Allies as Armaments: Explaining the Specialization of State Military Capabilities*

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Scholars and practitioners have long maintained that for capable states a full spectrum 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 military force. I substantiate these arguments with evidence from a new dataset on state military capabilities since 1970.

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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 (Phillips 2018), 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 (Waltz 1979, 102–14), 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 (Sagan 1993; Biddle 2005). 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 (Owens 2006). Conversely, states facing the same threat environment should consequently cooperate with one another to gain economies of scale by individually specializing their military portfolios (D. A. Lake 1999, 2001). 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 (Balencie 1992; DeVore 2009). Figure Figure 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 (Walker 2000). 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" (Till 2005). Inversely, where the United States excelled (strike groups, nuclear attack submarines, ballistic missiles submarines, and strike aircraft), its European allies remained underdeveloped.

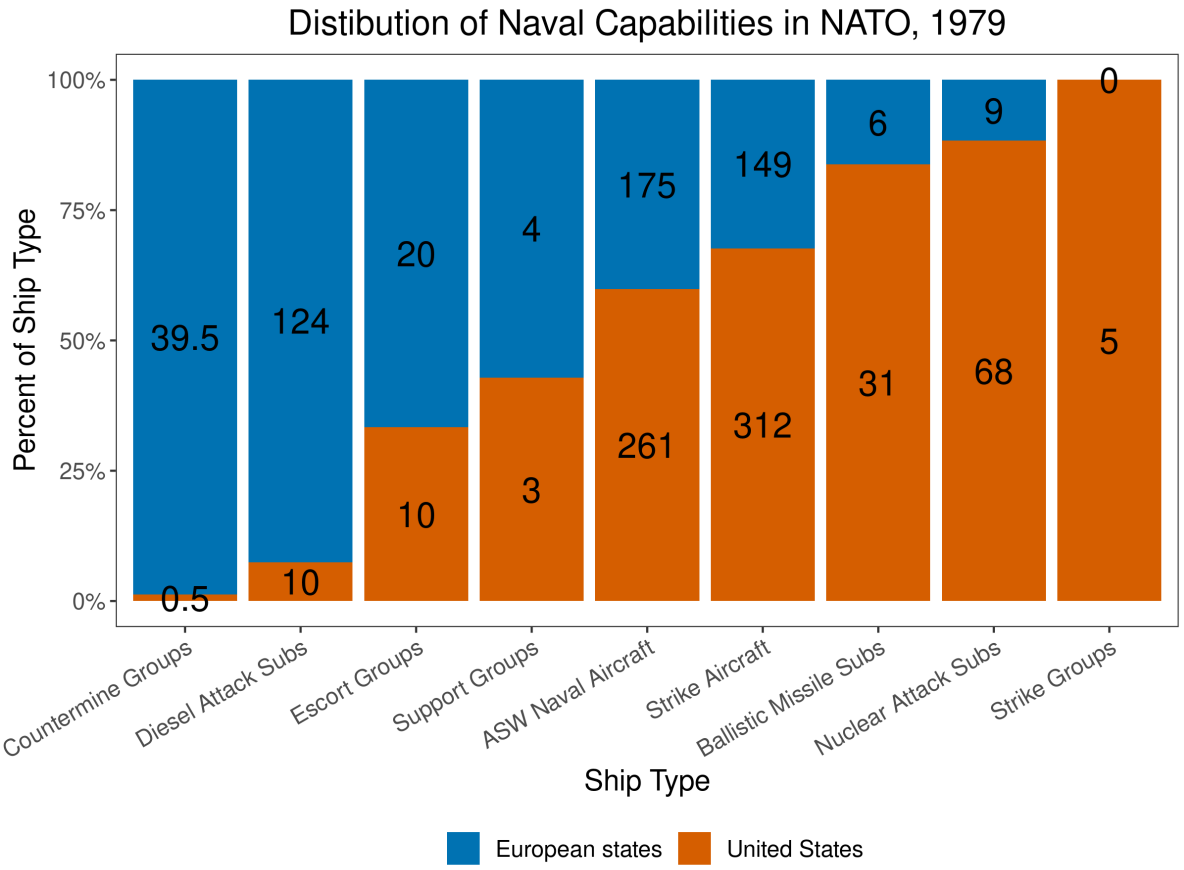


Figure 1: The United States and its European NATO allies engaged in a division of labor over naval assets. Numbers refer to asset/group counts.

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

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 (Boot 2006; Biddle 2007). 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 (Cheung 2011a). 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 (Buzan 1987).

Despite its shortcomings, most research on military capabilities still focuses on variation in the *size* of state militaries (Aufrant 1999; Fordham 2002; Sample, Valeriano, and Kang 2013; Cappella Zielinski, Fordham, and Schilde 2017; Odehnal and Neubauer 2020). 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 (Brooks 2005). 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 (Hone 1993; Caverley 2007). Early discussions about the political determinants of a state's weapons development were framed around a debate between internal and external causes (Evangelista 1988). 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 (Kurth 1973). This view is consistent with theories pointing to the importance of the military industrial complex in shaping national defense policy (Kotz 1988; Reppy 2000). 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 (Mawdsley 2018). In the American context, scholars have tried to reconcile these different perspectives by identifying causal factors at various stages of the weapons development process (Evangelista 1988; Farrell 1997).

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 (Builder 1989). Bureaucratic explanations point to the need to examine internal factors because of the absence of a single authority for weapons development decisions (Allison and Morris 1975; Kossiakoff 1980; Cockburn 1991). 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 (Higgs 1988; H. Smith 1988; R. G. Carter 1989; Heginbotham 2002) although there is much disagreement about the empirical record (Lindsay 1991; Mayer 1991). Preferences for a particular distribution of military capabilities may also be influenced by political ideology (Kehr 1975; Fordham 2019; Heginbotham, Heim, and Twomey 2019) or regime type (Conrad, Kim, and Souva 2013; J. Powell et al. 2018). Public support may matter in democracies more than non-democracies (Reiter and Meek 1999) which could cause democratic regimes that are sensitive to casualties to desire capital-intensive as opposed to personnel-intensive military forces (Gartzke 2001; Caverley 2014).

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 (Zuckerman 1982), although the latter perspective has been challenged by later empirical examinations of the same Cold War case studies (MacKenzie 1993; Spinardi 1994). More sociological theories of the social relations among networks of domestic actors has been forwarded by Spinardi (1990). Work in this vein has posited status concern explains particular weapons acquisition decisions (Eyre and Suchman 1996) 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 (Ashraf 2011).

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 (Owens 2006).[1] This is the realist position -- a state's distribution of military capabilities is a function of that state's threat environment (Waltz 1979) and states will maintain the distribution of military capabilities that best addresses that environment (McNamara 1967; Rathjens 1969; Berman and Baker 1982).

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* would posit that variation in states' distributions of military capabilities is explained by differing resource constraints and prioritization of particular threats (P. Dombrowski and Gholz 2009; Nordhaus, Oneal, and Russett 2012). 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. Waltz (1979, 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, "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." (Waltz 1979, 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." (Posen

[1] More generally, a state will also increase the level of military spending if they face a more threatening international security environment (Nordhaus, Oneal, and Russett 2012).

[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 threats.

1984, 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 (Jervis 1978), 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 (Turner 1977; Sagan 1993; Biddle 2005). 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" (Millett, Murray, and Watman 1986, 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 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" (Till 1994).

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 (Gulati, Nohria, and Zaheer 2000). 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 (Frieden 1999; D. A. Lake and Powell 1999). 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 (D. A. Lake 1996, 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 (D. A. Lake and Wong 2009, 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" (Mattern and Zarakol 2016, 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]

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

[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.

[4]For a more detailed evaluation of relational norms and social-based incentives, see Macneil (1980). Others have pushed back that this account is more descriptive than theoretical (Heide 1994; Joshi and Stump 1999).

[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

three primary benefits of specialization stem from economies of scale, operational efficiency, and improved integration (D. A. Lake 1999). 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 (Droff, Baumont, and Barra 2019). But the marginal cost of that investment goes down as a state decides to produce more of the same asset (Markowski and Hall 1998). Maintenance and repair costs are reduced when there is a smaller list of repair parts (Briani 2013). 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" (Postrel 2002; Haeussler and Sauermann 2016).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 (Young 1990).

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 (Overhage 2013).

states possess no more than a dozen.

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 \ref{fig:spectrum_specialization}.

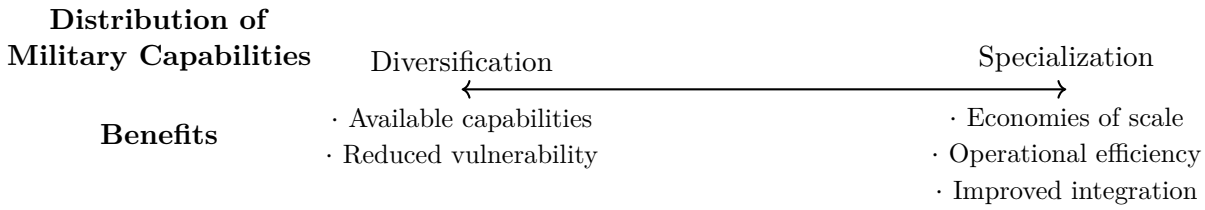


Figure 2: Varieties of the Distribution of Military Capabilities

In contrast to specialization, the benefits of diversification manifest as the security gains of a combined arms military (Biddle 2005). 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-

[6]For a contemporary example of US concerns of communication interoperability between its aircraft and allies operating Chinese-manufactured drones, see Penney (2020).

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" (Hammel 2010).

States that have not embraced the combined-arms model of warfare have consequently suffered. 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 (Herzog 2018). Operating with a similar logic, India's primary defense planning document after World War II, the "Naval Plan Paper No. 1-Costs of Future Royal Indian Navy" (1947), also made the case for a "balanced naval task force" which was later clarified by Indian Vice Admiral W.E. Parry (1949) 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 (Diehl 1994).[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.

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 non-security functions (DiGiuseppe and Poast 2016). This can garner the security benefits of capability aggregation posited by the neorealists (Waltz 1979; Walt 1987) as well as the economic benefits put forth by hierarchy theorists (Morrow 1993; D. A. Lake 1999; Kimball 2010).[9]

[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 (Howorth 2007; Janning and Bauer 2007).

[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 (Wilkins 2012).

[9] Auerswald and Saideman (2014) 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

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 (D. A. Lake 1997). 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 (Dekker 2004) and costs of coordination (Hennart 1988; Oxley 1997) 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) (Snyder 1984). 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 (Oye 1985).[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

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 Auerswald and Saideman (2014, 229–33).

[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 Sandler and Hartley (1999) and Fevolden and Tvetbråten (2016).

[11] Similar decision calculi and the resulting specialization is seen in various economic sectors like the packaging machine industry (Lorenzoni and Lipparini 1999) and telecommunications equipment manufacturing (Phelps 2010).

available to you during war (Conybeare 1992). 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 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" (Lawrence 2015, 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 (Anthony 1994; Bitzinger 1994; Neuman 2010; Kurç and Neuman 2017). 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 (Meier, Stephenson, and Perkowski 2019). 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 M. E. Smith (2013) 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" (Morgan and Martoglio 2005). Chair of the Joint Chiefs of Staff Martin Dempsey (2014) 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 (Axelrod and Keohane 1985; Oye 1985; D. A. Lake 1997). 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 (Snyder 1984). 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" (D. A. Lake 1996, 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 (Ikenberry 2001) 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 (Morrow 1991). As Auerswald and Saideman (2014, 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 (White 2005, 1385). While opportunism costs focus on uncertainty regarding your partner, coordination costs are more about uncertainty regarding the task (Gulati and Singh 1998; Casciaro 2003). 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 (Chandler 1977; Palmer 1983; Das and Teng 2000). 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 (Gulati and Nohria 1992, 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 (Simon 1962; Becker and Murphy 1992; Das and Teng 2000; Cummings and Kiesler 2014; Puranam, Alexy, and Reitzig 2014). Despite this, international relations research on the problems of cooperation inspired by Williamson (1985) and the accompanying transaction cost framework have been less concerned with coordination costs, instead arguing that opportunism costs should be at the forefront (D. A. Lake 1996, 2001). 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 (Overhage 2013). Coordination costs need to re-enter the picture (White 2005). In defense, "duplication of facilities, differences in requirements, coordination problems, lack of clear control and delays due to different budgetary systems all tend to in-

crease the costs of collaborative projects" (R. Smith 1996, 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 (Haeussler and Sauermann 2016).

General Rommel (1953) 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" (Auerswald and Saideman 2014, 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 (Hallams and Schreer 2012; Dicke et al. 2013; Haesebrouck 2017).

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

[12]For a detailed case study illustrating the difficulties of defense collaboration, see analysis of France and the A400M transport aircraft (Joana and Smith 2006; Mawdsley 2013).

and function (Wallander and Keohane 2002, 90–91).

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

The terminology for this explanatory variable, thus far described informally as cooperation, is far from harmonized and consequently confusing (Mattern and Zarakol 2016). I think of this cooperation more broadly as the presence of a form of governance -- "the management of relations between actors" (D. A. Lake 1996, 5) which others have called "relational governance" (Macneil 1980; Williamson 1985; Dwyer, Schurr, and Oh 1987; Zaheer and Venkatraman 1995). Cooperative security alignments involve commonly recognized defense relationships like mutual defense pacts and formal alliances (Leeds et al. 2002) as well as less analyzed, but more common defense cooperation agreements (DCAs) (Brandon J. Kinne 2020). 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 (Benson and Clinton 2016).

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 (Keohane 1984; Stein 1990; Martin 1994). 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" (Wallander 1999, 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 advantages, leaders hope to create a stronger joint fighting force (Leeds and Anac 2005, 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" (D. A. Lake 1996, 15).

Empirics

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

[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.

[14]Dyer and Singh (1998) and Mahmood, Zhu, and Zajac (2011) 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.

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 rDMC (Gannon 2021).

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-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.[16]

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

[15] Existing research has made similar distinctions in what military capabilities are examined cross-nationally (Brooks and Wohlforth 2016; Caverley 2021).

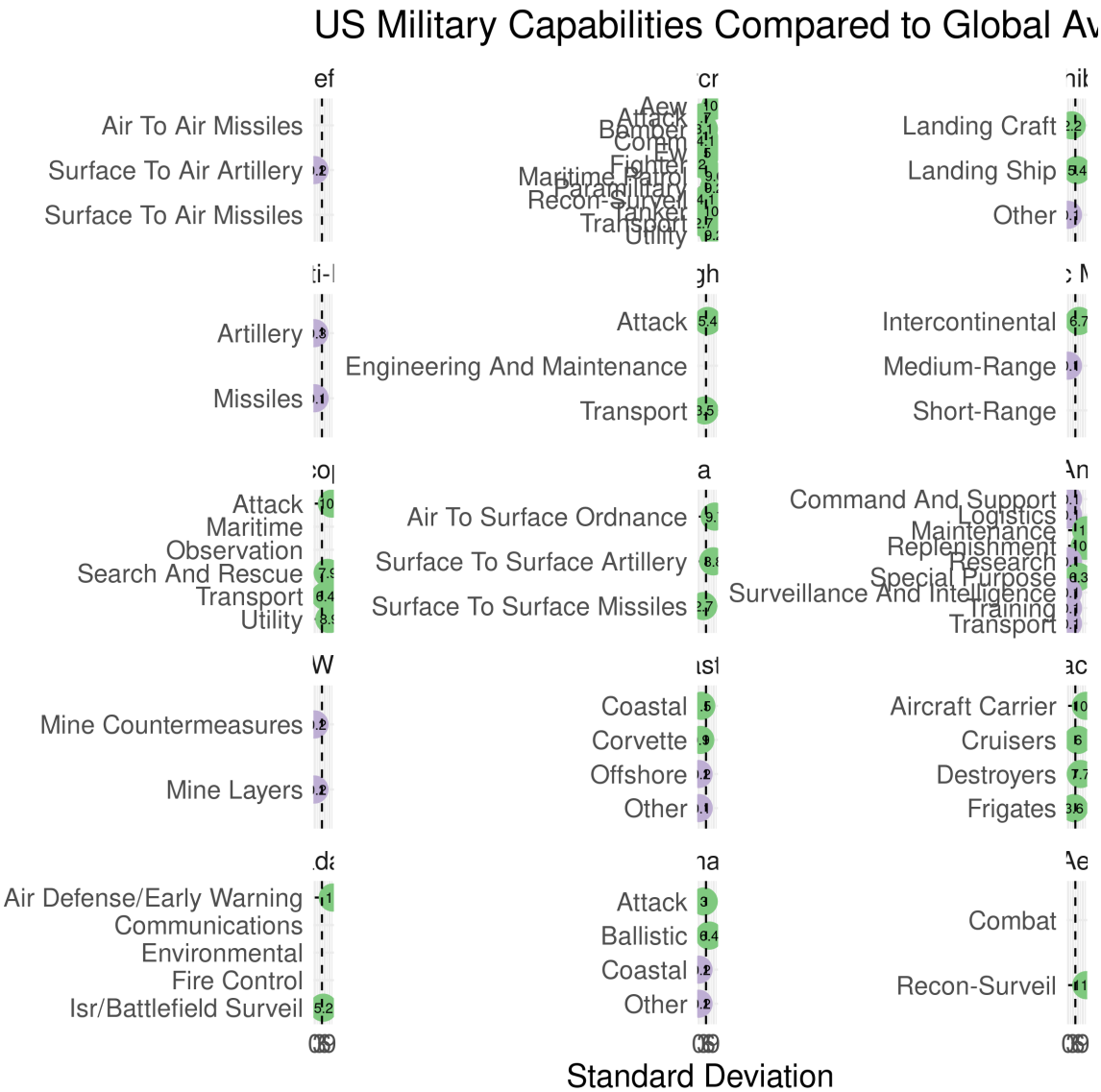
[16] This represented a bipartite network structure modeled after its use in ecological research (Alarcón, Waser, and Ollerton 2008).

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 Figure 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 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



Note: Capabilities with unknown annual counts are labeled, but omitted from all calculations.

Figure 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.

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.

specialization_scores/specialization_waffle_sdnorm.png

Figure \ref{fig:country_scores_waffle} 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 (P. J. Dombrowski and Gholz 2006, 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" (C. L. Powell and Persico 2010, 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 (D. R. Lake 2012, 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 is equal across the board. As Figure \ref{fig:us_lollipop} 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 \ref{fig:spider_overlay} 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.

spider_plots/comparison/2010_israel-united_arab_emirates-canada.png

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 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) (Brandon J. Kinne 2020). Data on state participation in offensive or defensive alliance pacts is provided by the Alliance Treaty and Provisions (ATOP) data set, version 5 (Leeds et al. 2002).

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 (Holsti, Hopmann, and Sullivan 1985; Leeds and Savun 2007; Gibler 2008; Langlois 2012). 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 (Brandon J. Kinne 2018).

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 (Gartzke 2001; Caverley 2014), spend less on defense (Fordham and Walker 2005; Goldsmith 2007), are generally less likely to be involved in conflicts (Russett and Oneal 2000), and may be more or less reliable alliance partners (Gartzke and Gleditsch 2004; DiGiuseppe and Poast 2016). 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 (Ghosn, Palmer, and Bremer 2004; Leeds and Savun 2007) and recent conflict experience may change patterns of innovation (Rosen 1988; Kollars 2015). The model controls for GDP, as resource-constrained states may be forced to specialize and may also be unable to replace labor with capital (Casetti 1984; Ball 1993; Calder 1997; Gartzke, Kaplow, and Mehta 2014; Craig et al. 2018). 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 (Markowitz and Fariss 2013, 2018; Gholz and Sapolsky 2021).

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 (Peterson and Cavanaugh 2019). 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 (D. B. Carter and Signorino 2010). 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 \ref{table:model} 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.

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 support of a positive association with defense pacts.

The relationship between interstate security alignments and military specialization is also substantively significant. Figure \ref{fig:effect_plot_dca} 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.

model_results/paper2_effectplot_dcabinary.png

When it comes to defense pact membership, Figure \ref{fig:effect_plot_atop} 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 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.

model_results/paper2_effectplot_atopcount.png

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 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 (Keohane 1986), the state has remained the primary unit of analysis for inquiries about determinants of state military capabilities (Røksund 2007; Cheung 2011b, 2016; M. E. Smith 2013). But a state's security is improved not just by their own defense efforts, but those of similarly aligned states in the international system (Wallace 2008; Yarhi-Milo, Lanoszka, and Cooper 2016). My contribution to research on international security cooperation is investigating how different interstate security alignments influence the composition of states' defense (Sprecher and Krause 2006). 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 (Wolford 2015; Cranmer and Menninga 2018).

Although it may initially seem that a theory of a shared production of military capabilities runs counter to theories about diversification (what Biddle (2005) 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 (Tago 2007; Kreps 2011). The nature of ally relationships impacts resolve, how the credibility of signaled threats, and how states bargain

during conflict (Wolford 2015). 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 (Glazier 1987).

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 Daalder (2013) 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* (Blankenship 2018; O'Hanlon 2018; Raji 2018). 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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