the presence of allied states. States can garner the benefits of both specializing and diversifying their military capabilities by individually specializing when the institutional relationship with their allies are conducive to collective diversification. Alliance relationships allows states to reduce the cost of forgoing some capabilities and overproduce others. The result is variation in the composition of state military capabilities – some being specialized and others being diversified. I substantiate these arguments by looking at the relationship between a state's military specialization and the nature of its security relationships from 1970 – 2014. States in alliances are able to specialize their militaries more than those that lack an institutional security alliance.

The case of US minesweepers during the 1980's is emblematic of this logic of a division of defense labor. While the United States itself had little ability to counter Iranian mines, its European allies did [8, 9]. Figure 3.1 shows the coordinated naval contributions of Western nations during the Iran-Iraq Tanker War. The Netherlands, Belgium, Norway, Denmark, and West Germany, realizing they had to demonstrate their usefulness to the alliance, developed anti-submarine warfare (ASW) and minesweeping capabilities in a way that allowed the United States to consequently focus on open sea naval operations [10]. These European countries "maintained degrees of specialist expertise in their own disciplines unmatched elsewhere in the alliance. This informal specialization led the Belgians to focus on mine clearance, especially of ports crucial to [Supreme Allied Commander Europe's] SACEUR's re-supply. The Danes and the Germans concentrated on the Baltic Approaches and the Baltic and developed a fleet of fast attack craft and land-based aircraft ideally suited to fast and complex operations in the narrow seas" [11]. Inversely, where the United States excelled (strike groups, nuclear attack submarines, ballistic missiles submarines, and strike aircraft), its European allies remained underdeveloped.

In the sections that follow, I first detail existing thinking concerning the factors that determine a state's force structure in general, and more specifically why capable states sometimes pursue a specialized distribution of military capabilities, despite the security risks that engenders. Section 3 then introduces a shared production model of defense, theorizing why alliances can sufficiently minimize the risks inherent in military specialization. Section 4 provides an empirical test of this theory with evidence on disaggregated military capabilities of all states in the international system from 1970 – 2014. Section 5 concludes with the implications of these findings for theories of why states build the weapons that they do, and why they

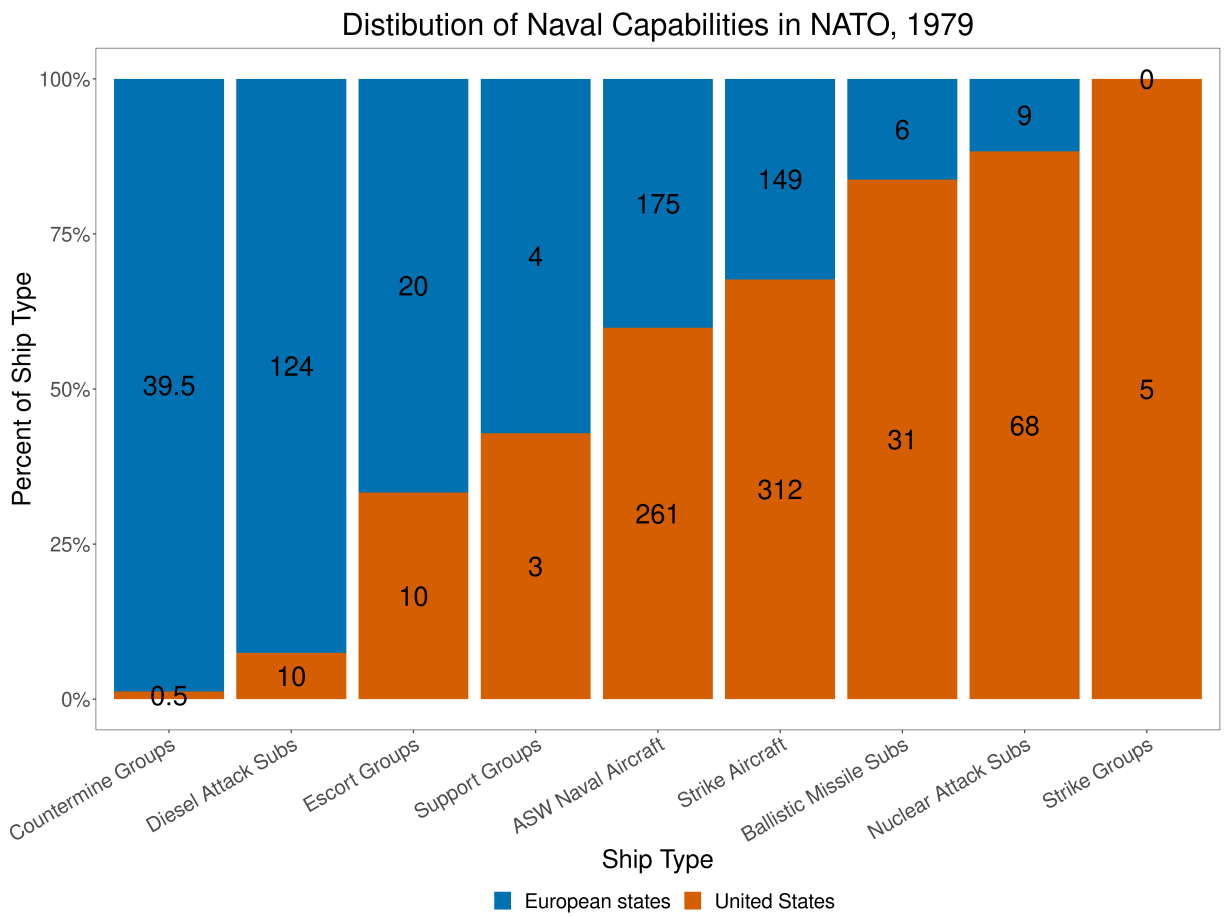

Figure 3.1: The United States and its European NATO allies engaged in a division of labor over naval assets. Numbers refer to asset/group counts (Source: [11, 12])

don't build the weapons that they "should".

3.3 Existing Explanations for Variation in the Distribution of Military Capabilities

Most of the research on international conflict has focused on the beginning and end of war – its causes and consequences. However, the plans for conflict, the actual conduct of conflict, and the tools these involve have much to tell us about war's causes and consequences [13, 14]. If the conduct of conflict is itself an important concept in explaining international phenomena, then examining the factors that determine the composition of a country's military force is also a worthy endeavor [15]. The combination

of capabilities that comprise a military's toolkit determine the operations it plans for and undertakes, the types of threats it can credibly make, and the consequences of resorting to force [16].

Despite its shortcomings, most research on military capabilities still focuses on variation in the *size* of state militaries [17–21]. However, such research does not explain why state militaries vary in their *composition*.

The composition of a state's military is a function of non-political constraints as well as political decisions. Non-political constraints involve factors like economic production and geography – a state will only possess what it can afford and it will not possess capabilities that have no utility given their physical location on the globe [22]. But the development of military capabilities is at its core a political story since it is the result of political processes rather than simply being shaped by the invisible hand of market economics [23, 24]. Early discussions about the political determinants of a state's weapons development were framed around a debate between internal and external causes [25]. Theorists forwarding internal explanations focused on domestic factors like bureaucracy, constituency interests, or scientific R&D culture while the external causes theorists argued that a strategic consideration of foreign threats motivated weapons acquisitions decisions.

Theories about the domestic determinants of military procurement examine factors like politician's economic motivation for continued production by major defense contracting firms [26]. This view is consistent with theories pointing to the importance of the military industrial complex in shaping national defense policy [27, 28]. However, private interests cannot shape national defense policy or production independently; they instead operate within a regulatory environment that conditions firm lobbying efforts that could influence arms acquisition decisions [29]. In the American context, scholars have tried to reconcile these different perspectives by identifying causal factors at various stages of the weapons development process [25, 30].

Theories of domestic politics generally try to explain weapons acquisition decisions more generally rather than whether those weapons acquisitions are consistent with a specialized or diversified distribution of military capabilities. Theories about inter-branch rivalry point to competing priorities among army, navy, and air force service branches and argue those with more political influence are able to lobby for a more prominent role for their service [31]. Bureaucratic explanations point to the need to examine internal

factors because of the absence of a single authority for weapons development decisions [32–34]. Others point to re-election incentives held by elected representatives and argue that military budgets that generate jobs or shore up nationalism are thus the preferred model [35–38] although there is much disagreement about the empirical record [39, 40]. Preferences for a particular distribution of military capabilities may also be influenced by political ideology [41–43] or regime type [44, 45]. Public support may matter in democracies more than non-democracies [46] which could cause democratic regimes that are sensitive to casualties to desire capital-intensive as opposed to personnel-intensive military forces [47, 48].

More socially-driven domestic considerations also point to the importance of non-state actors and incentives, but are less tied to the assumption of egoistic profit motivations and self-interest among defense contractors. Instead, the weapons systems a state develops are decided by scientists and technologists [49], although the latter perspective has been challenged by later empirical examinations of the same Cold War case studies [50, 51]. More sociological theories of the social relations among networks of domestic actors has been forwarded by [52]. Work in this vein has posited status concern explains particular weapons acquisition decisions [53] but only in limited empirical cases. While domestic politics influences many aspects of force structure like acquisition decisions, production capacity, and innovation patterns, it is less clear why, for example, states with strong bureaucracies would have highly specialized force structures or why we should expect states with divided governments to have more diversified force structures [54].

Turning now to “external cause" explanations, consider a State A that faces a threat from State C because of divergent and inconsistent preferences over their ideal international environments. State A’s best response to the threat from State C would be acquiring the distribution of military capabilities that it believes is most optimal for its security given its beliefs about State C [5].[1] This is the realist position – a state’s distribution of military capabilities is a function of that state’s threat environment [2] and states will maintain the distribution of military capabilities that best addresses that environment [56–58].

If we now consider the existence of another actor, State B, that also faces a threat from State C due to divergent and inconsistent preferences, a question arises about whether State A and B will have similar or different distributions of military capabilities.[2] The *anarchic view of international politics*

[1] More generally, a state will also increase the level of military spending if they face a more threatening international security environment [55].

[2] I hold the rest of State A and State B’s threat environments constant, meaning State A and State B do not consider each other

would posit that variation in states' distributions of military capabilities is explained by differing resource constraints and prioritization of particular threats [55, 59]. As a result, State A and B, if similar in resource endowments and economic constraints, should have similar distributions of military capabilities because they face similar threat environments. [2, p 165] argues that "contemplation of a common fate may not lead to a fair division of labor – or to any division of labor at all." And even if their material capabilities differed, "[c]ontending states imitate the military innovations contrived by the country of greatest capability and ingenuity. And so the weapons of major contenders, and even their strategies, begin to look much the same all over the world." [2, p 127]. Collaboration is unlikely and fleeting unless the threat from State C is grave.

One important conclusion from this pessimism about cooperation under anarchy concerns states as like-units. While there is "functional specialization – an intense division of labor" *within* states and other organizations, "[t]he same is obviously not true of international politics. There, power is distributed more equally than in organizations. Moreover, it is distributed to protect no group purpose. There is no functional specialization among states." [60, pp 36–37]. Because states cannot resolve the problem of credibly relying on one another, the self-help nature of the international system should prevent states from being able to functionally differentiate their military capabilities by relying on each other. The absence of an international sovereign makes cooperation under anarchy difficult [61], so instead, states try to maximize their security through a "combined arms" approach to defense where each states individually acquires the military capabilities they deem necessary (and feasible) for their national security [3, 4, 62]. This optimal distribution of capabilities is diversified because "each weapon, unit, and technique possesses a unique set of capabilities and vulnerabilities. Taking full advantage of these military assets increases the likelihood that an armed force will fulfill its mission. Taken in aggregate, the operationally effective military organization is one that derives maximum benefit from its components and assets by linking them together for mutual support" [63, p 52].

Practitioners have long adopted this model, with historians noting that politicians and military commanders arguing "a synergistic mix of platforms and weapons intended to produce a force or more capability than that represented merely by the sum of its parts, has always been justified by the argument that it provides a wide range of responsive options... The analogy is that of the supermarket; marketing

threats.

managers have to cater for the unpredictable wishes of a customer who does not know what (s)he wants, by providing as wide a range of attractively packaged and competitively priced products as they can" [64, p 185].

3.4 A Theory of Specialization within Alliances

When deciding how to allocate military capabilities, states face two conflicting sets of motivations. If they choose to allocate those resources towards a diversified portfolio, opting to acquire a minimum amount of all defense capabilities that would provide security given the anticipated threat environment, they reduce their overall vulnerability by covering their bases but do so at a high economic cost. In contrast, a state choosing to allocate their resources towards a specialized portfolio would commit to a smaller set of capabilities, resulting in observed over-production of the capabilities chosen and under-investment in the capabilities omitted. From this, the specializing state gains financially from economies of scale and may also garner economic and military benefits from improved operational efficiency and integration. I first posit that this functional differentiation can be observed as military specialization. This explains why specialization by capable states is not a strategic blunder as it initially appears, but instead an optimality made possible by the nature of interstate relations.

The conditions under which actors can engage in efficient and mutually beneficial cooperation is a broader story in international affairs about resource management. States face a constrained optimization problem where the set of resources available to accomplish some task are finite, requiring a balance between efficiency and efficacy. States manage this trade-off in different ways, with some theories predicting they will prioritize efficacy (diversification to produce a full-spectrum combined-arms military) and others predicting they will prioritize efficiency (specialization to develop only the capabilities that are absolutely vital). Theoretical insight from business organization research about inter-firm cooperation helps identify one way that like-minded states can manage this trade-off [65]. There are conditions under which relationships with like-minded states are conducive to a division of labor that minimizes the otherwise zero-sum trade-off between efficiency and efficacy. When this occurs, states can overcome part of the constrained optimization problem by individually specializing (efficiency gains) while collectively

diversifying (efficacy gains).

A common set of assumptions motivate the theoretical approach. This theory is fundamentally a strategic one assuming rational social choices by states. Actors are rational insofar as their preferences are transitive, their actions purposive, and their criteria for evaluating interstate relations is instrumental rather than innate [66, 67]. But assuming that states act rationally does not presuppose complete information. States may still make mistakes and suffer unintended consequences given uncertainty about the state of the world, including the true underlying values of the variables of interest and regard them with some unknown probability distribution [68, p 22]. I offer a theory about how different strategies of interstate relations alter the payoffs of different military configurations for cognizant actors making utility-maximizing choices [69, p 130]. In doing so, the nature of interstate relations changes the optimal force structure decision for a state, given its preferences. While recognizing that they "arise in the first place from bargaining solutions to problems of order" [70, p 634], I remain largely agnostic about the origins of states preferences over alliance relationships and do not try to explain where they come from.[3] The form of security cooperation states undertake could be motivated by interest-based or social-based incentives (or, most likely, both) but the important assumption for my theory is that the form of governance is constituted by the agent and it structures the degree to which they can engage in security cooperation in a way that is conducive to a division of labor.[4]

3.4.1 Costs and Benefits of Specialization

To justify explaining variation in the distribution of capabilities, I first identify the costs and benefits of both ends of the dimensions of interest – specialization and diversification.[5] The three primary benefits of specialization stem from economies of scale, operational efficiency, and improved integration

[3]For parsimony, I largely bracket the decisions and preferences of domestic actors and instead treat states as units with homogeneous preferences. Domestic considerations clearly play a role in state defense policy as an input into both the dependent and independent variable, but not in a way that invalidates the explanatory role of interstate relationships. See [18, 71, 72] on domestic determinants of forms of security cooperation. Similarly, I do not present a theory about the structure of the international system.

[4]For a more detailed evaluation of relational norms and social-based incentives, see [73]. Others have pushed back that this account is more descriptive than theoretical [74, 75].

[5]Importantly, the benefits of specialization are unlikely to be linear or the same across weapons systems. Weapons platforms like main battle tanks that states possess in the thousands will have different benefits from specialization than military technologies like aircraft carriers where even the most militarily capable states possess no more than a dozen. The nuances of specific military assets are examined in more detail in a later chapter detailing a case study of former Soviet states.

[6]. Although these initially seem like economic issues that should matter less than security considerations, the two are inevitably intertwined. A state's decisions about how to best provide for its defense occur within a constrained optimization environment. Thus, economically-conscious defense decisions impact how well a state will be able to provide for its security and how well aspects of their defense portfolio work with one another during conflict.

First, the cost of setting up manufacturing and industrial plants as well as acquiring the materials for weapons acquisition often entail large up front investment [76]. But the marginal cost of that investment goes down as a state decides to produce more of the same asset [77]. Maintenance and repair costs are reduced when there is a smaller list of repair parts [78]. Economies of scales are also "active", in that they accrue as a state undertakes defense-related activities. The more a state operates with a particular asset, the lower their marginal costs because of "learning by doing" [79, 80].There are also domestic political benefits to economies of scale that allow a state to reduce the overall amount of defense spending, yielding positive payoffs for policymakers [81].

Second, specialization also allows a military to perform select missions more efficiently since it streamlines logistics and reduces the overall cost of learning how to use new equipment. Many military capabilities require capability-specific investments that involve a fixed cost. A state with several dozen different types of aircraft will require more complex pilot training than a state that only has to master the effective utilization of a few types of aircraft. For example, Germany has reduced the need for redundant infrastructure by centralizing car and light truck production all within the Bundeswehr-Fuhrparkservice GmbH which allows them to produce newer vehicles more quickly, although of less variety and overall quantity [82].

Third, integration is easier as a country specializes since the complexity of integrating numerous types of platforms with various roles and responsibilities decreases. Even issues as fine-grained as the software used in various pieces of equipment are sufficient impediments to military operations that nations consider this issue carefully. NATO's Standardization Agreement (STANAG) is representative of decisions all states consider internally to address improved integration like broad fleet compatibility with the same fuel nozzle.[6] These benefits are summarized in figure 3.2.

[6]For a contemporary example of US concerns of communication interoperability between its aircraft and allies operating

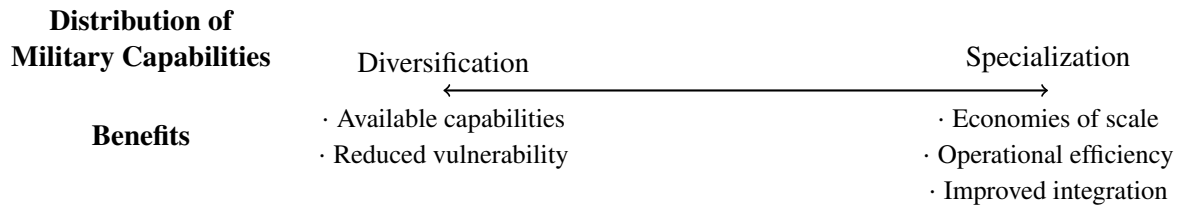

Figure 3.2: Varieties of the Distribution of Military Capabilities

In contrast to specialization, the benefits of diversification manifest as the security gains of a combined arms military [4]. States that engage in a combined arms approach to warfare instead of specializing benefit from having all the capabilities needed to defend themselves. No weapons system is perfect, and the nature of warfare means weapons systems that excel at one aspect of international conflict do so precisely because they lack other capabilities. Aerial bombers can sacrificed maneuverability so that they have carry a high payload. More maneuverable aircraft like fighters have to compensate for the benefits of speed and maneuverability with lower ordinate payloads in order to achieve those benefits.

Diversification also reduces vulnerability because failure to diversify makes it easier for the adversary to develop countermeasures. A state with a limited variety of military capabilities has given their adversaries a shorter list of defense capabilities they must be able to defeat to prevail in conflict. Air defense systems, for example, come in three different varieties; surface-to-air missiles (SAMs), anti-aircraft artillery (AAA), and piloted aircraft. These systems all differ in the altitudes they can target, stealth, reaction times, mobility, and cost. A state that has chosen to develop only one of these capabilities might have more in quantity (scale economies) and quality (operational efficiency and improved integration), but they are now vulnerable to the development of new missiles designed to mitigate the strengths of that one air defense system. In a 1940 testimony before the Senate Appropriations Committee, General George Marshall noted the need for both aircraft and anti-aircraft artillery because the former is an area system that excels at searching while the latter is a point system designed to protect key assets. When asked by Congress which was preferable, he said “the whole thing is interwoven . . . all these matters have to be given proper weight to get a well integrated and balanced whole" [84].

States that have not embraced the combined-arms model of warfare have consequently suffered.

Chinese-manufactured drones, see [83].

After the Yom Kippur war, Israel opted to specialize their military by cutting artillery and mechanized infantry in favor of a shift to pure armor-aircraft. This left them vulnerable to an anti-armor and anti-aircraft attack that set them back in the early stages of the 1973 war against Egypt. It was only after they reversed course that they were able to defeat the Egyptian air defense systems [85]. Operating with a similar logic, India's primary defense planning document after World War II, the [86], also made the case for a "balanced naval task force" which was later clarified by Indian Vice Admiral W.E. [87] as "containing all types of ships and aircrafts, on the sea, over the sea, and under the sea" in a move to reduce India's dependence on Great Britain for military assets.

Importantly, these costs and benefits are not uniform across states. States with smaller militaries have greater incentives to specialize since the economic benefits of doing so are more salient. The more resource-constrained a state, the more the resource gains of specializing matter [88].[7] Conversely, larger states like great powers are more likely to face a broader array of threats to their security, creating an incentive to diversify to deal with a multitude of threats. I thus expect that smaller states will, on average, be more specialized than larger states, all else equal.

3.4.2 A Division of Defense Labor and Military Specialization

Given the relative costs of a diversified or specialized distribution of military capabilities, it appears the wise decision is to diversify as best as possible given an environment constrained by limited material resources. So, why do states specialize? In particular, why do some states consciously choose to forgo optimal defense simply to capture economies of scale? Doing so appears to be a decision to choose a sub-optimal defense posture that could be have been avoided.

Specializing one's military is not sub-optimal if it is part of a cooperative division of labor that means a state gets access to a diverse range of military capabilities provided by aligned states.[8] After all, one way states can save resources in a constrained optimization environment is by sharing the production of international security with other states in a way that allows each state to allocate resources toward

[7] Others question whether we empirically observed more specialization by states facing higher budget constraints. In the European context, many states have diversified their military portfolios despite the financial cost of doing so [89, 90].

[8] I define aligned states as states with whom one could have cooperative security relations where there are expectations of support and/or mutual coordination during future interactions. Formal military alliances represent one type of alignment, but not all alignments are alliances [91].

non-security functions [92]. This can garner the security benefits of capability aggregation posited by the neorealists [2, 93] as well as the economic benefits put forth by hierarchy theorists [6, 94, 95].[9]

A state's decision about whether to have a division of labor with aligned states over the production of security assets is a function of three factors – the gains from cooperation, the expected cost of opportunism, and the expected cost of coordination [97]. When the gains of cooperation exceed the expected costs of opportunism and coordination, they can specialize their militaries because cooperation means doing so does not sacrifice the benefits of a interstate diversified military force. Otherwise, problems of opportunism [98] and costs of coordination [99, 100] inhibit otherwise fruitful defense cooperation.[10]

The gains from cooperation include those previously outlined like economic benefits from economies of scale, political benefits from the efficiency gains of focusing on core competencies, and security benefits from improved performance at particular security needs. The expected cost of opportunism is a function of the severity and likelihood of abandonment (your partner shirking responsibility), entrapment (your partner bringing you into unwanted conflicts), and exploitation (your partner altering the terms of the agreement for more favorable gains by doing things like free riding) [103]. The expected cost of coordination concerns how much work is required to ensure the relationship achieves the expected benefits. When cooperation via this division of labor is preferred to non-cooperation, states will thus specialize [104].[11]

There are *gains to cooperation* in a security arrangement simply by virtue of having access to more resources. After all, one of the expected payoffs from developing relationships with similarly aligned states is the expectation that some aspect of your ally's military resources are available to you during war [107]. Ideally, the resource gains under cooperation would be more than the sum of its parts because there are scale economies in the production of defense through factors like standardization, repetition, fixed

[9] [96] also identify how specialization by alliance members can help individual states engage in cost-effective defense investments while maintaining an aggregate full spectrum combined-arms force, but reach the opposite conclusion in remaining skeptical that the risk of opportunism and cost of coordination can be adequately addressed. Their analysis is driven by European debates over the Smart Defence initiative that stalled due to fears that participating countries could refuse to participate in coalition warfare. See [96, pp 229–233].

[10] As discussed, this perspective assumes a rational decision-making approach whereby states decide whether to engage in a division of labor over the production of security assets based on a cost-benefit analysis of doing so. For contrasting views on the benefits and drawbacks of assuming rational decision-making in the specific context of the economics of arms acquisition, see [101] and [102].

[11] Similar decision calculi and the resulting specialization is seen in various economic sectors like the packaging machine industry [105] and telecommunications equipment manufacturing [106].

initial investment, and learning. This is increasingly the case because budget considerations created a constrained optimization environment that can be ameliorated by a division of labor with trusted allies. “Assuming the Budget Control Act remains the law of the land and sequestration once again compounds the Navy’s resourcing dilemma, the service’s incentive to offset risk through more fundamental and pervasive partnering approaches only grows" [108, p 4].

Scholars have analyzed the gains of defense cooperation at the firm-level by identifying ways that military contractors specialize and then integrate production capabilities to reduce the costs of production and R&D [109–112]. In business arrangements, a division of labor can be costly because the value of a product is effectively the lowest common denominator of its component parts [113]. An excellent car engine is largely moot if a poorly sourced axle renders the vehicle unusable. The same is true in defense, where a break in one part of the chain can render the entire force vulnerable to defeat.

Yet, practitioners have recognized the benefits of having such a division of labor over defense capabilities. US Naval Rear Admiral [114] noted that by having this cooperative approach, “each nation can avoid duplication and thereby reduce its proportional share of the expense. This is not simply about global maritime partnerships. It’s about a focused and pragmatic approach to force allocation that acknowledges allies’ existing contributions. Countries could immediately apply the freed resources to unique national missions for which a collaborative approach is impractical." Discussions in the US about a ‘1,000 ship Navy’ are predicated on precisely this model; a navy that is “not a thousand gray hulls flying the American flag, but rather a voluntarily global maritime network that ties together the collective capabilities of free nations to establish and maintain a dramatically increased level of international security in the maritime domain" [115]. Chair of the Joint Chiefs of Staff Martin [116] remarked on the importance of partner capacity in saying “we need to construct stronger security partnerships with like-minded nations, so that all can contribute to the collective defense."

Concerning the *risk of opportunism*, both states must feel that mutual cooperation is preferred to mutual defection in cases where unilateral defection is preferred to unrequited cooperation [97, 104, 117]. Otherwise, depending on another state that may renege when asked to contribute to your defense could seriously jeopardize a state’s security. If this risk is seen as high, states should instead opt to produce security on their own. The three ways opportunism can impose costs are through abandonment (shirking

or buck-passing), entrapment (chain ganging), or exploitation [103]. These can prove fatal to a state depending on another for defense, especially if that dependence took the form of a specialization, because "if the state has specialized in a land-based army and its partner has agreed to provide the complementary naval defense, for instance, opportunism by the latter may leave the former more vulnerable than if it had produced both an army and navy of its own" [68, p 13].

In the specific example of the Iran-Iraq Tanker War, had its western European allies been unable or unwilling to provide minesweepers, US aircraft carriers alone could have done little to alleviate the harms of Iran threatening to shut down the Strait of Hormuz. Avoiding this requires avenues for communication and routines for interaction that mitigate concerns about opportunism sufficient to encourage cooperation via the coordination of military strategies [118] which was made easier by the fact that these European states also had a stake in the operation given the importance of stable access to Middle East oil. Because a division of labor where you rely on your partner providing assets risks losing autonomy over the conduct of those assets during combat, there can be ambiguity about the effects of cooperation on a state's security goals [119]. As [96, p 232] put it, "in alliance warfare, allies sometimes do not always show up when needed or they show up but are not able to do what is needed."

The *costs of coordination* are distinct from those incurred in reducing opportunism [120, p 1385]. While opportunism costs focus on uncertainty regarding your partner, coordination costs are more about uncertainty regarding the task [121, 122]. You can have full confidence your partner will not act opportunistically if interests are perfectly aligned, but there still has to be coordination about the division of labor and a formal designation of roles absent the ability to read minds [123–125]. This is fundamentally an issue of information asymmetry, so creating a "common knowledge assumption" can induce and stabilize cooperation by reducing uncertainty about the other actor's payoffs structure and conveying their own payoff structure to the other actor [126, p 19].

Research from macro-organizational behavior of businesses has found that the need to cooperate and control are the fundamental tension in inter-organizational research [125, 127–130]. Despite this, international relations research on the problems of cooperation inspired by [131] and the accompanying transaction cost framework have been less concerned with coordination costs, instead arguing that opportunism costs should be at the forefront [7, 68]. Coordination costs may not be particularly salient in

contexts where resources are simply pooled to produce the output, but that is not the case in the security context [82]. Coordination costs need to re-enter the picture [120]. In defense, “duplication of facilities, differences in requirements, coordination problems, lack of clear control and delays due to different budgetary systems all tend to increase the costs of collaborative projects" [132, pp 69–70].[12] Collaboration requires communication, making adjustment in response to your partners actions. It is quite difficult to fight a war with another state’s tools. Integration between one state’s military and those of its allies can involve interdependence that is sequential, reciprocal, or simultaneous in nature [80].

General [135] noted that a large part of why the Allies were successful was standardization of US equipment. Germany had trouble on the logistical front because their ground vehicles required buying parts from 13 different companies which made it difficult to keep them all operational. Friction over this process can result in resentment like what Canada and the UK experienced during ISAF in Afghanistan. Canada did not have logistical and transport capabilities in the region and instead relied on the UK provision. But the UK got upset that they were playing taxi, with a British brigadier commenting “every time the Canadians want to move somewhere, we would have to move them. We took casualties every single time" [96, p 232]. A similar issue arose in the NATO’s Libya campaign in 2011, where difficulty coordinating air strikes by various NATO members changed NATO’s overall intervention strategy to minimize the risk of ineffectiveness [136–138].

In sum, seemingly suboptimal force structures – those that omit useful defense capabilities and/or overproduce others – occur when a state has opted to specialize its military portfolio. A state is more willing to do so when the security risks of specialization are no longer prohibitive; a condition that is made possible by participation in cooperative security alignments that reduce those security risks. When states opt for collective defense arrangements, specializing ones military represents an efficient way to do so, making both states better off. Specialization is thus an outcome of cooperative security arrangements that promote a division of responsibility and function [139, pp 90–91].

Hypothesis 1. States in cooperative security alignments should have a more specialized distribution of military capabilities than states not engaged in cooperative security alignments.

[12] For a detailed case study illustrating the difficulties of defense collaboration, see analysis of France and the A400M transport aircraft [133, 134].

The terminology for this explanatory variable, thus far described informally as cooperation, is far from harmonized and consequently confusing [70]. I think of this cooperation more broadly as the presence of a form of governance – "the management of relations between actors" [68, p 5] which others have called "relational governance" [73, 131, 140, 141]. Cooperative security alignments involve commonly recognized defense relationships like mutual defense pacts and formal alliances [142] as well as less analyzed, but more common defense cooperation agreements (DCAs) [143]. What these have in common is some form of structured defense cooperation through which states cooperate militarily or with defense capabilities beyond just mere coincidence. When states engage in join military training exercises, sign mutual defense pacts, or base troops on foreign soil they have a cooperative security alignment that is undertaking actions that reduce the risk of opportunism and the cost of coordination [144].

These forms of governance are instruments of control that allows actors to specialize their military by addressing the costs of cooperation so that the expected benefits of specialization exceed the expected costs [145–147]. This "can enable states to choose cooperative strategies in security relations by reducing uncertainty about the power and intentions of other states and about the consequences of their strategy choices" [148, p 5]. A state's distribution of military capabilities will thus be more specialized when their relationship with aligned states encourages a shared production model of military capabilities. Under these conditions, cooperative security alignments represent a means to deal with the constrained optimization problem by taking advantage of capability specialization and complementarity made possible by shared production.[13]

In one sense, this is not a significant departure from the neo-realist assumption that states' fear of exploitation is most salient in security issues where their survival may be at stake. Rather, it simply forwards an explanation for how cooperation can manage that uncertainty for forging relations in institutions that reduces the expected cost of opportunism and coordination such that the benefits of cooperation can be accrued. When cooperating for the production of security, states can "take advanced of economies of scale in the provision of defense and to benefit from specialization by coordinating training, equipment, and procedures. By pooling their efforts and/or cooperating with states that have different comparative

[13]Not all forms of security cooperation are created equal. It is reasonable to expect a formal defense pact to better encourage strategic cooperation than regularized training exercises. Differentiating between alignment relationships is the subject of the next chapter.

advantages, leaders hope to create a stronger joint fighting force [149, p 185].[14] Absent that, “the state may waive some degree of specialization for fear that the other will not live up to the terms of the agreement" [68, p 15].

3.5 Empirics

3.5.1 Dependent Variable

The dependent variable is the distribution of military capabilities in country i in year t. An entity's distribution of military capabilities is defined here as the combination of military equipment that could be used by a state during conflict. This includes platforms like artillery, aircraft, naval vessels, armored vehicles, satellites, and transport ships. It does not include munitions like single-use bombs or ammunition or firearms used by individual military personnel.[15] I choose these scope conditions because military platforms are equipment that can be deployed, that other nations are likely to observe, that could be used to signal intent and resolve in a crisis without actual use, and that are durable goods.

To measure this, I create a new index that identifies differences between states' composite force structures across time and space. A state's distribution of capabilities – computationally, a vector of quantities for each of the 70 military technologies outlined in the previous chapter – is compared to every other state's vector of the same capabilities for that same year. The value of this index describes the degree to which a state's military capabilities are diversified or concentrated. It is monadic, treating a state as a unitary agent. The data come from the annual Military Balance reports published by the International Institute for Strategic Studies (IISS) and represent military capabilities for 173 countries over 50 years (1970 – 2014)[16].

Assume that global defense in year t is composed of N countries and M military technologies. I construct an $n \times m$ interaction matrix for each year t such that each row n is a country and each column m is a technology. Each cell thus represents the observed count of a given technology in that country-

[14] [150] and [151] have similar justifications for a relational view of firm cooperation and competitive advantage. My theory borrows heavily on research on firm alliances to explain the conditions under which a state's defense resources span state boundaries because they are a part of interstate resources and practices.

[15] Existing research has made similar distinctions in what military capabilities are examined cross-nationally [152, 153].

[16] See the previous chapter for a detailed explanation of the data.

year's military. In aggregate, this can be represented as $d_j = \sum_{i=1}^{N}(p'_{ij} ln \frac{p'_{ij}}{q_i})$ where N is the total number of countries in that year, p_{ij} is country i's possession of technology j divided by the total amount of technologies j, and q_i is the total number of technologies possessed by country i divided by the total number of technologies in the world.[17]

To create a measure of the distribution of military capabilities for every country-year, I compute a ratio of a given country's share of the aggregate global count for each capability. For example, in 1980 the United States possessed 553 tanker aircraft, 3 mine countermeasures, and 13 intelligence, surveillance, and reconnaissance (ISR) radar. Without global context, it is difficult to make sense of these numbers. Thought of in terms of the world share, this was 75% of the world's tanker aircraft, 0.2% of the world's mine countermeasures, and 34% of the world's ISR radar. There is now some intuition for those high and low extremes – the United States possessed an overwhelming amount of the world's tanker aircraft but largely omitted the development of minesweepers. For perspective, Fiji and Cuba owned as many minesweepers as the United States.

To control for the relative rarity of different capabilities, I then calculate the standard deviation of a country's share of each technology. Figure 3.3 visualizes this example. The United States was 10.4 standard deviations above the global mean in owning 553 tanker aircraft, 0.2 standard deviations *below* the global mean in owning 3 minesweepers, and 4.9 standard deviations above the global mean in owning 34 ISR radar. This makes clear that while the United States possessed a sizable ISR radar capability, it was not nearly as outsized as its tanker aircraft fleet.

But was possessing 4.9 standard deviations above the global mean for ISR radar a sign of relative US strength in this capability, an unexpected omission given general US military dominance, or par for the course? To identify where a country's share of a given capability lies relative to expectations, I compare each capability's standard deviation to the country's average standard deviation in a givenyear. Across 70 different military technologies, the United States possessed an average of 4 standard deviations above the global mean. Thought of this way, 10.4 standard deviations for tanker aircraft is a lot, even for the United States, and 4.9 standard deviations for ISR radar indicate that even though the United States possessed much more than the average state, it possessed about as many as we would expect for the United States

[17]This represented a bipartite network structure modeled after its use in ecological research [154].

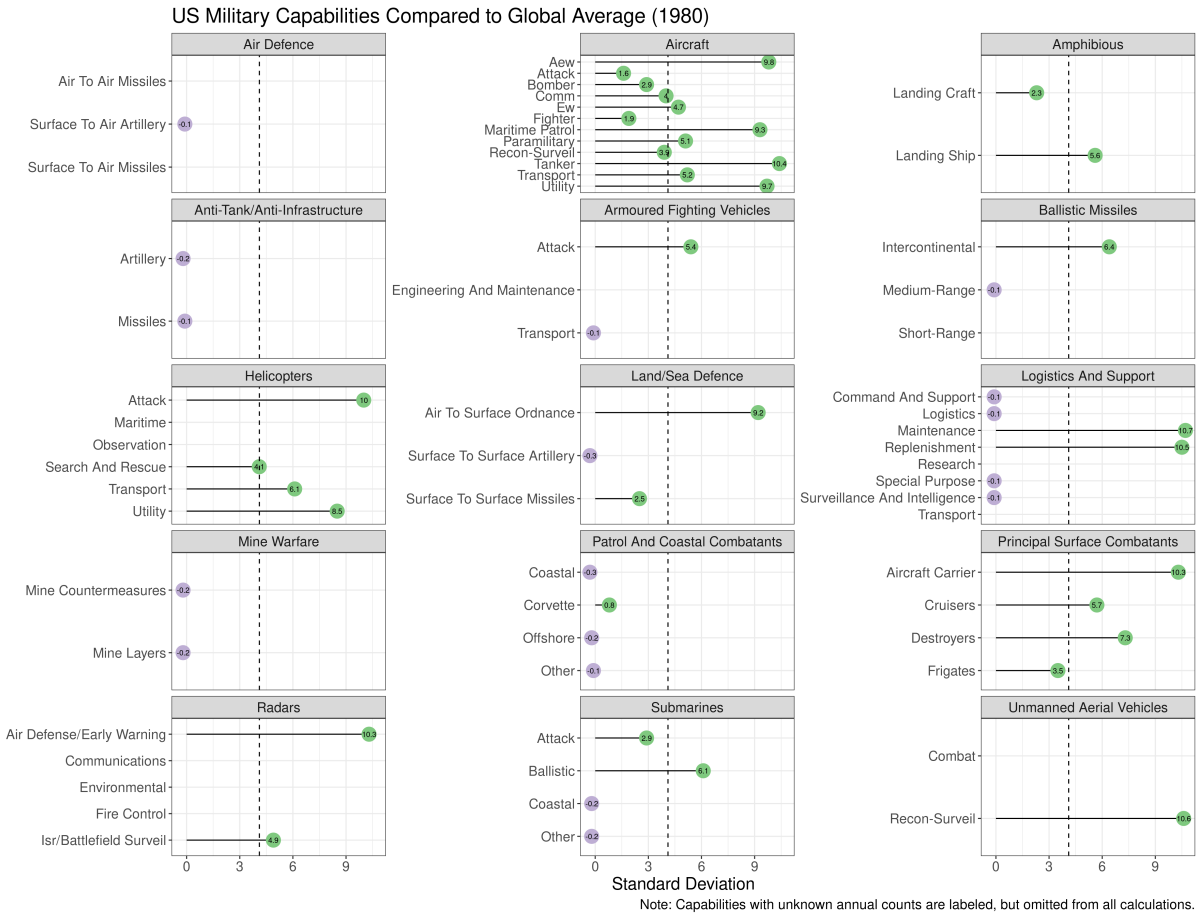

Figure 3.3: Bars represent standard deviations from the annual mean for each category. The vertical dashed line is the country's mean standard deviation across all capabilities.

given its composite force structure.

A suboptimal force structure is one that contains two deviations – omissions and over-productions – from some baseline. My baseline here is the neorealist assumption that states behave as like-units under anarchy and should consequently seek diverse military capabilities subject to resource constraints. I thus measure specialization as the degree to which a state's military capabilities are dispersed relative to their average standard deviation from the world share. If the United States has *precisely* 4 standard deviations above the world share for every military technology, it has neither omitted nor overproduced on any one front. That standard deviation itself simply indicates the United States has a larger military than everyone else, but it is larger in all respects. On the other hand, if the United States has an average of 4 standard deviations above the world share across capabilities, but it has 10 standard deviations above the world share for some capabilities and 0 or 1 standard deviations above the world share for others, both of those constitute specialization in that the United States has chosen to overproduce some capabilities and under-produce others, holding the overall size of its military constant.

Figure 3.4 shows the distribution of this dispersion score by country over time. This represents the dispersion of each individual state's 'evenness' relative to its own average. Some descriptive trends stand out. Most states on the African continent have low specialization, meaning the relative composition of their military forces does not differ much from the global average. In other words, many African states are equally 'capable' across military capabilities, largely due to relatively low capacity across all capabilities. For country-years that are the darkest purple (least specialized), if most states have a one fighter aircraft per dozen armored fighting vehicles, these states do as well.

The most specialized states initially seem counter-intuitive. After all, the conventional wisdom holds that superpowers like the United States and Soviet Union possess full-spectrum military forces [155, p 8]. Yet practitioners think about a full-spectrum force as involving the ability to "prevail, quickly, and cheaply, in any and all forms of conflict" [156, p 157]. This is not mutually exclusive with a form of specialization that emphasizes some capabilities over others. Rather, capable states with full-spectrum militaries are still subject to constrained optimization and are unable to excel at all forms of conflict simultaneously [157, p 91]. Making priorities is both a product of luxury and of necessity. So while the United States may dominate in many military capabilities, that does not mean its relative dominance

Figure 3.4: DMC scores by year

is equal across the board. As Figure 3.3 showed, US naval dominance is the product of dominance in principal surface combatants, particularly aircraft carriers, cruisers, and destroyers. When it comes to patrol and coastal combatants and even many logistics and support vessels, the United States possesses no more than the average state, and in some cases even possesses fewer. The dependent variable thus measures a state's deviation from its own mean, where its own mean represents what we would expect for each individual capability given its aggregate size and capability.

Figure 3.5 shows differences in the distribution of military capabilities for Canada, Israel, and the United Arab Emirates in 2010. While variation in the capabilities each of these countries would possess is intuitive, given differences in geography and the regional threat environment, two novel insights stand out. First, these countries all have similar levels of annual military spending – between $14 - $20 billion. Second, they all vary significantly in the specialization of their distribution of military capabilities. Israel is the most specialized (1.07), Canada is somewhat specialized (0.54) and the UAE is quite diversified (0.24). To put those measures into perspective, this puts Israel 0.15 standard deviations about the average degree of specialization, Canada 0.25 standard deviations below the world average, and the UAE 0.7 standard deviations below the world average. Despite these countries having similar levels of military spending, Israel has chosen a force structure composition that specializes in certain capabilities like combat vehicles, air defense, and aircraft while forgoing logistics and support vessels, surface ships, and anti-tank capabilities. The UAE, despite having similar – albeit not identical – geographic considerations has instead chosen to arm itself with a swiss army knife that has no noticeable strengths, but also no obvious weaknesses.

3.5.2 Independent Variable and Controls

The independent variable concerns a state's participation in cooperative security alignments. I use this phrase over the more conventional term "alliances" because alliances represent one of many different types of cooperative security alignments. Much defense cooperation occurs outside the scope of formal defense pacts that involved treaties. That some cooperative security alignments may be more or less conducive to a specialized division of labor is the subject of the next chapter.

I operationalize cooperative security alignments at the country level as annual participation in

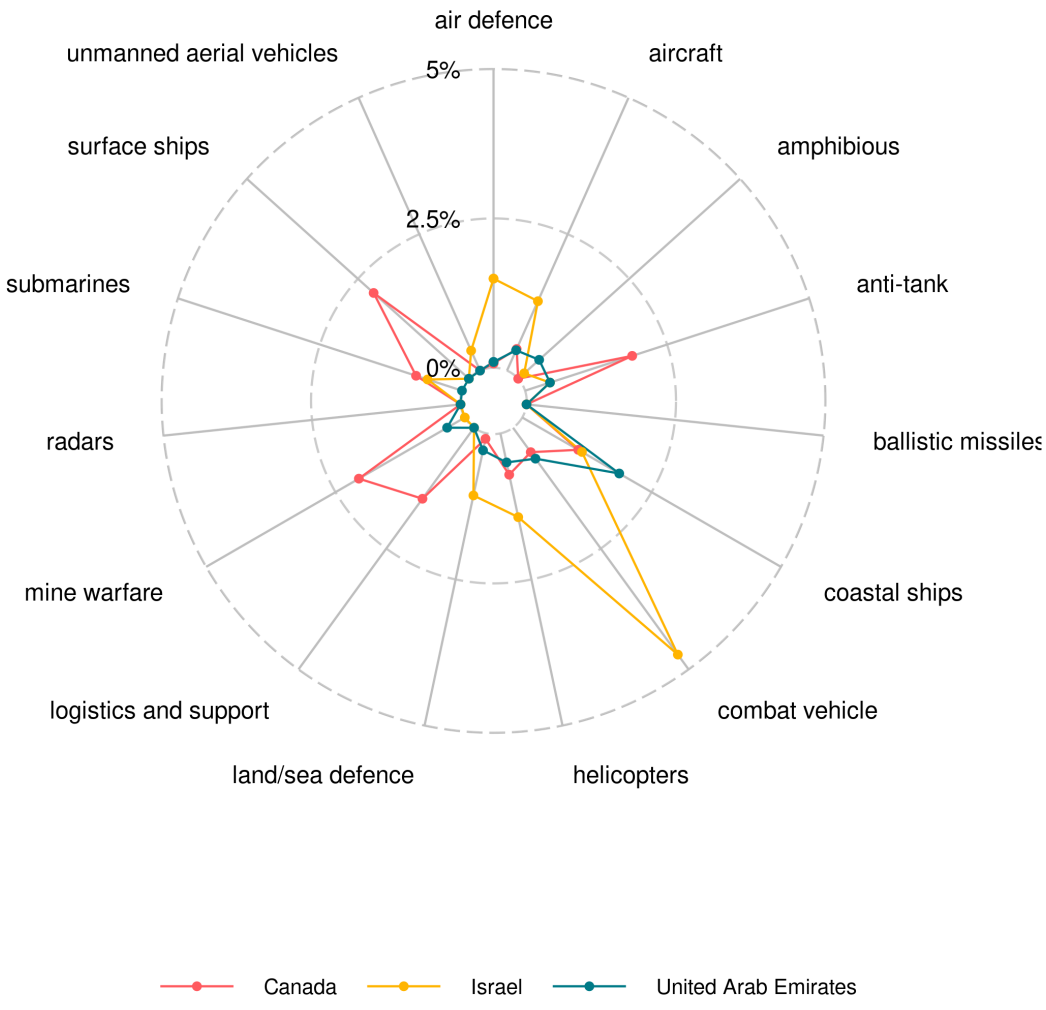

Figure 3.5: Distribution of Military Capabilities for Canada, Israel, and the United Arab Emirates. Each capability is measured as a percent of the world's share.

Defense Cooperation Agreements (DCAs) and offensive or defensive alliances. These variables are both observables for conditions conducive to military specialization because a state can engage in a division of labor with other states when these relationships are present. Data on DCAs is provided by the Defense Cooperation Agreements Dataset (DCAD) [143]. Data on state participation in offensive or defensive alliance pacts is provided by the Alliance Treaty and Provisions (ATOP) data set, version 5 [142].

I include both ATOP and DCAD as different operationalizations of alliance commitments to include temporal variation in both the number of states that are members of security alignments and also the number of security alignments in which a given state participates annually. Defensive alliances rarely end, and as a result by 2014 only 13 states in the international system are *not* members of a defensive alliance as coded by ATOP [158–161]. This lack of variation as well as temporal auto-correlation makes statistical inference using defense pact membership intractable. However, the number of defense pacts in which a state participates annually does change, as some states join more alliances over time. DCAs provide more spatial and temporal variation, as they concern day to day defense cooperation at the bilateral level that are still institutionalized, but are more routine forms of decentralized security cooperation [162].

I include a set of control variables that existing theories indicate could be causally related to the dependent and/or independent variables of interest. The models control for regime type, coding a country-year as a democracy if they score higher than 6 on the 21-point Polity V index. Democracies may build more capital intensive militaries because of casualty sensitivity [47, 48], spend less on defense [163, 164], are generally less likely to be involved in conflicts [165], and may be more or less reliable alliance partners [92, 166]. There is also a control for whether a country has been involved in an interstate war in the previous half decade, as states currently or recently engaged in conflicts may have different military capabilities than those not facing a salient military threat [159, 167] and recent conflict experience may change patterns of innovation [168, 169]. The model controls for GDP, as resource-constrained states may be forced to specialize and may also be unable to replace labor with capital [170–174]. Finally, I control for whether a state is a great power, as some states may harbor more global ambitions for which power projection capabilities are conducive [175–177].

3.5.3 Model and Results

The dependent variable is military specialization of country *i* in year *j*, measured as the dispersion of a state's aggregate standard deviations for each military technology from its own composite average of the world share. If a state possesses an average of 5% of the world's share of each technology and each technology is exactly 5%, their specialization score is low. If a country possesses an average of 5% of the world's share of each technology but for some technologies it has 10% of the world's share and for others it has 0%, then its specialization is high.

To reduce the influence of outliers and because military specialization has a lower bound of 0. The dependent variable is normalized using Ordered Quantile technique (ORQ) which yields the most appropriate Pearson P-test statistic using out-of-sample cross-validation with 10 folds and 5 repeats [178]. As the dependent variable is a continuous measure, I estimate a series of ordinary least square (OLS).

I estimate a series of models using three different independent variables – (1) a dummy variable for membership in at least one DCA, (2) an annual count of each country's DCAs, and (3) an annual count of each country's ATOP defense pacts. For each independent variable, I estimate a series of alternate model specifications: (1) bivariate defense alignment models, (2) adding all control variables, (3) control variables plus decade fixed effects, (4) control variables plus decade fixed effects and country-clustered standard errors, (5) control variables plus scaled cubic polynomials, and (6) control variables plus scaled cubic polynomial and country-clustered standard errors. Decade fixed effects and scaled cubic polynomials are appropriate because technology evolves over time and militaries innovate; we should not expect the make up a state's military in 1980 to be composed of the same assets as 1990 [179]. Furthermore, country-clustered standard errors account for the non-independence between observations. For simplicity, most of these model results are presented in full in the appendix.

Table 3.1 shows the results of the bivariate models as well as models with all controls and scaled cubic polynomials. The results from models 1 and 2 show that DCA membership is positively associated with military specialization with statistical significance of at least the 0.05 standardized level. Models 3 and 4 show that although the number of DCA of which a state is a member is positively associated with militaty specialization, the association no longer exists once control variables and temporal dependencies are

included. Models 5 and 6 show that as a state is a member of more defense pacts, its military specialization increases. This association is similarly significant at at least the standardized 0.05 level. In aggregate, these results provides initial evidence that that states with alliance partners are able to specialize their military portfolio – omitting certain capabilities and over-producing other capabilities – relative to states that are reliant upon self-defense.

Table 3.1: OLS regression results

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Independent Variables						
DCA Member	0.84^{***}	0.20^{***}				
	(0.10)	(0.06)				
DCA Count			0.03^{***}	0.00		
			(0.00)	(0.00)		
Defense Pact Count					0.06^{***}	0.01^{*}
					(0.01)	(0.00)
Controls						
Democracy		0.10		0.11		0.09
		(0.07)		(0.07)		(0.07)
Interstate War (5yr lag)		0.19		0.17		0.21^{*}
		(0.10)		(0.10)		(0.08)
GDP (log)		0.31^{***}		0.33^{***}		0.32^{***}
		(0.02)		(0.02)		(0.02)
Great power		0.68^{***}		0.66^{**}		0.51^{**}
		(0.20)		(0.20)		(0.18)

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$
All models include country-clustered standard errors. Scaled cubic polynomials in full models not shown.

These results are robust to a series of alternate model specifications provided in the appendix. Consistent results exist in models without decade fixed effects or scaled cubic polynomials and without country-clustered standard errors. To ensure the results are not simply an artifact of normalizing the dependent variable, the models are also all run on the non-normalized measure of military specialization. In this case, there is stronger support for the association with the number of DCAs, but weaker evidence in

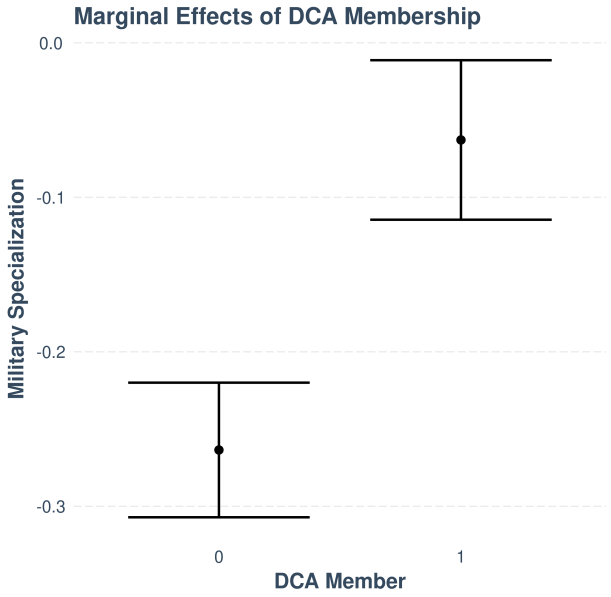

Figure 3.6: Effects plot for DCA membership and normalized military specialization scores with partial residuals holding all control variables constant.

support of a positive association with defense pacts.

The relationship between interstate security alignments and military specialization is also substantively significant. Figure 3.6 shows effects plots with partial residuals, showing the predicted change in military specialization for DCA membership while holding all control variables constant. Being a participant in a DCA is associated with an increase in military specialization of roughly 0.2 standard deviations. Put in interpretable terms, this is roughly the difference in the specialization of Belarus and Kenya's militaries in 2010. Belarus, a DCA member, was 0.2 standard deviations more specialized than Kenya, not a DCA member, despite both countries having similar levels of military spending. Belarus' military was specialized in possessing higher quantities of attack aircraft, attack armoured fighting vehicles, and transport helicopters than expected and in omitting most other capabilities relative to the rest of the world, particularly artillery. By comparison, Kenya is constantly had 0.2 standard deviations below the global mean for almost all capabilities except for transport ships.

When it comes to defense pact membership, Figure 3.7 highlights that the median degree of military specialization is most strongly associated with states that are members of 20 defense pacts in a given year. States with the average number of global defense pacts in a given year (4) have militaries that

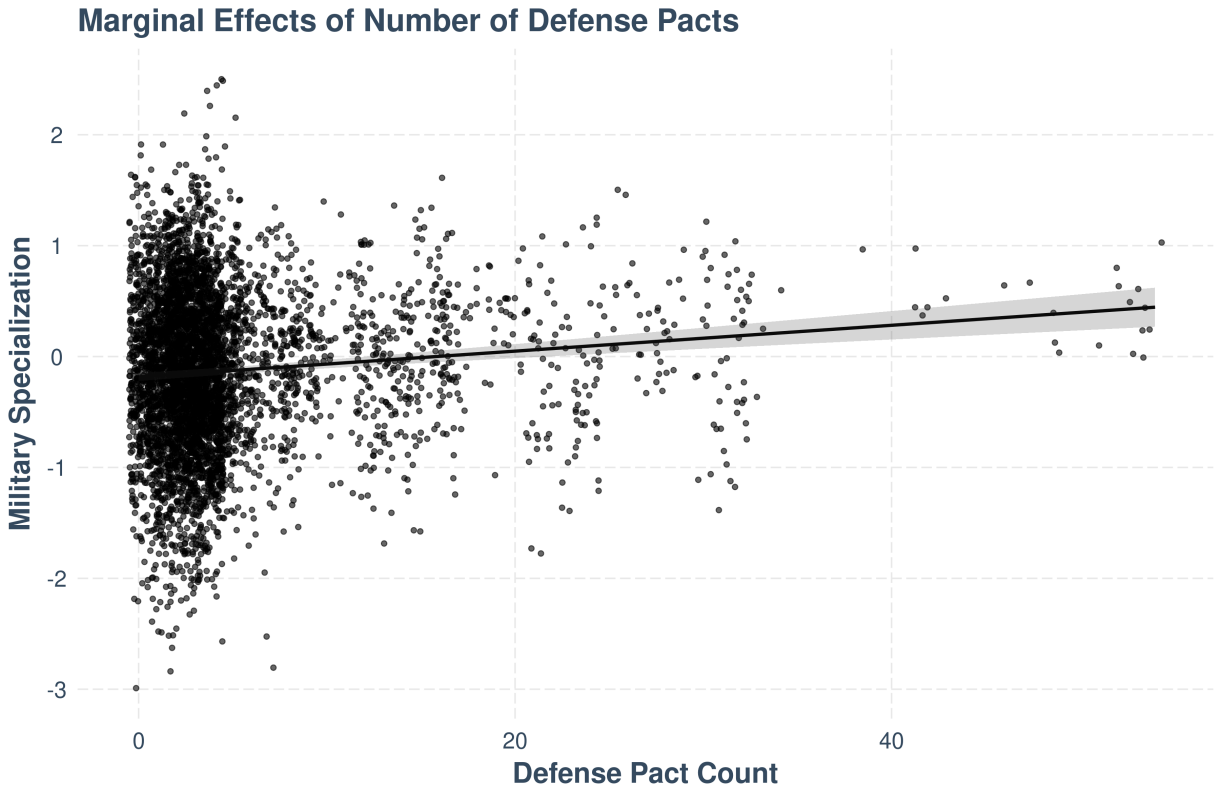

Figure 3.7: Effects plot for number of defense alliances and military specialization scores with partial residuals holding all control variables constant. Military specialization is normalized, with numeric values representing standard deviations from the mean.

are nearly 0.3 standard deviations less specialized, holding all other variables constant. In 1988, Poland was a member of 9 defense pacts and had a military specialization score of 0.33. By 1995, Poland had doubled the number of defense pacts in which they participated and their military specialization score subsequently increased to 0.72.[18]

3.6 Discussion and Conclusion

In sum, “make or buy" in the context of international security is better thought of as “make/buy, or rely". States can provide for their security on their own (make or buy) in the realist’s self-help world of anarchy or they can pool resources with others by engaging in a division of labor within a cooperative

[18] A more detailed analysis of specialization among former Soviet Union and Warsaw Pact states following the end of the Cold War is the subject of an ongoing project.

defense agreement agreement that leaves them all better off (rely). There are a variety of forms of governance that allows states to “rely" to different degrees and for different reasons. The second stage of the theory investigates this to explain the “how much" and “who" in divisions of security labor. While much research theorizes the conditions under which states choose security cooperation, I argue that the form of that cooperation has division of labor benefits that explain the functional differentiation of states.

The link between security cooperation and the means by which states fight has not been properly theorized because despite a general recognition that institutions influence state behavior [180], the state has remained the primary unit of analysis for inquiries about determinants of state military capabilities [114, 181–183]. But a state’s security is improved not just by their own defense efforts, but those of similarly aligned states in the international system [184, 185]. My contribution to research on international security cooperation is investigating how different interstate security alignments influence the composition of states’ defense [186]. This requires examining the specific capabilities that allies bring to bear during a conflict since that is what influences the effectiveness of coordination and thus the probability of success [187, 188].

Although it may initially seem that a theory of a shared production of military capabilities runs counter to theories about diversification (what [4] calls “combined arms"), it simply represents a re-framing of the unit of analysis. While individual states may rationally choose to opt out of a diversified military portfolio, when the unit of analysis is instead a cooperative security alignment we should now see states optimizing their combined military capabilities in a fashion consistent with the constraints those alignment relationships play on their ability to individually specialize.

The wars in Iraq and Afghanistan taught the United States an important lesson regarding the complications of configuring one’s force structure with regard to certain allies when involved in situations outside of the scope of that alliance [189, 190]. The nature of ally relationships impacts resolve, how the credibility of signaled threats, and how states bargain during conflict [187]. Part of the explanation for US vulnerability in recent wars was its inability to compensate for missing military capabilities that the US anticipated being able to omit given the relative strengths of our allies – a stark contrast to the successful division of labor during the Iran-Iraq Tanker war of the late 1980’s [191].

Understanding security cooperation among states can help scholars better understand how and

why states differ in their military portfolios. This insight can help inform current debates about changing NATO relations and identify the consequences of allies trusting each other less than they used to. These debates often turn to the question about whether allies are contributing enough to the alliance. But by looking at *what* states are contributing to the common defense, rather than *how much* they are spending, new perspectives on burden sharing and the value of the alliance emerge.

As recently as 2013, then US ambassador to NATO Ivo [192] gave a speech in which he noted that the problem was not that NATO countries were not spending enough money on defense, it was that they were not spending that money wisely. Unfortunately, discussions surrounding the US relationship with its allies has largely still concerned burden-sharing on defense *spending* [193–195]. Yet the amount of one's ally's defense spending matters because of what military capabilities they spend those resources on. After all, the composition of military assets, not just the amount spent, is what is truly of tremendous consequence for how NATO deals with future threats.

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Chapter 4

A Division of Defense Labor Across Nations: A Theory of the Shared Production of Military Capabilities

4.1 Abstract

Theories of alliance burden-sharing have primarily investigated the size of allied state militaries, but not their composition. Why do some alliance partners engage in a division of labor over the security capabilities they produce, while other alliance relationships maintain redundant militaries with overlapping capabilities? I argue that alliance relationships can promote an efficient division of labor over the production of defense assets when that alliance relationship has high interest alignment and vertical integration. These two conditions make it easier for states to minimize the risk of defection and ensure effective coordination in a manner that allows them to distribute defense capabilities efficiently across actors. In doing so, states in military alliances can coordinate their defense in a way that garners the benefits of individual specialization and collective diversification. I substantive this argument using data on disaggregated national military capabilities from 1970 – 2014.

4.2 Introduction

The US-Japan alliance, formally signed in 1950, is conventionally understood as an asymmetric alliance where one actor (Japan) receives protection under a security umbrella and the other actor (United States) receives autonomy via military base access that furthers its geopolitical ambitions [1, 2]. Despite what initially seems like a clear and lopsided division of security responsibilities, the nature of US-Japan security cooperation is more complex. As the Soviet Union increased its naval presence in East Asia during the late 1970's, the United States and Japan developed new defense guidelines whereby Japan was entrusted with protecting its sea lines of communication (SLOCs) 1,000 nautical miles off its coast. Politicians in both states acknowledged the challenge this entailed given the Japanese Constitution's prohibition on offensive military capabilities and the reconfiguration of forward deployed forces it would require on the part of the United States. Nonetheless, in 1982 the two states agreed to plans drawn up by Prime Minister Suzuki for Japan to develop additional surface to air (SAM) missiles, anti-submarine warfare (ASW) helicopters, maritime surveillance aircraft, and search and rescue (SAR) helicopters [3]. Although the Soviet naval threat in East Asia later ended, by the turn of the century Japan had doubled its SAM and ASW helicopter inventories, along with expanding its maritime surveillance fleet from 6 to 80 and its SAR helicopters from 52 to 84. Far from being a sign of distancing from the United States, the changed composition of the Japanese military instead reflects complementarity with that of the United States and a division of labor whereby the United States served as the alliance's "offensive spear", able to focus on certain military capability and security threats because Japan carried the "defensive shield" that ensures SLOCs remained open [4, 5].

It has long been understood that states are not all like-units.[1] However, barring information about how states differ, it is tempting to treat them as equivalent, or at least arrayed along a single measurable metric. Doing so has implied that if states had similar levels of resources, they would produce similar amounts of military power.[2] The result of this assumption is that variation in how states arm themselves is primarily measured in size, rather than composition. However, there are countless examples of different military capabilities which raises the question: why do states possess the force structure that they do [23]?

[1] For example, see [6–16].

[2] One theoretical explanation assumption is that socialization and competition under anarchy results in convergence [17–22].

Here, I relax that assumption using new data on the make-up of military capabilities across states from 1970–2014. Doing so shows how states are differentiated not just in the size of their militaries, but in the specific military capabilities in which states have invested.

To do this, I focus on the role that alliances play as one part of the explanation for states' strategic decision to choose different distributions of military capabilities even when the structure of the international system and economic capacity are held constant. Why do some pairs of allies specialize their respective military portfolios in a way that complements the capabilities of their ally, while other pairs of allies maintain more redundant militaries?

The institutional form of interstate cooperation helps explain functional differentiation as a conscious policy choice by actors that rely on each other for security. Allied states can engage in division of labor over the production of defense assets – each specializing in complementary capabilities – when their relationship is characterized by high interest alignment and vertical integration that they expect to continue into the future. This explains variation in the distribution of military capabilities across states not simply as a product of economic capacity and geography, but also as a function of states' willingness and ability to omit and/or overproduce some defense capabilities based on the capabilities of their partners. This builds upon existing theories about the conditions under which major states try to gain security through joint efforts [24, p 58]. I examine the consequences of those joints efforts and add a nuanced understanding to what it means to be 'joint'.

This paper is organized into five sections. Section 2 outlines existing thinking concerning the degree to which states exist in an anarchic world of 'self-help' concerning defense. Section 3 then details a theory of a shared production model of defense outlining the conditions under which cooperation under anarchy enables functional differentiation in the production of security – interest alignment and vertical integration. In doing so, it develops a typology that explains the various forms of security cooperation and state military capabilities that should exist based on these two conditions. Section 4 provides an empirical test of that theory by identifying the division of labor in security capabilities across all states from 1970 – 2014 using a novel dataset of disaggregated military capabilities. Section 5 concludes with the implications of these findings for theories about international cooperation and conflict and avenues for future research.

4.3 Existing Explanations for Cooperative Security

The previous chapter details existing explanations for the composition of a state's military, ranging from economic and geographic considerations [25] to domestic politics [26, 27] to social considerations and status [28, 29]. The prevailing political explanation concerns the nature of the international threat environment [30–32].

If the international system is anarchic and governed only by the logic of self-help, then states can deal with that threat environment through either internal or external balancing [17, 33]. The logic of internal balancing means states provide for their own security by arming themselves while external balancing means cooperating with allies against the overarching threat. A result of internal balancing is that state militaries start to look similar overtime as states mimic the capabilities of greater powers, with differences explained by the distribution of resources or geography [22]. External balancing, when it happens at all, does not change the composition of military capabilities each states possesses because of concerns that cooperation cannot be guaranteed. And in the event that State A and B do cooperate, the stronger of the two will be able to impose its will and preferences over the other rather than engaging in a "division of labor across nations" [17, p 105] since self-interested states have no incentive to provide for the security of another state absent that provision enhancing its own security.

Opposition to this neorealist view of anarchy has come from the *hierarchic view of international politics*. If State A and B faced a similar threat environment because of State C, State A and B should engage in a division of labor over the production of security assets to most efficiently provide for their collective security [34]. They have everything to gain and very little to lose from that cooperation [35]. The problem with the previous perspective is thinking about power as a component of competition that all states are engaged in without consideration of the cost of fighting. In reality there are bystanders who gain or lose based on the outcome of competition between two states and the cost of competition can shape whether the gains of competition are worthwhile.[3] While quoted above in recognizing the best defense against an unpredictable enemy is diversified combined arms, [39, p 185] also noted that it may be "necessary to augment these by improving access to the capacities of the other services, and of friendly navies."

[3] See the discussion on relative and absolute gains by [36–38].

So why do some capable countries have gaps in their militaries that they could fill, but choose not to, while other capable countries appear dissatisfied with those gaps? This functional differentiation is not just the product of the distribution of power and it does not appear that states are trying to be self-sufficient in their defense [40, p 260], as some scholars have predicted [41].

And yet, while proponents of this theory would predict a division of labor in defense among like-minded states, the empirical record is far from set. To take Europe as an example, while "one might expect a continent with both a long-established military alliance and highly integrated economies and policymaking machineries to also have a highly integrated defense economy", [40] others have found that Europe's defense market is actually quite fragmented and protectionist [42]. The 27 states in the EU have a combined 25 armies, 21 air forces, and 18 navies most of which possess different weapons systems and that rarely coordinate force planning [43]. This is not a new problem either; not long after the end of the Cold War [44] noted that the redundancy of Europe's defense platforms was becoming increasingly costly.[4] This duplication was not inevitable and could have been ameliorated through pooling and sharing agreements.[5]

So the question becomes why we see a division of labor in some cases but not others and, more interestingly, the form that this division of labor takes. If states facing a common threat feel they are in the world of anarchy, they will have diversified military capabilities since mistrust results in "self-help" defense. But if states facing a common threat have some reason to believe they can effectively cooperate despite anarchy, they will have specialized military capabilities that complement one another since mechanisms for fostering that cooperation enable them to "provide for the common defense". Because my theory borrows generously from this perspective, a comprehensive account of existing research is embedded into the following theory.

[4] [44] measure duplication as the number of platforms and systems in production, rather than the quantities of these platforms, and they are interested in domestic production rather than state ownership and acquisition.

[5] Some have argued this is easier to achieve when there is cultural similarity, trust and solidarity, militaries of similar size and strength, and low levels of corruption [45, 46]. [40] rejects this hypothesis because of skepticism that these conditions exist in the European context. While these scholars have looked at arms collaboration, I am here interested in arms distribution – both within a states and among a collection of states.

4.4 Theory: Bringing balance to each other's force

4.4.1 Variation in Forms of Relationship Governance

What are the conditions under which two allies are able to ensure that a promise to cooperate with each other in the development and deployment of military capabilities happens successfully? Generally speaking, alliances are a promise to cooperate with another actor under a given set of contingencies [47]. In the context of military capabilities, a specialized division of labor with an ally can thus be an efficient way to undertake defense cooperation, but it requires bargaining over the terms of that cooperation. Research on bargaining within alliances has started from the [48] model of comparative advantage in trading goods based on differences in production costs [49–52]. One of the things states in an alliance bargain over is which produces what capabilities because these capabilities differ in their asset specificity, economies of scale (private benefits), and contribution to aggregated defense (public benefits). Such bargaining must address the risk of cooperating in the international arena – the risk of opportunism and costs of coordination.

This theory presents a bargaining model that differentiates it from other conceptions of principal-agent problems in the context of military contracting and arms sales [53–56]. When two aligned states bargain over the desired division of labor for the production of security assets, they are both simultaneously serving the roles of principal and agent. I define aligned states as states with whom one could have cooperative security relations where there are expectations of support and/or mutual coordination during future interactions.[6] Each would like the other to serve as an agent to which they can outsource some aspect of defense.[7] Specialization is thus a way for states to ensure the arrangement is mutually desirable for both parties by answering the question 'what can you bring to the bargaining table?' The degree to which the arrangement is mutual and, similarly, whether the outsourcing is truly bidirectional is subject to much variation that will be explained in more detail in the later section on vertical integration.

Forms of governance differ in how well they enable states to contract to produce pooled security. Yet theories borrowed from industrial organization that originally conceived of governance decisions as

[6]Formal military alliances represent one type of alignment, but not all alignments are alliances [57].

[7]Research on principal-agent relations shares a similar logic concerning delegation. Principals grant power to an agent to gain the benefits of a division of labor. The issue is how the relationship can be controlled and monitored to ensure compliance [58, p 173].

being either markets or hierarchies [59, 60] has since realize there are a variety of governance structures that can produce cooperation to different degrees and in different forms [61–65]. In parallel, there has been a wide body of research on the variation of the design of cooperative security structures in interstate relations [34, 66–71].

While not theorizing about the origins of these different forms of governance, I here identify two mechanisms by which forms of governance make a division of labor more desirable by simplifying intra-alliance bargaining. The political economy decision about “make or buy" [72] serves as a useful analogy to what these forms of governance have in common. Concerning defense, states have a decision about “make/buy or rely". When states “make/buy", they operate in a self-help world of anarchy where they are responsible for their own security. The alternate is engaging in some type of security relationship that allows you to “rely" so that you can forgo the costs of building or buying it yourself [51, 73].

This is easier to achieve when the actors’ interests are more closely aligned [47] and when there is vertical integration, allowing one actor to dictate the terms of the bargain [74].[8] If intra-alliance bargaining does not succeed because a gap in interest alignment has narrowed the bargaining range and/or because one actor cannot dictate the terms of the bargain sufficient to reach a mutually agreeable solution, then there will not be a shared division of labor over the production of security assets and states will thus design defense portfolios that operate independent of one another; a return to the anarchy-driven combined arms model that seeks individual diversification rather than individual specialization under a structure of collective diversification.

The amount of interest alignment and vertical integration required to overcome this problem is not constant. Two states with similar resource endowments, technological capacity, and geography may both want to specialize in the same set of capabilities given the cost required to do so. For example, two neighboring island states may both want to undertake the naval patrol portion of specialization rather than air defense if their industrial shipbuilding capacity makes that comparatively cheaper. In this case, the degree of division of labor may be lessened by the similarity of both countries.

The fact that both specialization and diversification have distinct benefits poses a dilemma that

[8] [70] uses the language of institutions to discuss the concept I describe as vertical integration. I prefer the latter term because it’s more clearly dyadic and because the language of institutions is too similar to form of governance which is used to describe the broader phenomenon. It also helps distinguish types that are coercive from those that are voluntary negotiations.

can only be resolved by intra-alliance bargaining. Even if collective diversification is Pareto optimal, intra-alliance bargaining is necessary to address the temptation to free ride by specializing to such an extent that the other alliance partner is forced to diversify. But since specializing creates reliance on the other actor, mutual specialization now presents a way to resolve the collective action problem by creating a mutual hostage-taking situation [75]. By forcing mutual reliance where both actors' militaries are reasonably hamstrung absent the contribution of the other, each can be assured that the other will not defect because that implicates the shadow of cooperation in the future.[9]

These two factors make it easier to reach an intra-alliance bargain by reducing the risk of opportunism and reducing coordination costs. When this happens, states are able to specialize their defense portfolios in ways that garner the efficiency gains of specialized production while maintaining the security gains of a diversified defense portfolio. The result is functionally differentiated military force structures across states in the international system.

Interest Alignment

Interest alignment describes the consistency of states' security interests and agreement on the nature of the international threat environment. Whether states have common security interests is a function of whether they face the same threats and the mutual desirability of ways to deal with that security threat. When security interests between two states are consistent, an adversary that poses a threat to one state's security interests also poses a threat to the other state's security interests [76]. In this situation, states are more likely to have compatible payoff structures regarding actions that should be taken to get the optimal international environment [35].[10]

If we think about interest alignment as a shared understanding of agreed upon goals, then interest alignment can be seen as a necessary condition for cooperation [35, 78]. However, circumstances where

[9]For a division of labor to truly resolve the credible commitment problem, mutual hostage-taking must involve specific assets. If one actor can quickly and easily produce the military capabilities in which the ally specializes, there is little actual reliance. Future research could quantify asset specificity of military technologies by weighing factors like production lead time, although generalizing that across time and space may prove challenging.

[10]A related but distinct aspect of interest alignment is interest intensity. Two actors may have the same interests in that they have a shared understanding of a common goal, but one may be much less willing to expend resources for that goal to be accomplished. In cases where interest intensity diverges significantly, the alignment of interests may be insufficient to encourage cooperation [77].

interests are perfectly aligned seem exceedingly rare – if not non-existent – in international relations. And unless there is perfect harmony in interest alignment, the risk of opportunism can only be reduced, not eliminated, as long as each actor retains autonomy over its own decision-making [77]. While formal alignments themselves may not often change rapidly or substantially, the salience of the threats that a particular alignment can reliably help counter does change.

For interest alignment to incentivize security cooperation, and thus encourage a division of defense labor, it must increase the gains of cooperation and reduce its costs (opportunism and coordination costs). Interest alignment improves the gains of cooperation by augmenting the effectiveness of coalition contributions to war [79–82]. Closely aligned preferences make crisis bargaining within the coalition easier which improves that coalition's ability to credibly signal resolve. It also positively shapes that coalition's collective strategy in the event that conflict does break out [83].[11] Cases of collective security are representative of cases of high interest alignment. When a state opts for collective security, they are essentially conveying that the security of the whole is an vital component of the security of the homeland [87].

High interest alignment makes it easier to overcome opportunism and coordination costs because the presence of a common objective that both actors seek produces higher payoffs to conscious policy coordination [78, 88, 89]. This is especially true in cases where the common threat facing two states is something like a territorially acquisitive great power since they both have an interest in mutually producing the capacity to respond to that threat. Military specialization has a symbiotic relationship with this end

For example, the United States and West Germany had aligned security interests during the Cold War because they both saw the Soviet Union as their primary adversary. As a result, the US viewed efforts to enhance West Germany's security as being consistent with the enhancement of its own security [90]. In this way, high interest alignment encourages cooperation by lowering the risk of opportunism. In these cases, there is a reduced – albeit, not eliminated – need for external enforcement mechanisms because the punishment a state faces from defection – an undesirable threat environment – is synonymous with failure by your ally. The value of cooperation is what makes it self-enforcing [91]. As a result, closely aligned

[11] Extensive work has been done on the consequences of preference misalignment in the context of extended deterrence and alliance formation but this has not been applied to the more general context of security cooperation that manifests in the sharing of access to an ally's military assets [84–86].

interests mean states will contribute to the security of their ally because they have a security incentive to do so even in the event that their partner may defect.

By increasing the expected gains of cooperation and overcoming the expected costs of opportunism and coordination, high interest alignment can increase states' willingness to embrace a shared production model of military capabilities. By complementing each other's forces, the gains from economies of scale mean that each state is better off than if they simply added their redundant military capabilities together. The gains from specialization can now be realized if the accompanying costs have been sufficiently reduced by closely aligned interests. Importantly, the rewards of shared production can be reaped internally. Since reducing the production of particular capabilities is one manifestation of specialization, states benefit economically from sharing the burden.

The US relationship with Australia took a significant turn in the early 1970's when Nixon's Guam Doctrine announced US withdrawal from Asia and an expectation that our allies in the region do more to defend themselves [92]. Australia's concern about the US retreat from Asia after the Vietnam War was pronounced and marked the beginning of a new Australian perspective that they were alone in their defense since their interests were no longer aligned with that of the US. The Defence White Paper [93] noted "it is not our policy, nor would it be prudent, to rely upon US combat help in all circumstances". The new self-reliance approach to defense directly influenced force structure decisions since Australia knew any capability that was needed for defense or to achieve international objectives would have to be domestically owned [94]. As a result, their military is less specialized than that of others in the region.

Hypothesis 2. States in cooperative security alignments with high interest alignment should have a higher division of labor than states in cooperative security alignments without high interest alignment.

Of course, this relationship is endogeneous – a state's relationship with other states influences the capabilities each state produces but the capabilities each state has at their disposal also impacts the decision to ally with another state [73]. States may specialize because the omission or surplus production of particular capabilities creates the conditions for mutual vulnerability and interdependence as a form of hostage-taking [75]. But rather than think of this endogeneity as a barrier to casual inference, it instead also explains why this relationship may be enduring. If a state has a demand for a particular military capability

that is part of another state's military portfolio, and the first are unable to make or buy that capability, it may strengthen its relationship with the other state so as to enhance the first's ability to borrow [95].[12] If this is true, then the nature of the alignment relationship is still influencing the types of capabilities states are producing. A small and vulnerable state would strategically maintain dependence on a powerful ally by specializing its own military in a way that ensures the powerful ally maintains that relationship.

Vertical Integration

Vertical integration describes the extent to which one of the allies makes decisions about the nature of cooperation in the event of contingencies that had not been anticipated [65, 96]. I choose the term vertical integration because this variable is about the condition of control and the location of decision-making in intra-alliance bargaining rather than the source of that control or the manner in which it is exercised [97]. While anarchy means that all arrangements about pooling defense efforts are largely self-enforcing, the more vertically integrated the arrangement, the more decisions about self-enforcement are controlled by the dominant actor [98].

Vertical integration is not just about the distribution of material power. That concept is too durable and does not give appropriate agency to the actors whose agency creates the relationship [6, 99]. While some vertically integrated relationships have an unequal distribution of material military power such that "a more powerful state has the material capability to intervene in and provide security for the weaker one" the presence of such a capability is not synonymous with vertical integration nor is its absence indicative of a horizontal relationship [12, p 696].[13]

Vertical integration increases the relative gains of cooperation by reducing the risk of opportunism and the cost of coordination. It reduces the risk of opportunism through three mechanisms; solving information asymmetries, increasing reputation costs, and creating mutual interdependence. The first of these, information asymmetries, are resolved by vertical integration by providing rules of thumb concerning the role each state plays in the relationship [78]. The dominant state delegates nodes of responsibility

[12] [73] deal with the coterminous relationship between arming and alliances by separately modeling defense pact ties and military expenditure as outcome variables and then jointly estimating them with a conditional mixed-process (CMP) estimator.

[13] [12] uses the language of hierarchy to describe what I refer to as vertical integration more broadly. Hierarchy is a form of vertical integration that is distinguished by its legitimacy [34].

to the subordinate state either because those tasks are less important niche capabilities or because the subordinate state can perform those tasks at a lower cost given comparative advantage offered by geography or industrial capacity [100]. This can reduce uncertainty about its costs because you have some idea of how they will act in turn. When that happens in both directions, there is confidence they won't act opportunistically [101]. By transferring a purely exchange relationship into a power relationship, vertical integration ensures unified command [102, 103]. NATO did this by explicitly linking the stationing of US troops abroad in exchange for countries purchasing US military equipment [35].

Reputational costs matter for cooperation because actors are almost always in mutual overlapping alliances or have an expectation of possible alliances in the future [104, p 19]. If international cooperation is a game of repeated play, then actors have to demonstrate that they are worthwhile partners [105]. Vertical integration increases reputational costs by centralizing decisions about issue linkage and creating precision in how cooperation will happen [106–108]. This reduces the risk of opportunism by creating exit costs to reneging on cooperation [67] which also facilitates reciprocity and further cooperation [109–111]. By making reciprocity more likely, we now have a necessary condition for states to believe that mutual cooperation has higher payoffs than mutual defection [91].

Lastly, even in asymmetrical alignments where the strong state is determining the terms of the agreement, both states are able to leverage the power of their allies to achieve international outcomes that are in their favor [112]. Smaller states may desire institutionalizing their relationship with more dominant states precisely because that increases their bargaining leverage and creates mutual interdependence [113, 114]. This provides a way for both actors in an alignment relationship to value the alliance independent of the degree of control they exercise in determining the structure and terms of that alignment [115–117].

Vertical integration also reduces the cost of coordination because it improves information processing [77, 118], ensures actors know what communication is authoritative [102], and simplifies decision-making [118]. "[T]he focus shifts to creating structures, institutions, and relationships that enable partners to work together across boundaries. The coordination perspective emphasizes organization design, communication, and process management as requisite skills of alliance managers" [77, p 533]. This helps produce things like standard operating procedures (SOP), unified command structures, and authoritative rules and procedures that create the type of task coordination that is needed for certain military strategies and

structures [119]. These help minimize communication, simplify decision-making, reduce uncertainty about future tasks, and prevent disputes [120]. By reducing the costs of coordination, institutionalization makes the interdependence of tasks easier which, in turn, facilitates a division of labor [35]. Institutionalization allows actors to figure out the "anticipated organizational complexity of decomposing tasks among partners along with ongoing coordination of activities to be completed jointly or individually across organizational boundaries and the related extent of communication and decisions that would be necessary" [103, p 304].

Hypothesis 3. States in cooperative security alignments with high vertical integration should have a higher division of labor than states in cooperative security alignments without vertical integration.

Vertical integration is a way of institutionalizing cooperation because decision-making becomes relatively centralized based on the preferences of asingle actor. Policymakers have recognized the importance of institutionalization of security relationships, with US Navy Rear Admiral [121] noting "what is unavoidably true is that, in the absence of an institutionalized habit of pooling our naval resources in steady-state planning, the best of intentions will not result in meaningful implementation of a cooperative strategy." The high degree of institutionalization in bodies like NATO have "reduced uncertainties about each other's behaviour and provided mechanisms for the peaceful resolution of disputes" [122, p 6]. So the issue is not just whether or not states have a formal alliance. NATO, SEATO, CENTO, and ANZUS all involve actors with similarly aligned interests but these institutions have varying degrees of institutionalization in their decision-making structures. More institutionalized alliances like NATO should have higher degrees of specialization and complementarity than less institutionalized ones like SEATO.

Typology of Forms of Governance

From these two variables – interest alignment and vertical integration – we get a simplified typology of different types of interstate security relationships summarized in Figure 4.1. Anarchy represents the absence of a form of governance in the self-help world, differentiated from the other relationships that are characterized by some degree of strategically calculated reliance on other states for security. These other relationships allow states to rely on each for defense by specializing their militaries in ways that initially seem sub-optimal, but actually represent an efficient division of labor. Network relationships are those

with high interest alignment and low vertical integration. Empire describes relationships with low interest alignment and high vertical integration. And hierarchy describes relationships with high interest alignment and high vertical integration.

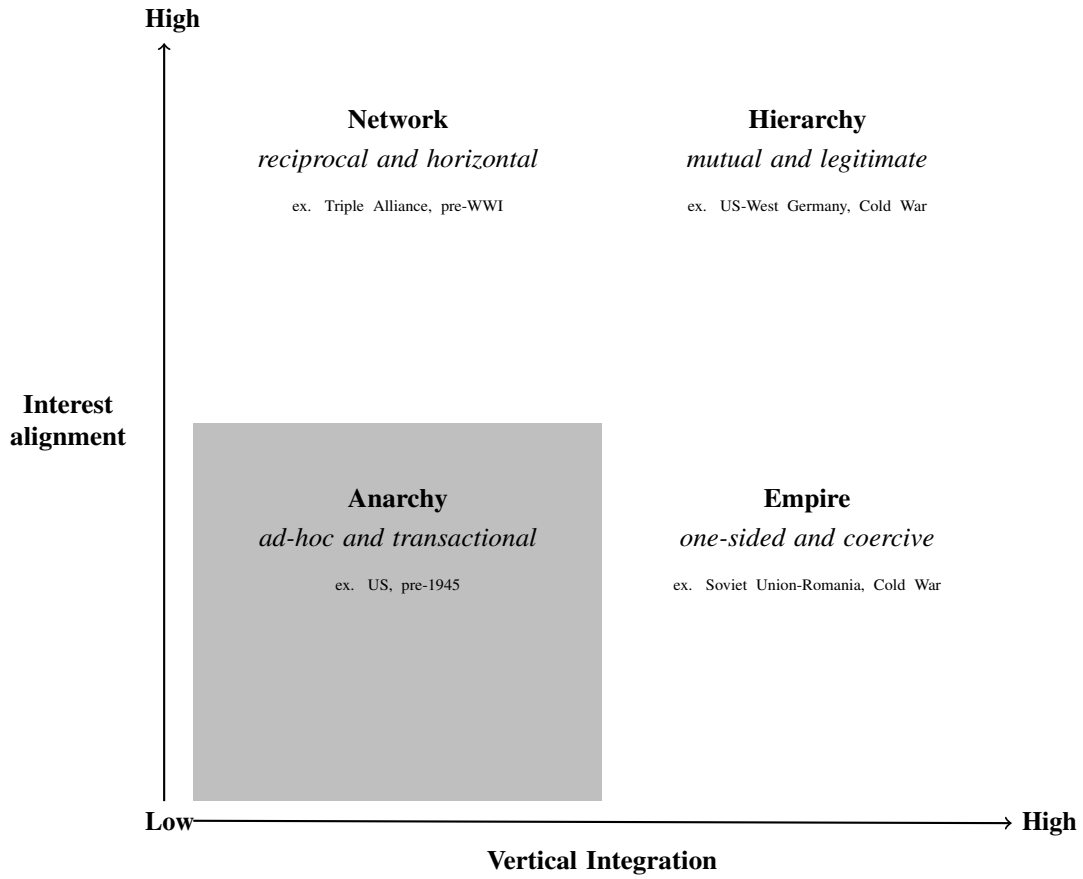


Figure 4.1: Typology of forms of alliance governance at the interstate relations level of analysis. The shaded area represents the absence of a form of governance. While the axes are, in principle, continuous, they are simplified here to represent four ideal types with relative rather than precise coordinates.

There is a wide variety of research on forms of governance that allow states to contract to produce pooled security. While early research borrowed heavily from industrial organization research that identified governance mechanisms on a continuum ranging from markets to hierarchies [59], scholars have since realized that there are a wide variety of governance structures that accomplish that to different degrees and in different forms [61, 63–65]. Much work has been done to explain variation in the design of cooperative governance mechanisms in the context of international security [34, 66–71, 108, 123–126]. Consequently, there is a kaleidoscopic language surrounding the forms of governance that exist. Scholars have identified

types like alliances, concerts, collective security institutions, spheres of influence, protectorates, formal and informal empires, value-added partnerships, relational exchanges, and networks that all exist somewhere in Figure 4.1 [34, 107, 127].[14]

Rather than get caught up in identifying the precise coordinates or ranges for each, I simplify things by dividing it up into the four ideal types. The important thing they all have in common is relationships with some degree of reliance that distinguishes them from anarchy by virtue of having mechanisms for solving opportunism and ensuring partner commitment [128, 132, 136–138]. I also do not theorize the origins or determinants of these forms of governance.

Pessimism about states' ability to cooperate on security issues under anarchy is challenged by the reliance seen under some alliances. Contrary to claims that self-help prevents states from strategically choosing to functionally differentiating their defense capabilities, various forms of governance in interstate relations can allow functional differentiation in defense based on the presence of interest alignment and vertical integration. In relationships with high interest alignment and low vertical integration (networks), both states specialize to a moderate degree. In relationships with low interest alignment and high vertical integration (empires), the subordinate state specializes to a high degree and the dominant state specializes to a small degree. And in relationships with high interest alignment and high vertical integration (hierarchies) both states specialize to a high degree. The baseline null case of relationships with low interest alignment and low vertical integration (anarchy) are emblematic of the systemic neorealist world of states that do not specialize and are instead like-units. I now define these four concepts and lay out theoretical predictions for the effect they have on the distribution of military capabilities, summarized up front in Figure 4.2.

Anarchy describes the null case where both interest alignment and vertical integration are low. These "relationships" are not an example of any real cooperative security relationship because states are instead behaving unilaterally and operating in a self-help world, much like the US did prior to 1945. Although typically conceptualized as a systemic variable, I think of it as a type of interstate relation that scholars of system-wide anarchy consequently (if implicitly) attribute to individual state relationships. This is most similar to what others have previously called a market. [62, p 302] defined markets as "the paradigm

[14] For more on varieties of forms of governance, see [62, 128–134] that differentiate forms of governance based on characteristics like institutionalization, exclusivity, and purpose [135].

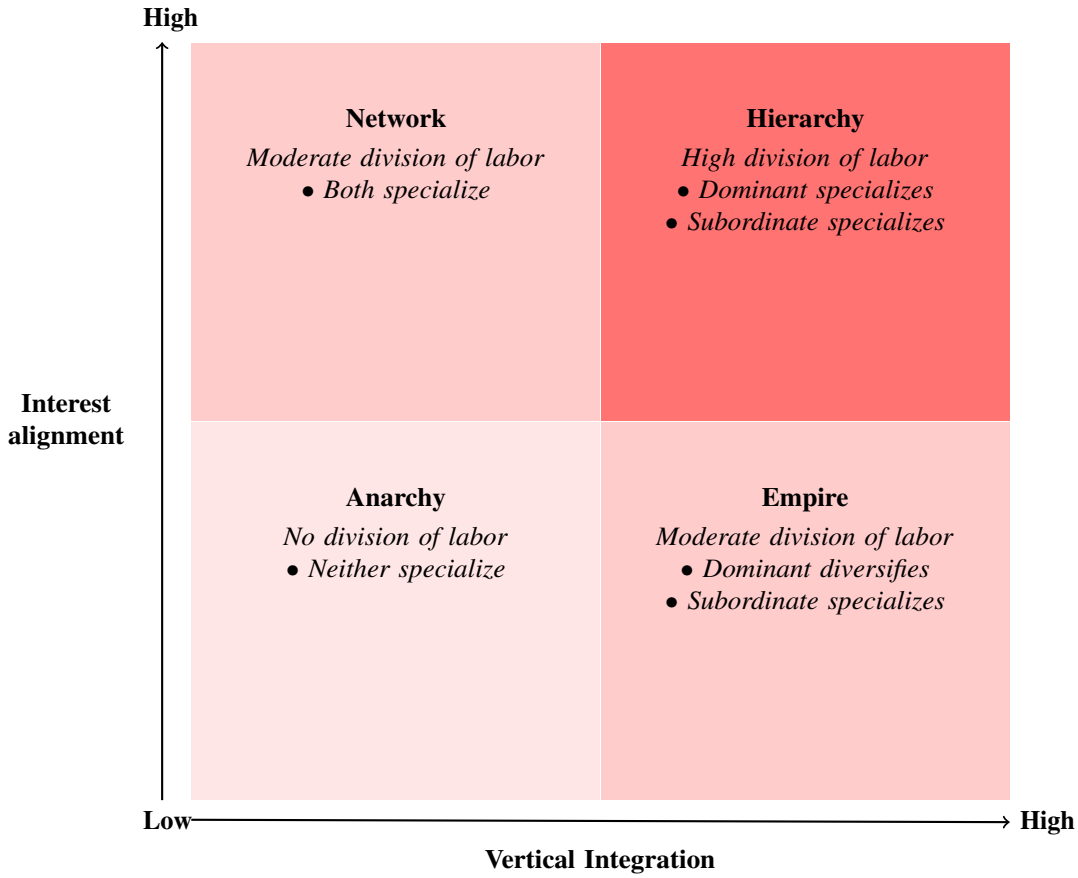


Figure 4.2: Summary of theoretical predictions. Each quadrant represents an interstate relationship which can be simplified by assuming it is dyadic.

of individually self-interested, noncooperative, unconstrained social interaction" between actors where behavior is not determined by any supervising actor of form of governance. There may be coordination, but it is not integration and thus is not a way in which states "rely" in the way I think about cooperation. There can still be defense interactions like arms sales, but they are not an enduring and stable long-term relationship [139, 140].[15] Rather, they are more emblematic of occasional transactions [65, p 376] or short-term bargaining relationships between autonomous buyers and sellers with limited social relations [133, p 485]. Ironically, these may not represent a market failure, rather than rational market decisions, since failure to cooperate results in the under-provision of public goods and suboptimal self-defense under

[15]Since arms sales are not the dependent variable of interest, I do not devote much time to theorizing them here and instead leave that to future work. Instead, I assume that, all else equal, they represent transactional market relationships with limited reliance structures. In truth, there is variation in the types of arms sales arrangements that are built on dependencies as opposed to those that are transactional [141].

certain conditions.

I predict no division of labor by either state in cooperative security relationships that are anarchic (the absence of a cooperative security relationship). The outcome of bargaining over collective defense is too costly and thus unresolved. In the absence of interest alignment or vertical integration in that relationship, the expected costs of opportunism and coordination exceed the expected gains of cooperation [12]. In this situation, functionally differentiating one's military by specializing in a way that creates a dependence on other states leaves one vulnerable to costly and likely opportunistic behavior by others [97]. As a result, there will be no functional differentiation outside that explained by differences in factor endowment and geography. Instead, states occupying similar positions will adopt similar strategies for power and security.

Hypothesis 4. States in an anarchic cooperative security alignment show have a low division of labor where neither specializes their distribution of military capabilities.

Networks are defined as security relationships that take the form of horizontal, voluntary, and reciprocal cooperation [142, p 8]. The horizontal nature of these relationships means that, unlike under vertical integration, control is not located with one actor. Instead, conflict and bargaining are resolved via reciprocity, reputational concerns, and interdependent actor preferences [62, p 295]. When states have very similar interests, they can rely on less impositional and hierarchic security arrangements. The Triple Alliance between the Russian Empire, French Third Republic, and United Kingdom prior to World War I is emblematic of a cooperative security arrangement with a network form of governance. They had aligned interests concerning the fear of German aggression [143] but strong mechanisms for enforcing agreements about assistance from allies were absent [144]. These agreements are entirely self-enforced, often through implicit or open-ended contracts that can be informal [145, p 504]. But this informality should not be equated with random or uniform exchanged; they are still patterned, persistent, and repeated. And when they do include formal legal contracts they are limited to the activity in question [146]. As a result of all these factors, cooperation on shared tasks comes from social coordination and control rather than authority since the absence of vertical consolidation limits the degree to which any one actor has authority.

That social coordination and control can be sufficient for some degree of cooperation and a division

of labor even in the absence of vertical integration because interest alignment can foster trust [147]. I do not mean trust in an altruistic sense, but rather calculative trust where the costs of cooperation are reduced through mechanisms like reputation and mutual hostage-taking [75, 148]. Furthermore, networks provide a means of resolving information asymmetries and since information is costly [66], that can reduce the risk of opportunism and cost of coordination and thus incentivize cooperation [149, p 300].

The use of the term network may seem odd since the unit of analysis has been described in dyadic, rather than k-adic terms, but it is used as a recognition that even dyadic models and theories of interstate relations must recognize the structural embeddedness of dyadic relationships within a broader structure of overall relations [150–153]. This distinction represents a topic for future research.

I predict a moderate division of labor in cooperative security relationships that are networks. Interest alignment provides some capacity to solve opportunism and coordination problems by reducing incentives to defect and reducing information asymmetries [70, 133]. Furthermore, both states will engage in some specialization because doing so allows both states to engage in mutual hostage-taking which can resolve the enforcement problem by creating mutual vulnerability and thus a disincentive to defect. However, this mutual and complementary specialization is limited because there is still uncertainty in resolving the intra-alliance bargaining problem.

Hypothesis 5. States in a network cooperative security alignment show have a moderate division of labor where both somewhat specialize their distribution of military capabilities.

Empire describes relationships with high vertical integration and low interest alignment. It occurs when that low interest alignment creates a higher risk of defection by the subordinate actor than would have existed otherwise. This is conceptually similar to what [7, pp 15–16] calls a dominion; a form of governance where the dominant state “to some extent determines the internal government of other communities, but they nevertheless retain their identity as separate states and some control over their own affairs."

The Warsaw Pact during the Cold War is an example of an empire form of governance. The absence of high interest alignment meant that coercion defined relationships between the satellite states and the Soviet Union more so than legitimacy [90, 154] and cooperation was more enforced by resource

extraction and control of foreign policy rather than inducing subordination via concessions [70, p 140]. In this way, the dominant state exercises power in a way that represented indirect rule and a coercive hierarchy more than legitimate negotiated coordination [70, 143]. Of course, the Warsaw Pact was not characterized exclusively by relationships of military dominance since the leaders of the satellite states did recognize the Soviet Union's dominance as legitimate, even if the public didn't [155, p 77], but the example is useful case to consider. Although a less common feature of world affairs in the present day, relationships governed by empires still exist today [16] despite dominant states' desire to avoid them given the costs [156].

I predict a moderate division of labor in cooperative security relationships that are empires. This is the result of specialization by the subordinate state but not the dominant state. Importantly, this represents cases where specialization by a subordinate country may be imposed by the dominant state. Specialization by the subordinate is a way the dominant state can control defection through coercive manipulation of its subordinates; a situation where there is "the expectation of intervention when rules are violated – an expectation not found in interactions among allies no matter how unequal" [12, p 697]. However, the dominant state does not necessarily specialize since doing so could leave it vulnerable to opportunism by the subordinate state. As a result, there is one-way dependency. The dominant state is unwilling to take the security risk of specializing and the subordinate state cannot force them to specialize because the dominant state is not interested in getting buy-in for their legitimacy. Instead, they seek control via coercive and imposing means [12]. Furthermore, one-way dependency is not always conducive to specialization since part of coercion is a lack of trust that lends itself to ideological indoctrination and institutional duplication. State Secretary of the Romanian Ministry of Defense [157] noted the effect this had on functional duplication between the Soviet Union and Romania during the Cold War.

Hypothesis 6. States in an imperial cooperative security alignment show have a moderate division of labor where the dominant state has a diversified distribution of military capabilities and the subordinate has a specialized distribution of military capabilities.

Hierarchy describes relationships with high interest alignment and high vertical integration. Although definitions of the concept in international relations abound, I here conceive of hierarchy narrowly as a relationship of legitimate authority [158, pp 625–626] where the dominant actor can "command

legitimately certain actions between the members of the organization" [98, p 973].[16] Its similarity to empire concerns the presence of high vertical integration between the actors involved. But it is not just about vertical actor-differentiation. Rather, vertical integration between the dominant and subordinate state must contain a dominant state's right to dictate part of the subordinate state's policies as well as compliance by the subordinate state that stems from agreement to that legitimated authority [34, 165]. This legitimated authority is only present when there is interest alignment between the dominant and subordinate state.

Others have differentiated coercive hierarchies from legitimate hierarchies [90], but here the prominence of coercion and domination is not a feature of hierarchy but rather what distinguishes different types of vertically integration forms of governance [158, p 632]. Hierarchy creates the conditions for cooperation that still has the asymmetry needed for monitoring, but it creates a relationship because it is mutually beneficial for both sides and not because it enforces binding rules onto one of the actors [159]. Cold War NATO and the Warsaw Pact, respectively, are illustrative examples of each case with resulting variations in the degree of security cooperation [166]. NATO was a hierarchically-aligned governance structure where reciprocity, monitoring, and issue linkage happened through mutually beneficial backscratching while the Warsaw Pact's security cooperation was blackmailing coercion [35]. Of course, vertically integrated relationships with high interest alignment are not government exclusively by authority [14]; coercive forms of control are still present in hierarchies since there are often mixed motivations for compliance [155, p 68]. But the presence of coercion is not their defining feature.

I predict a high division of labor in cooperative security relationships that are hierarchic. The mechanisms by which hierarchy drives specialization are different for the dominant and subordinate state. For the dominant state, specializing is largely about securing buy-in from the subordinate state by creating legitimacy, reducing entrapment by limiting the foreign policy tools of the subordinate, and capturing the economic gains of specialization [34, 167]. By limiting its own military capabilities, specialization helps the dominant state credibly tame its power by demonstrating that their dominance will rely on carrots as opposed to sticks [34, 159]. Specialization takes the form of a capable state omitting capabilities it could otherwise produce – the US forgoing minesweepers in the 1980's – as a way of tying their own

[16] This is a well-established interpretation of hierarchy [34, 66, 159–162]. For more that think about hierarchy this way, see [158, pp 627–628]. For differing conceptions of hierarchy that focus on criteria like organized inequality, see [163, 164].

hands and limiting their ability to exercise coercive control by consciously adopting a sub-optimal military configuration [165]. Because interest alignment is high, there is room for the dominant state to credibly claim that they are comfortable giving the subordinate state leverage over their affairs [168].

Second, the distinguishing feature of hierarchy is the willingness to give up sovereignty, not the presence of domination, coercion, or power asymmetry [169]. When sovereignty is willingly given up, there will be more cooperation than when sovereignty is forcefully seized because regimes seeking to facilitate cooperation should “empower governments rather than shackle them" [159]. While an asymmetric alignment relationship may be one where the dominant state is able to coerce the subordinate state into having a particular distribution of military capabilities, that one-off coercive attempt does not benefit the dominant state in the way needed. The dominant state would not be able to rely on the weaker state for military capabilities because of problems of interoperability. Interstate security cooperation is challenging because of increased logistical requirements. It can induce some cooperation because brute domination can provide monitoring and reduce the moral hazard problem, but not as effectively as hierarchy [170]. Instead, there must be a mutual understanding that the states have different security responsibilities in the security alignment stemming from their different bargaining positions [158].

The dominant state also benefits from specialization by the subordinate state because a subordinate that only has some pieces of the military puzzle is less likely to act independently in cases where the principal does not agree with their actions, thus reducing the risk of entrapment. In other words, the dominant state wants to be able to pursue an international agenda that is consistent with their preferences, so they shape the shared distribution of military capabilities in a way that is consistent with that [171]. Strong countries in these relationships hope that the alignment can prevent opportunism on the part of the weaker county [34]. Determining the shared production of heterogeneous distributions of military capabilities can serve this role because having a credible and costly threat of opportunism can give a state influence over what their partner does. NATO having a Supreme Commander led by the United States is an example of the type of arrangement that manifests itself in these cases since integrated commands are a way the lead state can influence the military strategy of smaller states by asserting control via fiat and realigning incentives [61, 172, 173]. Without aerial refueling capabilities, for example, weaker US allies are limited in their ability to project power without a green light from the US. The dynamic where this is

most easily seen is in extended deterrence. The US offers a nuclear umbrella to allies like South Korea and Japan with the hopes that such an umbrella will reduce the incentive those weaker allies have to produce nuclear weapons on their own [116, 174].

Existing theories of hierarchy have noted anecdotal evidence of this in NATO with the United States specializing in naval capabilities and nuclear weapons [175, pp 10–11] and European allies doing more land forces and tactical air power [176, p 39]. [70, p 147] finds some cases of specialization like Great Britain specializing in mine sweepers which "arose from the limited division of labor created under that institution. These assets were the political products of a relatively high degree of trust; because member states believe that NATO would work effectively, they were willing to delegate responsibility to the organization and become dependent, to some extent, on the capabilities provided by other members" But he doesn't consider how interest alignment makes hierarchy easier, and he doesn't explain which specializes in the relationship which is the value-added of my theory.

The subordinate's motivation for specialization under anarchy is the inverse of the dominant state's motivation for buy-in. The dominant state's claim that they will rely on the subordinate state for some aspect of its foreign policy is only credible if the subordinate state possess the specific military assets that the dominant state has omitted. In doing so, the subordinate state can signal they are not free riding but instead making a significant contribution by providing capabilities the dominant state would not otherwise have readily available. Without this, the dominant state has not agreed to be constrained and dependent on the subordinate state for its security. This explains why the capabilities in which subordinate states often specialize is no mystery. It is in the dominant state's interest to make it easy for the subordinate state to specialize in a different asset; the United States gains little from asking Norway to provide the aircraft carriers while it produced minesweepers. In doing so, the bi-directional dependence is credible and addresses the enforcement problem.

But specialization by the subordinate state is not just a way of demonstrating its usefulness to the alliance, but also a way to gain leverage to ensure the dominant state proves useful. This is precisely what we saw during the Berlin Crisis of 1958-1961. Although the East Germany was dependent on the Soviet Union economically and militarily, East Germany was still able to exercise influence in the relationship because the Soviet Union was dependent on them ideologically [177]. Walter Ulbricht knew

that if communism failed in East Germany, that would strike a blow to the credibility of the Soviet system. As a result, Ulbricht was able to convince Khrushchev to continue supporting East Germany to prevent their collapse because of the reputational costs the Soviet Union and Khrushchev personally would suffer in the event of such a collapse. Despite being the subordinate actors in their relationship with the dominant United States, European allies were similarly able to influence military action by the United States during the Korean War and with the shift to a flexible response doctrine which may represent a similar logic to the one described here [178].

Hypothesis 7. States in a hierarchic cooperative security alignment show have a high division of labor where both states have a specialized distribution of military capabilities.

The choice of the term 'vertical integration' for the second explanatory variable should now be clear. I am not trying to be innovative or controversial in how I define, anarchy, networks, empire, and hierarchy. But my account differs slightly from previous accounts that think of the primary forms of social organization as markets, hierarchies, and networks [62, 179]. In those cases, the second explanatory variable is collapsed to the term hierarchy and empire is one end of the hierarchy continuum. Not all relationships with high vertical integration operate the same way or result in similar divisions of labor.

The distinction between hierarchy and empire based on interest alignment is important because it determines whether the cooperative security arrangement is mutually desired or not determines whether the trust and reliance is bi-directional or a one-way dependency. [17, pp 81, 114] defines hierarchy as "relations of super- and subordination" where "actors are formally differentiated according to the degrees of their authority, and their distinct functions" where there is a "social division of labor among units specializing in different tasks." But empires do not possess the same degree of functional differentiation or specialization. Dominant states could be dependent on subordinate states for power projection so that power does not ensure the dominant state gets the outcome it desires by virtue of brute force.

For example, East Germany was able to successfully negotiate concessions from a significantly more powerful Soviet Union because it knew that the Soviet Union could not weather the ideological blow of its collapse nor compensate for its geographic value [180]. Similarly, the United States was only able to exercise coercive power through high technology warfare during the 1999 Kosovo operation because it

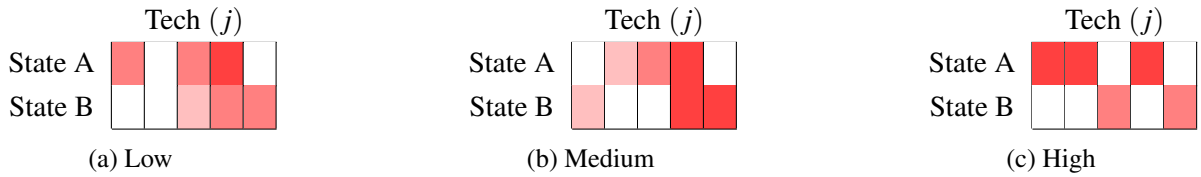
was willing to rely on its European allies to provide other militarily necessary capabilities. Had the United States tried to perform the operation alone, it would have been significantly more expensive and limited in terms of its actual effects.

This thus differentiates cases of vertical integration with interest alignment (hierarchy) from those with vertical integration but low interest alignment (empire). The former more closely resembles authority while the latter is domination or coercion, but both are examples of relationships with high degree of vertical integration.[17] [12, p 698] are worth quoting here in full:

> In sum, the hierarchy principle institutes a division of labor with respect to security (external and perhaps internal) in which subordinate states are dependent on and influenced by dominant ones. Unlike other dependency relations, however, an informal empire raises the expectation of intervention if the dependent party goes astray. Thus, the division of labor is not just about the provision of security, as it might be between two allies, the weak of which contracts with the stronger for help, but about its definition. Dominant states decide what counts as a security threat to subordinate states, and the latter are therefore not sovereign in the sense of autodetermining. This amounts to a functional differentiation of units with respect to security. Functional differentiation is a feature of domestic hierarchy, but Waltz argues that whatever differentiation exists in international politics is reducible to the distribution of power across (sovereign) states, in effect privileging anarchy.

While [12] makes a brief distinction between (non-hierarchical) allies having a division of labor over providing security and hierarchical relationships having a division over external and internal security, this difference is neither clarified nor systematically tested empirically. I argue that vertical integration interacts with mutual interests such that there are hierarchical relationships with mutual interests that are excluded from their definition of allies. When there is vertical integration and mutual interests, states can engage in joint decision-making that reaches an equilibrium in an intra-alliance bargaining framework that results in complementary specialization – a division of labor among functionally differentiated states. When there is vertical integration but no mutual interests, opportunism is addressed via the 'stick' wielded by the dominant state that can threaten to intervene if the subordinate state behaves opportunistically. These mechanisms are theoretically distinct ways vertical integration can reduce the expected cost of opportunism inherently present in interstate security cooperation.

[17] For a more thorough discussion of these distinctions, see [12, 66, 90].



(a) Low (b) Medium (c) High

Figure 4.3: Stylized representation of a division of labor among two actors. Each cell is shaded to represent that state's contribution regarding a given military technology. As the overlap between the states' capabilities decreases, the division of labor increases.

4.5 Empirics

4.5.1 Dependent Variable

The dependent variable is the division of defense labor among aligned states. I conceptualize security as an output that requires a number of distinct tasks (observed as military capabilities) that can, in theory, be distributed among a number of members of an alliance [181]. This can be observed as a matrix where each row is an alliance member and each column is a functional security capability. Each cell represents the quantity of that technology owned by that alliance member. A division of labor can then be quantified as the degree to which each member of the alliance specializes in one activity or performs all tasks, whether a task is performed by one alliance member or many of them, and what activities are performed together by the same individual [182]. I assume that these technologies could at least in theory be allocated to the defense of other allied states.[18] A stylized representation of variation in division of labor is represented in Figure 4.3. When two allies possess the same military capabilities (red) and omit the same military capabilities (white), their division of labor is low and can be described as redundant – neither is making a substantial unique contribution to their "pooled" defense capabilities. By comparison, when two allies possess different military capabilities from one another (c), they each fill in the gaps such that the combination of their capabilities is distinct from, and more well-rounded, than each individual state.

This dependent variable is derived from that in the previous chapter, this time applied to a non-monadic unit of analysis. While specialization is a characteristic of an individual state, division of labor is a characteristic of a group. Group members can all be specialized without that necessitating a division of labor if they are all specialized in the same tasks. In this way, this chapter allows me to differentiate

[18] A future extension would account for how factors like geography and basing mean some capabilities are more readily available to allies than others. For now, the rate of availability is assumed to be greater than 0 and constant across all technologies.

between different types of groups as motivated by the theory.[19]

The division of labor between two states is calculated as their 'niche width' which measures the weighted pairwise similarity of their military portfolios in a given year [185]. For each year t, considering the same $n \times m$ matrix as the previous chapter for every country N and technology M. The pairwise similarity measure $\theta_{ij} = \sum_m min(p_{im} p_{jm})$ for every states i and j where p_{im} and p_{jm} represent their respective proportions of technology m [186]. The measure is normalized between 0 and 1 where 0 means two states have entire dissimilar militaries and 1 means they have the exact same technologies in identical proportions. A division of labor can thus be observed as the complementarity associated with high dyad dissimilarity since it means your partner possesses capabilities you do not and visa versa. Figure 4.3 illustrates the distribution of the division of labor scores in the data.

The measure is weighted, meaning that their similarity is considered proportional to the size of each state (measured as the number of technologies it possesses) as well as the abundance of each technology. For example, two states both possessing 100 main battle tanks does not contribute very much to their similarity because main battle tanks are quite common. By contrast, the possess of ICBMs by two states would contribute much more to their similarity given the rarity of that capability. This measure is appropriate since it can account for actors that possess 0 of a given technology and was developed to account for wide differences in the availability of each technology.[20]

Cooperation between the US and European countries during the Iran-Iraq Tanker War worked because each was *uniquely* specialized in a way that produced complementarity rather than redundancy. The US provided large surface vessels that the other states did not have and the Netherlands and Belgium provided minesweepers that the US did not have. If the US and European countries had all been specialized in minesweepers, this cooperative security arrangement would not have made sense.

As another example, while the US possesses only 2 Arctic-capable icebreakers (as opposed to Russia's 40), 7 of the 8 Arctic nations are US allies via NATO or NATO-partners [193, pp 76–78]. For example, Thule Air Base houses the US Ballistic Missile Early Warning System (BMEWS), yet winter

[19] While I have so far discussed division of labor as simply non-monadically, the first empirical test examines the division of labor among dyadic state relationships, with the recognition that future work should examine the networks of alliances [153, 183, 184].

[20] This measure and similar measures were initially developed as an ecological index to compare biodiversity across different sites. See [185–192].

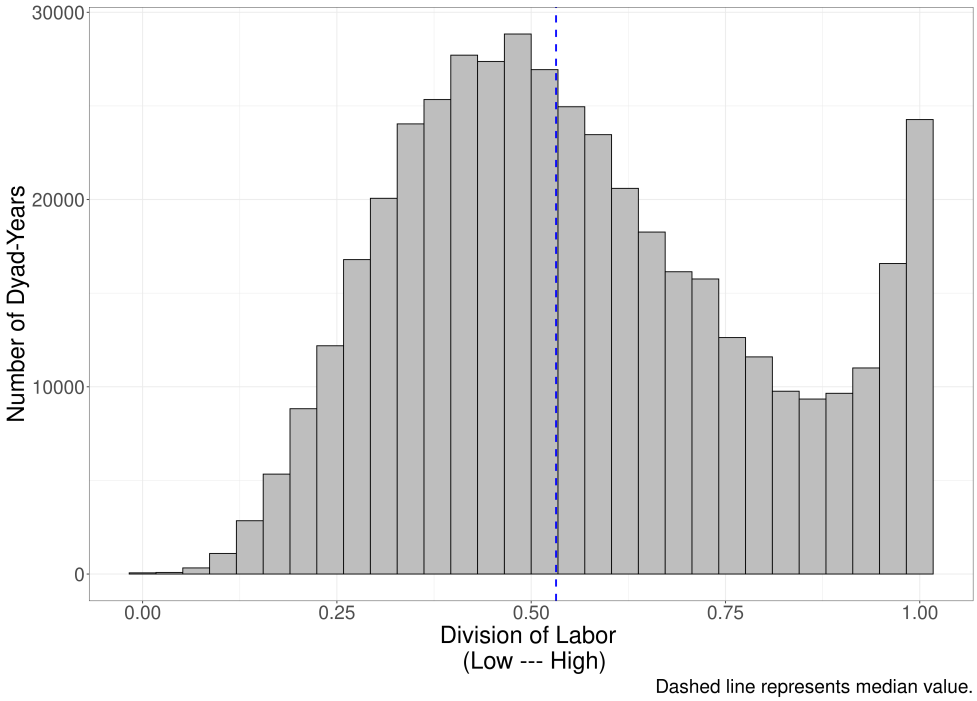


Figure 4.4: Distribution of division of labor scores for every dyad-year. Low values indicate the countries possess the same technologies in identical proportions. High values indicate dissimilarity in the capabilities each state possesses.

access to the base by sea is provided entirely by Canada's icebreaking fleet [194]. By having a division of labor whereby US allies operate icebreakers in the Arctic, "allies and partners can free up U.S. time and resources to focus elsewhere. They can also help improve situational awareness and manage tensions more broadly to minimize dangers and create opportunities in and near the North American and European Arctic" [195]. These capabilities thus complement the technological omission of the United States.

4.5.2 Independent Variable and Controls

The explanatory variables concern variation in the nature of the relationship between two aligned states. I define these variables dyadically for every pair of states that share an offensive or defensive alliance pact or a defense cooperation agreement. Data on alliance pact membership comes from the Alliance Treaty and Provisions (ATOP) data set version 5 [71] and data on defense cooperation agreements comes from the DCA data set [196]. As the previous chapter finds that states in alliances have more specialized militaries than states not in alliances, the purpose of this chapter is to identify the characteristics of alliances that make this the case and whether some alliances are more conducive to this specialized division of labor than others. Econometrically, failure to select only dyads with some type of cooperative security alignment would cause misleading inferences by including dyads like the United States and Russia which have similar militaries given their economic capacity and status as world powers, but that similarity cannot be attributed to a conscious division of labor between them.

I differentiate these defense relationships using the two variables described earlier – interest alignment and vertical integration. Interest alignment, defined earlier as the consistency of two states' security interests and agreement on the nature of the international threat environment, is operationalized using ideal point scores taken from UN General Assembly voting [197, 198]. This is an appropriate observable indicator for the degree to which two states have common security interests because it is sufficiently removed from actual dyadic war fighting decisions to avoid estimation bias, yet existing research has shown that it describes the degree to which two states have similar foreign policy preferences when it comes to international security [171, 199–201].

Vertical integration is operationalized using a measure of alliance institutionalization developed by [123]. Alliance institutionalization is a composite measure accounting for alliance commitments outside of

war like peacetime military contact, a common defense policy, integrated military command, and military basing. This provides a measure of vertical integration by identifying the degree to which the structure of the alliance means decisions about enforcing the conditions of the alliance are structured, primarily by the dominant state [201, 202]. In cases where two states are co-members of more than one alliance, the higher measure of alliance institutionalization is coded which is consistent with existing research [202].

As interest alignment varies for each dyad and alliance institutionalization varies for each alliance, the combination of the two variables provides both across- and within- alliance comparisons. The additive interaction of these two independent variables maps onto the four forms of alliance governance described in the earlier Figure 4.1 with the predictions outlined in Figure 4.2. Dyads with high interest alignment and high vertical integration (hierarchy) should have the highest division of labor. Dyads with high interest alignment and low vertical integration (network) as well as those with low interest alignment and high vertical integration (empire) should have a moderate division of labor. Lastly, dyads with low interest alignment and low vertical integration (anarchy) should have the lowest division of labor.

The models include control variables for geography, economic capacity, and the threat environment since existing theories suggest that these factors could influence the degree to which two states have a similar distribution of military capabilities or that could influence the degree to which those states cooperate on security issues. Since geographic proximity may better enable allied states to cooperate militarily and since states with similiar geographies may have similar security needs, the model controls for contiguity [200, 203]. The model also controls for differences in the GDP between two states, as economic considerations impact weapons procurement decisions [204, 205]. Doing so reduces the risk that the vast dissimilarity in the composition of the US and Barbados militaries is not mis-attributed to a conscious division of labor. Similarly, two states may also have similarly composed militaries simply because they independently face threats that warrant a particular distribution of military capabilities [206, 207]. Separating a state's assessment of the threat environment from its alliance relationships is a challenging, almost impossible empirical endeavor [208, 209]. Nonetheless, one can cautiously proxy for a state's assessment of the salience of its international threat environment with military spending [210, 211]. Two states that spend little on their militaries are both less likely to possess capital intensive assets and also both more likely to possess less capital intensive assets, regardless of the nature of their security cooperation. To account for

this, the model includes a control for the military spending ratio between the two states, measured as the difference between the smaller and larger of the two states.

4.5.3 Model and Results

The dependent variable is the division of labor of military capabilities measured for each dyad-year. The dependent variable is continuous and bounded between 0-1 where 0 represents redundant militaries and 1 represents complementary militaries that constitute a division of labor. The models are estimated using a series of ordinary least squares (OLS) regressions. I limit the sample to dyads that have a recognized security relationship, which I operationalize as the presence of either a Defense Cooperation Agreement (DCA) or offensive or defense alliance pact [71, 196].

Table 4.1 shows the results of a series of models, with varying specifications. I first estimate a model using just the two explanatory variables of interest. Without control variables, interest alignment has a negative association with division of labor and vertical integration has a positive association – both statistically significant at the 0.01 level. Once the control variables are included, the coefficient for interest alignment becomes positive and statistically significant and vertical integration remains positive and statistically significant. The three control variables all have negative coefficients and of them, contiguity and GDP ratio are statistically significant at at least the 0.05 level. This suggests that states have more similar militaries when they share a border and have similar levels of GDP, which is consistent with existing research. All of the models include dyad fixed effects, as the dyad observations over time are auto-correlated and not independent observations. As more technologies become available, the opportunity for the militaries of two states to look dissimilar increases. Models 3 and 4 thus include decade fixed effects and scaled cubic polynomials, respectively, to account for possible temporal trends in technological innovation and force structure [212]. Model 5 includes an interaction term between the two independent variables – interest alignment and vertical integration. The interaction term is not statistically significant, suggesting that the effect of interest alignment does not vary based on the degree of vertical integration (nor the inverse).

These results are robustness to a series of alternate model specifications provided in the appendix. Excluding dyads that are only DCAs, not formal alliances, produces similar results while allaying concerns

Table 4.1: OLS models

	Model 1	Model 2	Model 3	Model 4	Model 5
Independent Variables					
Interest Alignment	-0.01^{*}	0.02^{***}	0.02^{***}	0.03^{**}	0.03^{**}
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Vertical Integration	0.03^{***}	0.02^{***}	0.02^{***}	0.02^{*}	0.02^{*}
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Controls					
Contiguity		-0.11^{***}	-0.11^{***}	-0.11^{***}	-0.11^{***}
		(0.01)	(0.01)	(0.01)	(0.01)
GDP ratio		-1.18^{***}	-1.20^{***}	-1.20^{***}	-1.20^{***}
		(0.10)	(0.10)	(0.10)	(0.10)
Mil Spending ratio		-0.01	-0.01	-0.01	-0.01
		(0.02)	(0.02)	(0.02)	(0.02)
Interaction Term					
Interest Align. * Vertical Integ.				-0.00	-0.00
				(0.01)	(0.01)
Decade FE	No	No	Yes	No	No
Cubic polynomials	No	No	No	Yes	Yes

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$
All models include country-clustered standard errors.
Coefficients for decade and scaled cubic polynomials not shown.

that measures of alliance institutionalization may not be comparable between the two different datasets. Further models also operationalize interest alignment using other commonly used metrics like s-scores [123, 213] and joint alliances, operationalize vertical integration as signaled support from major powers [214], and including alternate measures of geography like distance [215].

A more intuitive interpretation of the two independent variables is shown in Figure 4.5. The first independent variable – interest alignment – is plotted on the X-axis. The partial residual are shown based on different values of vertical integration (low and high on its original ordinal scale). Division of labor is highest in dyads that have high interest alignment and high vertical integration and lowest in dyads

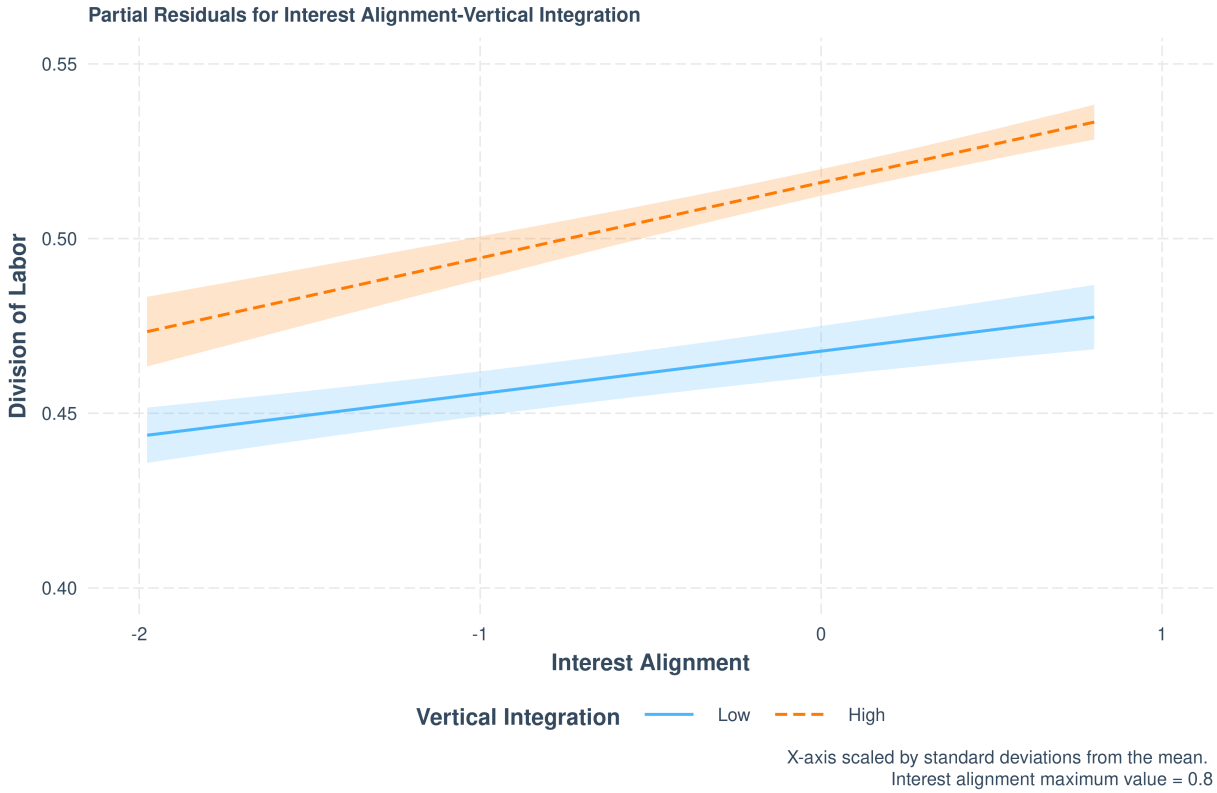


Figure 4.5: Partial residual plots for the two primary independent variables holding all control variables constant.

that have low interest alignment and low vertical integration. Dyads high in one of the two independent variables but not the other have a division of labor somewhere in between, with no clear indication about which of these matters more. The differences in slope are the result of a multiplicative interaction term between the two independent variables, although it is statistically insignificant.

This relationship is also substantively significant. A one standard deviation increase in interest alignment is associated with an increase in division of labor of just over a tenth of a standard deviation. Put concretely, this is the difference between the military division of labor between the United States and Japan in 1984 and in 2000. For vertical integration, a shift from low vertical integration to high vertical integration is associated with an increase in division of labor of roughly one quarter of a standard deviation. This can be represented by the difference in the division of labor between the United States and Poland and the United States and Ukraine in 2014. Poland, a NATO member, has a higher division of labor with the US than does Ukraine, a non-NATO member. Poland has accomplished this by specializing in short-range

transport aircraft and surface to air (SAM) missile defense systems that the United States does not possess in particularly high quantities. This is not coincidental, as Poland learned after the Bosnian war that their contribution to NATO air forces was marginal at best and they were instead better off contributing ground troops and short-range transport aircraft [216, 217]. Their first formal integration with NATO defense forces involved air defense systems as NATO "encouraged Poland to acquire more of a niche capability within the alliance, which would antagonize Russia less, but would also fit better into collective defense efforts (a smaller amount of mobile and highly technological units that could be deployed abroad quickly were encouraged.)" [218, p 38].

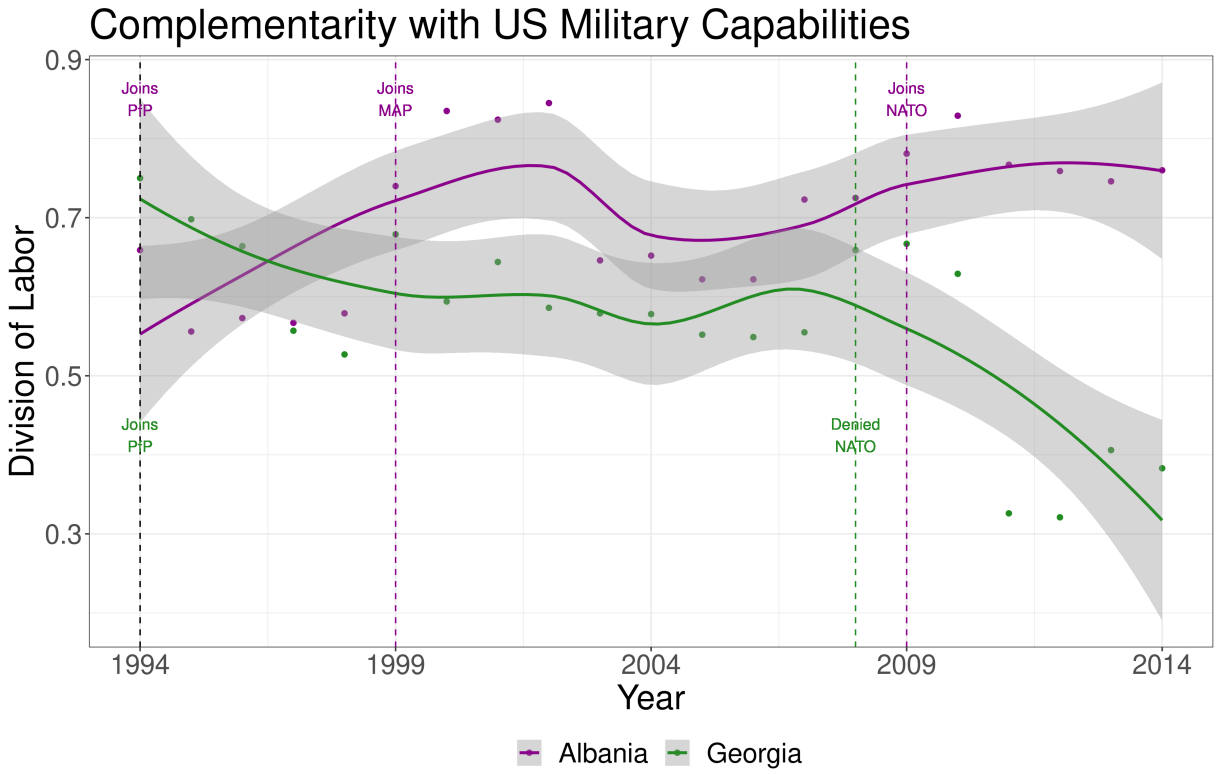
4.5.4 Discussion

NATO expansion provides an illustrative example.[21] In 1994, Albania and Georgia were among the 18 Former Soviet Union (FSU) and Warsaw Pact states to join the Partnership for Peace, a new NATO program designed to initiate military cooperation with prospective applicants [216]. Albania and Georgia were similar in many respects like GDP, military spending, geographic size, and coastline.

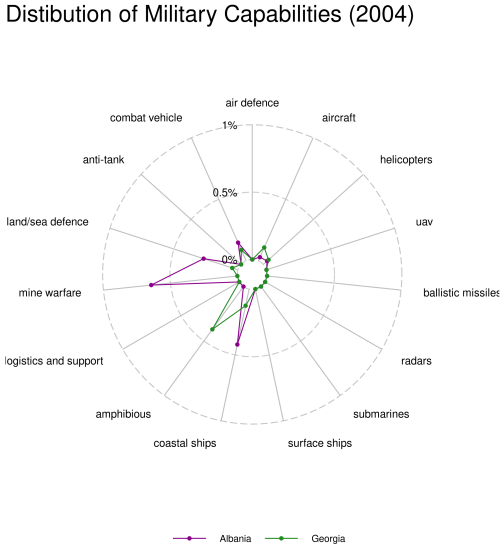
Figure 4.6 illustrates how this case maps onto the results of the statistical model. In 1994, both Albania and Georgia had similar divisions of labor with the United States (0.6). Albania's division of labor with the United States increased after they joined the Membership Action Plan (MAP) and again after they were granted NATO membership. By 2014, their division of labor with the United States was around 0.75. Georgia, by comparison, experienced a relatively constant decrease in their division of labor with the United States, with that decrease sharpening most following the 2008 war with Russia and consequent lack of confidence in their participation in the NATO alliance.

The difference in their respective divisions of labor with the United States can be attributed to Albania's decision to specialize their military while Ukraine opted for a more conventional (small) full-spectrum force. Figure 4.6b shows Albania and Ukraine's military portfolios as a percent of the world's share for each capability. While not identical, the two states were fairly similar in having moderate navies, smaller but capable land forces, and very limited air capabilities. Figure 4.6c shows how that changed a decade later. Albania specialized in naval patrol vessels with a range that allowed them to patrol as far as

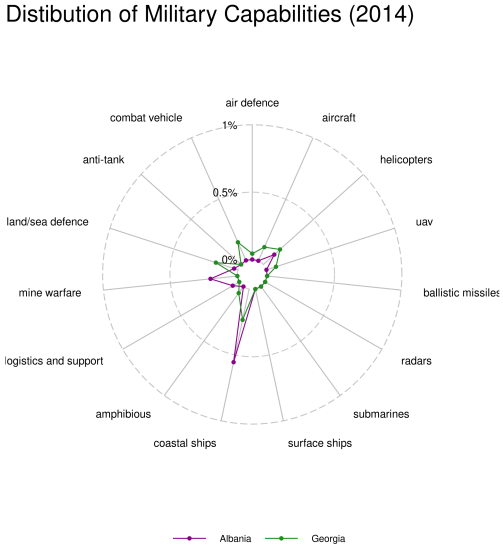
[21] For a more detailed account of the NATO expansion and Former Soviet Union and Warsaw Pact cases, see [219].



(a) Division of labor with the United States



(b) Percent of the world's share (2004)



(c) Percent of the world's share (2014)

Figure 4.6: Changes in Albania and Georgia's division of labor score with the United States from the time both joined the Partnership for Peace (1994) until the latest year in the data. Important alliance dates are highlighted.

Portugal, despite their own coastline being only 225 miles [220]. They also omitted air capabilities almost entirely, disposing of all former Soviet combat helicopters and fixed wing aircraft in favor of minimal air power capable only of surveillance and humanitarian missions. Choosing to these omissions and overproductions were consistent with their doctrinal aim of performing the niche role of maritime security for its NATO allies. Albania even went so far as to name their 2004 Military Strategy document “Strategy of NATO-integration" which called for a shift to sea and air surveillance and humanitarian assistance so that it could fulfill its goal of “providing combat readiness for defence; monitoring and surveillance of Albania’s sea, air, and land territorial space; participating in humanitarian assistance and disaster relief operations; fighting terrorism; and participating in peace support missions" [221].

Georgia, on the other hand, had received only weak promises of support from NATO in the lead up to the 2008 war with Russia [222]. After Russia’s attack – purportedly motivated by Russian concerns about NATO expansion – NATO confirmed that Georgia would not invited to NATO at this time, although it would be possible at some point in the future. While the 2011 National Security Concept of Georgia mirrors the 2005 version in discussing the importance of NATO membership for Georgia’s defense, there is pessimism about NATO’s willingness to defend Georgia [223]. Georgian President Saakashvili remarks that “NATO will not help us in this" [224] occurred a month after US ambassador John Tefft told Saakashvili that “Tbilisi, if it acted, would stand alone" [225, p 144]. As a result, Georgia has not been able to mirror Albania in downsizing their air force and instead specializing in niche maritime patrol capabilities that contribute to the common defense. Instead, they have continued to diversify their military portfolio with an eye toward self-defense against Russian territorial aggression, as evidenced by their more capable land and anti-air capabilities. Current debates have shifted from whether NATO expansion deterred Russian aggression [226, 227] to how NATO membership shapes the form of Russian aggression [228]. These findings help us further advance our understanding of these issues by identifying how NATO membership shapes the composition of military capabilities that states possess.

4.6 Conclusion

The primary purpose of a state's military is to improve their security. Despite a recognition that this is conditioned by considerations like economic and geographic constraints and differences in what security threats state face, military power is still treated as a fungible asset that varies in size, but not in composition. However, states differ in what military capabilities they choose for their security. When states with similar economic and geographic constraints choose different force structures it may be because the optimal force structure for is conditioned by a state's cooperative security relationships. States do not just decide between internal and external balancing. External balancing influences how a state internally balances because what military capabilities a state needs is a function of the military capabilities their ally possesses.

These findings also point to a new mechanism by which states can prevent opportunism by alliance partners. Conventional wisdom holds that asymmetric alliances have trouble with reliability-enhancing features like precision, issue linkage, and institutionalization since the larger state does not need reliability enhancement and the smaller state cannot get it [108]. Dominant states want to free ride on their smaller partners, but cannot because they have more at stake and thus end up over-providing [229]. Rather than coercing their allies into contributing, allies can engage in a strategic division of labor where each provides useful capabilities in a way that is incentive compatible for both partners. Specialization is thus a way of preventing opportunism by limiting adventurism by smaller states (resolving entrapment) and preventing abandonment by the larger state.

Convergence of foreign policy preferences and institutionalized hierarchy interact to shape the type of military capability portfolio a state maintains. Among other purposes, interstate alignments help a state defend itself better than they could defend themselves alone. However, there are downsides to relying on other states for defense. Other states could behave opportunistically by defecting in a way that presents a risk to your national security and defense and second, coordinating that cooperation can be costly. As a result, alignments must contain ways to guard against the risk of opportunism and costs of coordination [230]. This insight can help inform current debates about changing NATO relations and identify the consequences of allies trusting each other less than they used to. These debates often turn to

the question about whether allies are contributing enough to the alliance. But by looking at what states are contributing to the common defense, rather than how much they are spending, new perspectives on burden-sharing and the value of the alliance may emerge. After all, the composition of military assets, not just the amount spent, is what is truly of tremendous consequence for how NATO deals with future threats.

By applying economic and business organization theories about patterns of production across actors in the same space, a theory of a shared production model of military capabilities identifies a way that states can get the benefits of specialized production – economic, political, and military – while minimizing the costs of omitting some assets while overproducing others. In this way, states strategically choose to functionally differentiate through interstate security cooperation when it is conducive to a division of labor across nations. This happens when intra-alliance bargaining can overcome the costs of opportunism and coordination that otherwise inhibit reliance on others in the high stakes realm of the security and survival of the state. These two problems can be overcome when the states in question have (1) closely aligned interests and (2) there is an institutionally-designed command and control system. When states are able to cooperate over security issues, that cooperation manifests itself in specialized and complementary military capabilities.

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Chapter 5

Conclusion

5.1 Summary

This project was initially motivated by the puzzling observation that at times, capable states seem to forgo the development of useful and economically feasible military capabilities. Investigating the puzzle of security inefficiencies prompted a larger question about what it means for a military to be inefficient, which in turns requires the ability to observe what a state has and what it 'should' have.

This project creates the first metric of military specialization by applying measures of resource allocation from ecological diversity research to a novel dataset on the world's disaggregated military capabilities since 1970. The empirical findings provide evidence that interstate cooperation fosters differences in how states defend themselves by creating conditions for military specialization and also examining mechanisms by which alliances vary in how well they foster a division of labor (interest alignment and institutionalized hierarchy)

5.2 Contribution

This research makes a few key contribution that advance our understanding of international politics. The first concerns how institutions solve the collective action problem. Dividing up responsibilities among actors without any shirking responsibility is a challenging endeavor. One way actors can overcome this is

to compartmentalize the space of cooperation. When a division of labor means each actor provides some capabilities that the other needs, mutual interdependence can provide an efficient alternative to coercion by making cooperation more reliable and lower cost to all. By doing so, actors can overcome problems of enforcement that are often credited with inhibiting cooperation under anarchy.

The second concerns the unit of analysis when thinking about international security. The main problem with current investigations of state military capabilities is that despite a general recognition that institutions influence state behavior, the state has remained the primary unit of analysis for inquiries about determinants of state military capabilities. But a state's security is improved not just by their own defense efforts, but those of similarly aligned states in the international system. While this has long been recognized, my contribution is in investigating how interstate security alignments influence the composition of states' defense rather than just the amount of state defense. Sometimes the structure of the international system allows a network of states to act as an agent for the production of defense. In doing so, a state's defense assets are not representative of the international balance of power or that's state's ability to defend its security. Rather, the scholar's lens must zoom out and consider the network as the proper unit of analysis. These networks don't just exist as a binary, but rather the degree to which a network is a cohesive agent is dependent on the alliance conditions set forth here. As a result, small states that have traditionally been peripheral in grand theories of international affairs now start to matter more. The manner in which they focus on niche capabilities can matter more to dominant states than previously thought and also reveals information about the structure and nature of those relationships. By distinguishing the scenarios under which states engage in a division of labor from those where they embrace self-sufficient defense policy, a theory about these conditions can identify the conditions under which each set of theories appears true.

The third contribution of this research is to debates about alliance burden-sharing. Contemporary policy debates about alliance free riding focus on whether everyone's costs are sufficiently contributory. Yet, this ignores that one of the reasons alliances are created in the first place is to change states' defense spending and their military portfolio. If a state enters an alliance and there is no subsequent change to its military strategy, it's unclear what the alliance was supposed to do. Instead, discussions about alliance burden sharing need to look at what each state is spending money on. US allies could spend more money on defense without it contributing to collective defense efforts if they spent the money on the wrong things.

For example, states could increase spending by filling in for the gaps in their current military capabilities, becoming more autonomous and consequently more able to conduct actions contrary to the allied interest. NATO allies that are spending less than 2% of their GDP on defense but using that money to develop niche capabilities that compensate for omissions or short falls of more dominant NATO members are making a notable alliance contribution that is not properly reflected by looking at the bottom line. The true concern for the US should not be allies that are not spending enough on defense. Rather, it should be allies that are developing capabilities that are redundant with those of the US, simultaneously reducing their dependence on the US while demonstrating an increased capacity for a more independent foreign policy.

The fourth contribution is about our understanding of the determinants of coalition warfare effectiveness. The wars in Iraq and Afghanistan have taught the United States an important lesson regarding the complications of configuring its force structure with regard to certain allies when involved in situations outside of the scope of that alliance. Part of the explanation for the United State's vulnerability in recent wars was its inability to compensate for missing military capabilities that it anticipated being able to omit given the relative strengths of our allies – a stark contrast to the successful division of labor during the Iran-Iraq Tanker war of the late. While much has been written about how states decide between internal and external balancing as well as the consequences of each strategy, less has been said about the interdependence of the two. Arms and allies are not truly distinct strategies for security; the arms a state should develop are a function of the arms of its allies.

5.3 Future directions

Although a sizable portion of this dissertation is about theorizing the importance of alliances, they are only one illustration of a larger point about the heterogeneity of military capabilities in the international system. The primary purpose of this initial step is to identify that heterogeneity, demonstrate that it matters for international affairs, and that it is possible and worthwhile to identify why this heterogeneity exists. While alliances are a useful starting point for thinking about this, there is much to be written about the other factors that explain why states arm themselves with different military capabilities.

Even concerning alliances, the empirical evidence in favor of a shared production model of

defense has thus far been limited to the Cold War and post-Cold War era. Given plausible claims about the uniqueness of the post-war period, a question remains about whether the conditions for interstate cooperation over collective defense are an artifact of this unique time period rather than a theory that can explain the composition of a state's military more broadly. Future work should investigate other time periods where both military technologies and interstate relations differ in form and function relative to the modern era.