A Division of Defense Labor Across Nations*

A Theory of the Shared Production of Military Capabilities

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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 is hierarchical. 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.

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1 Introduction

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 program designed to initiate military cooperation with prospective NATO applicants (Szayna 2001). Albania and Georgia were similar in many respects like GDP, military spending, geographic size, and coastline. Yet 1 shows that by 2014, their militaries looked quite different. Albania specialized in naval patrol vessels with a range that allowed them to patrol as far as Portugal, despite their own coastline being only 225 miles (Polak, Hendrickson, and Garrett 2009). 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. Georgia, by comparison, maintained a more diversified military that was similar in size, but more evenly distributed in composition.

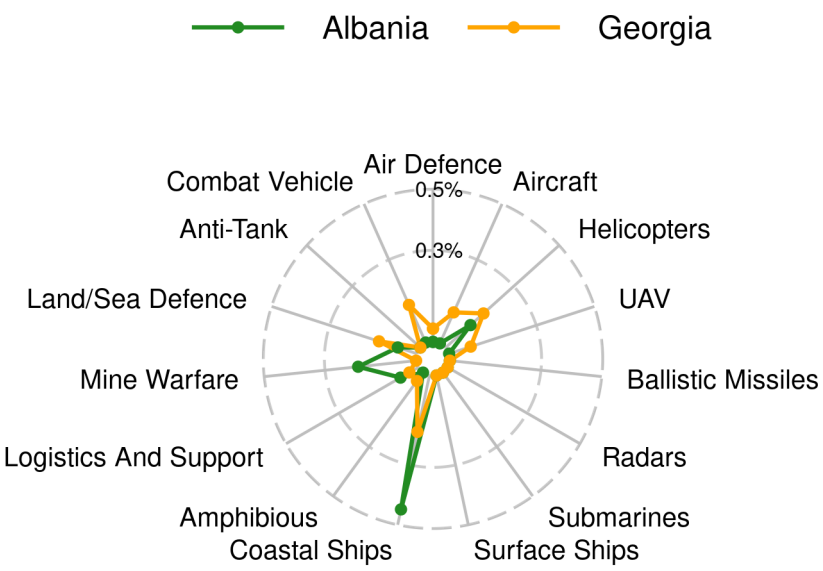

Figure 1: Albania and Georgia specialization.

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 (Kurth 1973)? 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 hierarchy 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

[1] For example, see Onuf (1989), Watson (1992), Buzan, Jones, and Little (1993), Ruggie (1993), Spruyt (1994), Deudney (1996), Wendt and Friedheim (1995), Paul (1999), Lake (2003), Lake (2007), Sharman (2013).

[2] One theoretical explanation assumption is that socialization and competition under anarchy results in convergence (Waltz 1979; Posen 1984; Resende-Santos 1996, 2007; Goldman and Andres 1999; Parent and Rosato 2015).

the conditions under which major states try to gain security through joint efforts (Jervis 1986, 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 hierarchy. 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.

2 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 (Brooks 2005) to domestic politics (Allison and Morris 1975; Kehr 1975) to social considerations and status (Spinardi 1990; Eyre and Suchman 1996). The prevailing political explanation concerns the nature of the international threat environment (McNamara 1967; Rathjens 1969; R. P. Berman and Baker 1982).

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 (Waltz 1979; Mearsheimer 2001). 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 (Parent and Rosato 2015). 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" (Waltz 1979, 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 (Lake 1999). They have everything to gain and very little to lose from that cooperation (Axelrod and Keohane 1985). 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, Till (1994, 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."

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

[3]See the discussion on relative and absolute gains by Grieco (1988); Snidal (1991); R. Powell (1991).

states are trying to be self-sufficient in their defense (Mawdsley 2018, 260), as some scholars have predicted (Bitzinger 2017).

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" (Mawdsley 2018), others have found that Europe's defense market is actually quite fragmented and protectionist (Bitzinger 2009). 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 (Howorth 2007). This is not a new problem either; not long after the end of the Cold War (De Vestel 1995) 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]De Vestel (1995) 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 (Valasek 2011; Briani 2013). Mawdsley (2018) 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.

3 Theory: Bringing balance to each other's force

3.1 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 (Papayoanou 1997). 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 Ricardo (1817) model of comparative advantage in trading goods based on differences in production costs (Snyder and Diesing 1977; Snyder 1984, 1997; Morrow 1993). 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 (DeVore 2011; Borghard 2014; E. Berman and Lake 2019; R. Powell 2019). 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

[6]Formal military alliances represent one type of alignment, but not all alignments are alliances (Wilkins 2012).

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 Section 3.1.2 on hierarchy.

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 being either markets or hierarchies (Williamson 1975; Perrow 1986) has since realize there are a variety of governance structures that can produce cooperation to different degrees and in different forms (Williamson 1985; W. W. Powell 1990; Heide 1994; Robicheaux and Coleman 1994; Zaheer and Venkatraman 1995). In parallel, there has been a wide body of research on the variation of the design of cooperative security structures in interstate relations (Lake 1996, 1999, 2001; Weber 1997, 2000; Haftendorn, Keohane, and Wallender 1999; Leeds et al. 2002).

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" (Coase 1937) 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 (Morrow 1993; DiGiuseppe and Poast 2016).

[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 (Cowhey and Mueller 2009, 173).

This is easier to achieve when the actors' interests are more closely aligned (Papayoanou 1997) and when there is hierarchy, allowing one actor to dictate the terms of the bargain (Krasner 1991). 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 hierarchy 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 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 (Williamson 1983). 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.[8]

[8]For a division of labor to truly resolve the credible commitment problem, mutual hostage-taking must involve

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.

3.1.1 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 (Yarhi-Milo, Lanoszka, and Cooper 2016). In this situation, states are more likely to have compatible payoff structures regarding actions that should be taken to get the optimal international environment (Axelrod and Keohane 1985).[9]

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 (Axelrod and Keohane 1985; Oye 1985). However, circumstances where 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,

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.

[9] 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 (Gulati, Wohlgezogen, and Zhelyazkov 2012).

as long as each actor retains autonomy over its own decision-making (Gulati, Wohlgezogen, and Zhelyazkov 2012). 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 (Stueck 1997; Kreps 2011; McInnis 2019; Cappella Zielinski and Grauer 2020). 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 (Wolford 2015).[10] 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 (Conybeare and Sandler 1990).

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 (Oye 1985; Thies 2003; Wolford 2014). 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

[10]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 (Morrow 1994; A. Smith 1995; Benson 2012).

result, the US viewed efforts to enhance West Germany's security as being consistent with the enhancement of its own security (Lanoszka 2013). 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 (Keohane 1986). As a result, closely aligned 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 (Curran 2014). 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 (Commonwealth of Australia 1976) 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 (Frühling 2014). As a result, their military is less specialized than that of others in the region.

Hypothesis: 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 (DiGiuseppe and Poast 2016). 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 (Williamson 1983). 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 (Conybeare 1992).[11] 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.

[11] DiGiuseppe and Poast (2016) 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.

3.1.2 Hierarchy

Hierarchy 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 (Zaheer and Venkatraman 1995; Donnelly 2006). I choose the term hierarchy 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 (Lake 1997). While anarchy means that all arrangements about pooling defense efforts are largely self-enforcing, the more hierarchical the arrangement, the more decisions about self-enforcement are controlled by the dominant actor (Jung and Lake 2011).

Hierarchy 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 (Onuf 1989, 2013). While some hierarchical 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 hierarchy nor is its absence indicative of a horizontal relationship (Wendt and Friedheim 1995, p 696).

Hierarchy 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 hierarchy by providing rules of thumb concerning the role each state plays in the relationship (Oye 1985). The dominant state delegates nodes of responsibility 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 (Sugiyama and Sugawara 2017). 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 (Axelrod 1984). By transferring a purely exchange relationship into a power relationship, hierarchy ensures unified command (Galbraith 1977; Gulati and Singh 1998). NATO did this by explicitly linking the stationing of US troops abroad in exchange for countries purchasing US military equipment (Axelrod and Keohane 1985).

Reputational costs matter for cooperation because actors are almost always in mutual overlapping alliances or have an expectation of possible alliances in the future (Gulati and Nohria 1992, p 19). If international cooperation is a game of repeated play, then actors have to demonstrate that they are worthwhile partners (Tomz 2007). Hierarchy increases reputational costs by centralizing decisions about issue linkage and creating precision in how cooperation will happen (Abbott and Snidal 2000; Koremenos, Lipson, and Snidal 2001; Mattes 2012). This reduces the risk of opportunism by creating exit costs to reneging on cooperation (Weber 1997) which also facilitates reciprocity and further cooperation (Gulati 1995; Malhotra and Murnighan 2002; Mellewigt, Madhok, and Weibel 2007). By making reciprocity more likely, we now have a necessary condition for states to believe that mutual cooperation has higher payoffs than mutual defection (Keohane 1986).

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 (Davidson 2011). Smaller states may desire institutionalizing their relationship with more dominant states precisely because that increases their bargaining leverage and creates mutual interdependence (Bosse and Alvarez 2010; Schneider 2011). 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 (Schroeder 2004; Weitsman 2004; Bearce, Flanagan, and Floros 2006).

Hierarchy also reduces the cost of coordination because it improves information processing

(Chandler 1977; Gulati, Wohlgezogen, and Zhelyazkov 2012), ensures actors know what communication is authoritative (Galbraith 1977), and simplifies decision-making (Chandler 1977). "The 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"(Gulati, Wohlgezogen, and Zhelyazkov 2012, 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 (March and Simon 1958). These help minimize communication, simplify decision-making, reduce uncertainty about future tasks, and prevent disputes (Pondy 1977). By reducing the costs of coordination, institutionalization makes the interdependence of tasks easier which, in turn, facilitates a division of labor (Axelrod and Keohane 1985). 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" (Gulati and Singh 1998, p 304).

Hypothesis: States in hierarchical cooperative security alignments should have a higher division of labor than states in non-hierarchical cooperative security alignments.

Hierarchy 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 (M. E. Smith 2013) 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 behavior

and provided mechanisms for the peaceful resolution of disputes" (Cottey 1995, 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.

3.2 Typology of Forms of Governance

From these two variables – interest alignment and hierarchy – we get a simplified typology of different types of interstate security relationships summarized in Figure XX. 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 hierarchy. Empire describes relationships with low interest alignment and high hierarchy. And hierarchy describes relationships with high interest alignment and high vertical integration.

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 (Williamson 1975), scholars have since realized that there are a wide variety of governance structures that accomplish that to different degrees and in different forms (Williamson 1985; Heide 1994; Robicheaux and Coleman 1994; Zaheer and Venkatraman 1995). Much work has been done to explain variation in the design of cooperative governance mechanisms in the

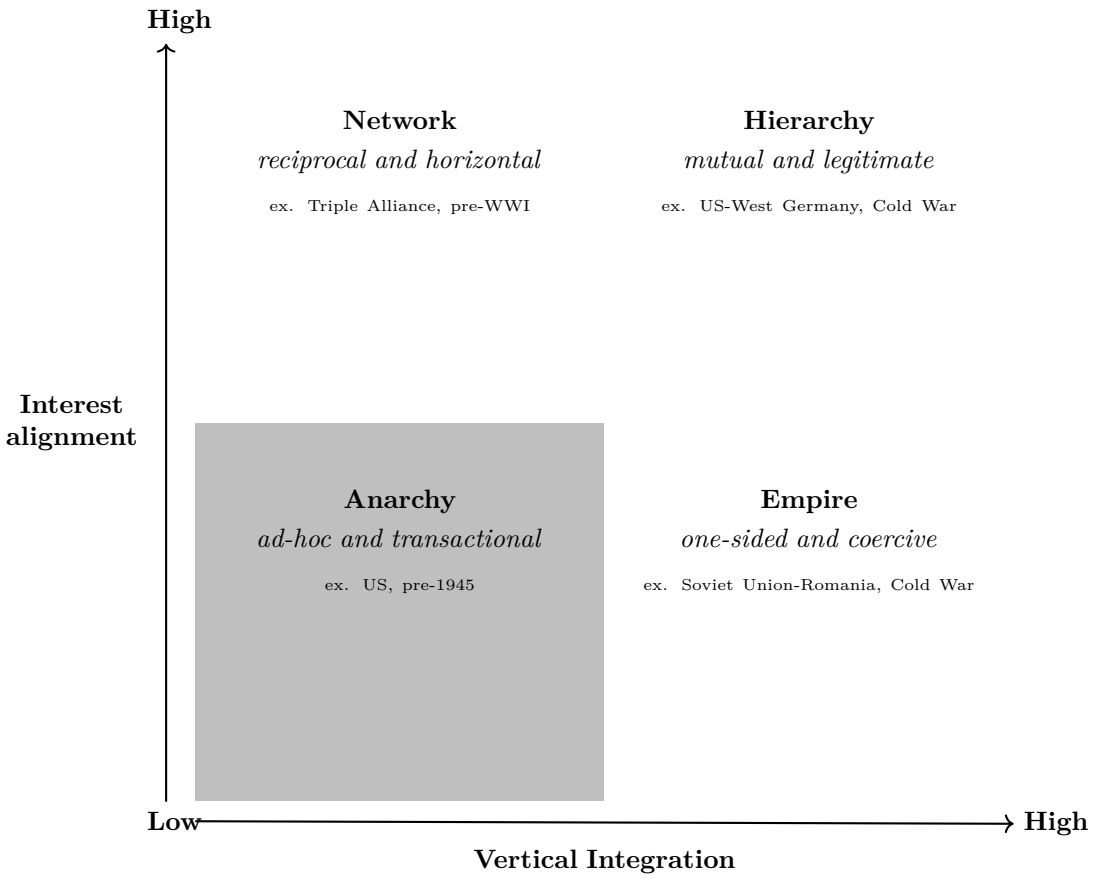

Figure 2: Typology of forms of alliance governance at the interstate relations level of analysis. The shaded area represents the absence of a form of governance. While the axes are, in principle, continuous, they are simplified here to represent four ideal types with relative rather than precise coordinates.

context of international security (Lake 1996, 1999, 2001; Weber 1997, 2000; Haftendorn, Keohane, and Wallender 1999; Leeds et al. 2002; Leeds and Anac 2005; Mattes 2012; Tandon 2012; Kinne 2013; Voeten 2019). 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 XX (Kahler 1995; Lake 1999; Koremenos, Lipson, and Snidal 2001).[12]

[12]For more on varieties of forms of governance, see Dwyer, Schurr, and Oh (1987); Johnston and Lawrence

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 (Dwyer, Schurr, and Oh 1987; Achrol 1991; E. Anderson and Weitz 1992; Morgan and Hunt 1994; Gundlach, Achrol, and Mentzer 1995). 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 hierarchy. In relationships with high interest alignment and low hierarchy (networks), both states specialize to a moderate degree. In relationships with low interest alignment and high hierarchy (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 hierarchy (hierarchies) both states specialize to a high degree. The baseline null case of relationships with low interest alignment and low hierarchy (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 XX.

Anarchy describes the null case where both interest alignment and hierarchy 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

(1988); J. C. Anderson and Narus (1990); Heide and John (1990); W. W. Powell (1990); Achrol (1991); Ring and Van De Ven (1992); and Webster (1992) that differentiate forms of governance based on characteristics like institutionalization, exclusivity, and purpose (Wallander and Keohane 2002).

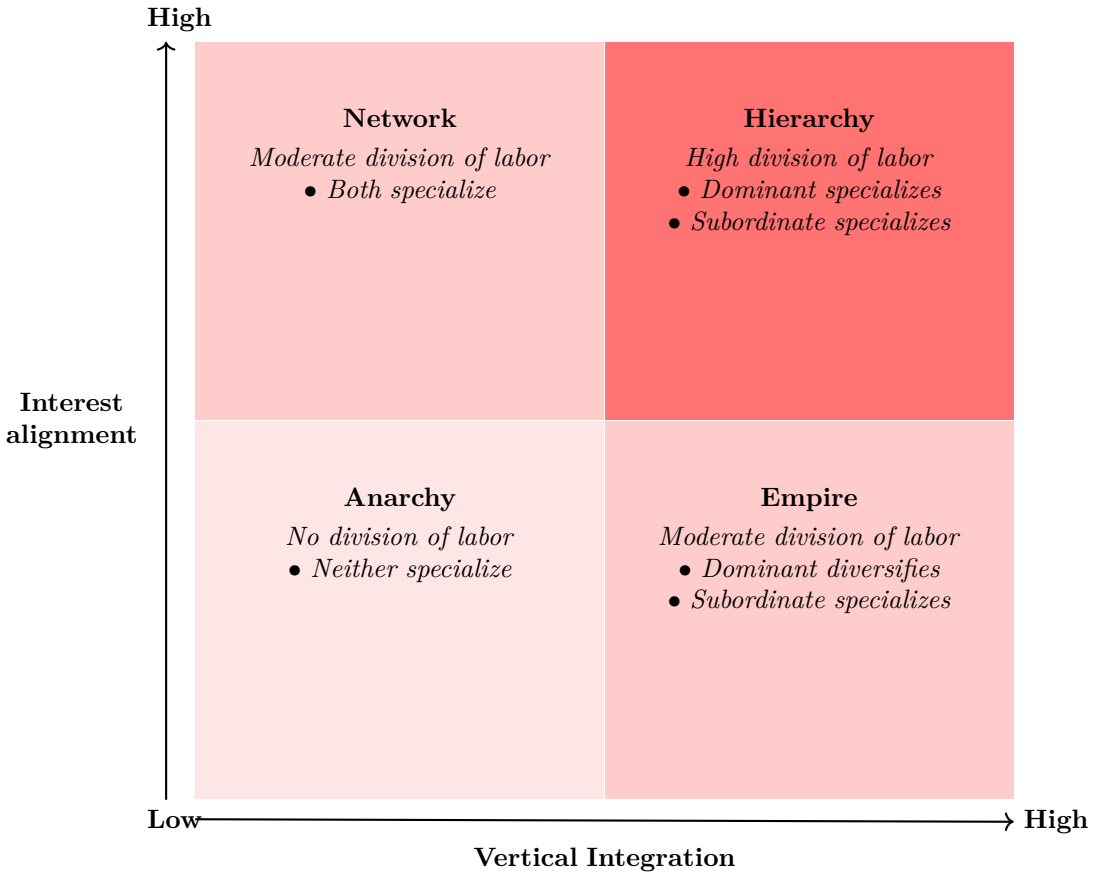

Figure 3: Summary of theoretical predictions. Each quadrant represents an interstate relationship which can be simplified by assuming it is dyadic.

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. W. W. Powell (1990, 302) defined markets as "the paradigm 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 (Podolny and Page 1998; Kahler 2009).[13] Rather, they

[13]Since arms sales are not the dependent variable of interest, I do not devote much time to theorizing them here

are more emblematic of occasional transactions (Zaheer and Venkatraman 1995) or short-term bargaining relationships between autonomous buyers and sellers with limited social relations (Ring and Van De Ven 1992, 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 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 hierarchy in that relationship, the expected costs of opportunism and coordination exceed the expected gains of cooperation (Wendt and Friedheim 1995). 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 (Lake 1997). 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: 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 (Keck and Sikkink 1998, p 8). The horizontal nature of these relationships means that, unlike under hierarchy, control is not located with one actor. Instead, conflict and bargaining are resolved via reciprocity, reputational concerns, and interdependent actor preferences (W. W. Powell 1990, p 295). When states have very similar interests, they can rely on less impositional and hierarchic security arrangements. The Triple Alliance between

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 (Erickson 2018).

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 (Holsti, Hopmann, and Sullivan 1985) but strong mechanisms for enforcing agreements about assistance from allies were absent (Slantchev 2005). These agreements are entirely self-enforced, often through implicit or open-ended contracts that can be informal (Blatter 2003, 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 (Jones, Hesterly, and Borgatti 1997). As a result of all these factors, cooperation on shared tasks comes from social coordination and control rather than authority since the absence of hierarchy 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 hierarchy because interest alignment can foster trust (Meier, Stephenson, and Perkowski 2019). 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 (Williamson 1983, 1993). Furthermore, networks provide a means of resolving information asymmetries and since information is costly (Lake 1996), that can reduce the risk of opportunism and cost of coordination and thus incentivize cooperation (Gulati 1998, 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 (Granovetter 1992; Poast 2010, 2016; Dorff and Ward 2013). 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 (Ring and Van De Ven 1992; Lake 2001). 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: 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 hierarchy 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 (Watson 1992, p 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 (Roeder 2010; Lanoszka 2013) and cooperation was more enforced by resource extraction and control of foreign policy rather than inducing subordination via concessions (Lake 2001, 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 (Holsti, Hopmann, and Sullivan 1985; Lake 2001). 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 (Hobson and Sharman 2005, 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 (Sharman 2013) despite dominant states' desire to avoid them given the costs (Gallagher and Robinson 1953).

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" (Wendt and Friedheim 1995, 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 (Wendt and Friedheim 1995). 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 (Maior and Huluban 2002) noted the effect this had on functional duplication between the Soviet Union and Romania during the Cold War.

Hypothesis: 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 hierarchy. Although definitions of the concept in international relations abound, I here conceive of hierarchy nar-

rowly as a relationship of legitimate authority (Mattern and Zarakol 2016, p 625-626) where the dominant actor can "command legitimately certain actions between the members of the organization" (Jung and Lake 2011, p 973).[14] Its similarity to empire concerns the presence of high hierarchy between the actors involved. But it is not just about vertical actor-differentiation. Rather, hierarchy 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 (Lake 1999; Ikenberry 2001). 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 (Lanoszka 2013), but here the prominence of coercion and domination is not a feature of hierarchy but rather what distinguishes different types of hierarchical forms of governance (Mattern and Zarakol 2016, 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 (Keohane 1984). Cold War NATO and the Warsaw Pact, respectively, are illustrative examples of each case with resulting variations in the degree of security cooperation (Ikenberry and Kupchan 1990). 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 (Axelrod and Keohane 1985). Of course, hierarchical relationships with high interest alignment are not government exclusively by authority (Lake 2003); coercive forms of control are still present in hierarchies since there are often mixed motivations for compliance (Hobson and Sharman 2005, p 68). But the presence of coercion is not their defining feature.

[14]This is a well-established interpretation of hierarchy (Keohane 1984; Lake 1996, 1999, 2009; Kang 2010; Bukovansky et al. 2012). For more that think about hierarchy this way, see (Mattern and Zarakol 2016, p 627-628). For differing conceptions of hierarchy that focus on criteria like organized inequality, see (Cooley 2005; Nexon and Wright 2007).

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 (Blau 1963; Lake 1999). 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 (Keohane 1984; Lake 1999). 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 hands and limiting their ability to exercise coercive control by consciously adopting a sub-optimal military configuration (Ikenberry 2001). 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 (Wolf 1994).

Second, the distinguishing feature of hierarchy is the willingness to give up sovereignty, not the presence of domination, coercion, or power asymmetry (Gulati and Westphal 1999). 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" (Keohane 1984). 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 (Pfeffer and Nowak 1976). Instead, there must be a mutual understanding that the states have different security responsibilities in the security

alignment stemming from their different bargaining positions (Mattern and Zarakol 2016).

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 (Ward and Dorussen 2016). Strong countries in these relationships hope that the alignment can prevent opportunism on the part of the weaker county (Lake 1999). 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 (van de Ven 1976; Williamson 1985, 1991). 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 (Weitsman 2004; G. P. R. Wallace 2008).

Existing theories of hierarchy have noted anecdotal evidence of this in NATO with the United States specializing in naval capabilities and nuclear weapons (Lunn 1983) and European allies doing more land forces and tactical air power (Kaplan 1988, p 39). Lake (2001, 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 (Harrison 1993). 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 (Risse-Kappen 1995).

Hypothesis: 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 'hierarchy' 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 (W. W. Powell 1990; Ronfeldt 1996). 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 hierarchy 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. (Waltz 1979, p 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 (Harrison 2011). 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 hierarchy with interest alignment (hierarchy) from those with hierarchy 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 hierarchy.[15] Wendt and Friedheim (1995, 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 Wendt and Friedheim (1995) make a brief distinction between (non-hierarchical) allies

[15]For a more thorough discussion of these distinctions, see Wendt and Friedheim (1995), Lake (1996), and Lanoszka (2013).

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 hierarchy interacts with mutual interests such that there are hierarchical relationships with mutual interests that are excluded from their definition of allies. When there is hierarchy 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 hierarchy 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 hierarchy can reduce the expected cost of opportunism inherently present in interstate security cooperation.

4 Empirics

4.1 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 (Gorelick et al. 2004). 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 (Gorelick and Bertram 2007). I assume that

these technologies could at least in theory be allocated to the defense of other allied states.[16] A stylized representation of variation in division of labor is represented in Figure XX. 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 between different types of groups as motivated by the theory.[17]

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 (Bolnick et al. 2002). 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 (Zaccarelli, Bolnick, and Mancinelli 2013). 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

[16] 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.

[17] 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 (Warren 2010; Cranmer, Desmarais, and Kirkland 2012; Poast 2016).

associated with high dyad dissimilarity since it means your partner possesses capabilities you do not and visa versa. Figure XX 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.[18]

Insert DV distribution figure

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 (Markowitz 2020, p 76-78). For example, Thule Air Base houses the US Ballistic Missile Early Warning

[18]This measure and similar measures were initially developed as an ecological index to compare biodiversity across different sites. See Bolnick et al. (2002), Jeanson, Kukuk, and Fewell (2005), Jeanson et al. (2007), Dornhaus (2008), Dormann et al. (2009), Zaccarelli, Bolnick, and Mancinelli (2013), Leroy, Le Viol, and Pétillon (2014), and Holbrook, Wright, and Pruitt (2014).

System (BMEWS), yet winter access to the base by sea is provided entirely by Canada's icebreaking fleet (Cross 2019). 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" (Avey 2019). These capabilities thus complement the technological omission of the United States.

4.2 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 (Leeds et al. 2002) and data on defense cooperation agreements comes from the DCA data set (Kinne 2020). 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 hierarchy. 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 (Bailey, Strezhnev,

and Voeten 2017; Bailey and Voeten 2018). 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 (Gartzke 1998; Ward and Dorussen 2016; Bak 2018; Gannon and Kent 2021).

Hierarchy is operationalized using a measure of alliance institutionalization developed by (Leeds and Anac 2005). 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 Hierarchy 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 (Benson and Clinton 2016; Gannon and Kent 2021). 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 (Benson and Clinton 2016).

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 XX with the predictions outlined in Figure XX. Dyads with high interest alignment and high hierarchy (hierarchy) should have the highest division of labor. Dyads with high interest alignment and low hierarchy (network) as well as those with low interest alignment and high hierarchy (empire) should have a moderate division of labor. Lastly, dyads with low interest alignment and low hierarchy (anarchy) should have the lowest division of labor.

The models include control variables for geography, economic capacity, and the threat environ-

ment 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 (Joyce and Braithwaite 2013; Bak 2018). The model also controls for differences in the GDP between two states, as economic considerations impact weapons procurement decisions (Diehl 1994; Caverley 2014). 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 (Hartley and Russett 1992; Fordham and Walker 2005). Separating a state's assessment of the threat environment from its alliance relationships is a challenging, almost impossible empirical endeavor (Leeds 2003; Castillo and Downes 2020). Nonetheless, one can cautiously proxy for a state's assessment of the salience of its international threat environment with military spending (M. D. Wallace 1979; Fordham 2004). 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.

4.3 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 (Leeds et al. 2002; Kinne 2020).

Table XX 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 hierarchy 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 hierarchy 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 (Carter and Signorino 2010). Model 5 includes an interaction term between the two independent variables – interest alignment and hierarchy. The interaction term is not statistically significant, suggesting that the effect of interest alignment does not vary based on the degree of hierarchy (nor the inverse).

Insert model results

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 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 (Signorino and Ritter 1999; Leeds and Anac 2005) and joint alliances, operationalize hierarchy as signaled support from major powers (McManus and Nieman 2019), and including alternate measures of geography like distance (Weidmann, Kuse, and Gleditsch 2010).

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

Insert effects plot

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 hierarchy, a shift from low hierarchy to high hierarchy 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 (Szayna 2001; Wolosz 2004). 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.)" (Burton 2018, p 38).

4.4 Discussion

NATO expansion provides an illustrative example.[19] 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 (Szayna 2001). Albania and Georgia were similar in many respects like GDP, military spending, geographic size, and coastline.

Figure XX 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.

[19] For a more detailed account of the NATO expansion and Former Soviet Union and Warsaw Pact cases, see (Gannon 2021).

Insert Albania Georgia DoL with US and 2004 and 2014 world share

The difference in their respective divisions of labor with the United States can be attributed to Albania's decision to specialize their military while Georgia opted for a more conventional (small) full-spectrum force. Figure XX shows Albania and Georgia'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 XX shows how that changed a decade later. Albania specialized in naval patrol vessels with a range that allowed them to patrol as far as Portugal, despite their own coastline being only 225 miles (Polak, Hendrickson, and Garrett 2009). 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" (Government of the Republic of Albania 2004).

Georgia, on the other hand, had received only weak promises of support from NATO in the lead up to the 2008 war with Russia (Lanoszka 2017). 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 (Merabishvili and Kiss 2016). Georgian President Saakashvili remarks that "NATO will not help us in this" ("Russian Agencies: Saakashvili Says Threat of War Remains" 2008) occurred a month after US ambassador John Tefft told Saakashvili that "Tbilisi, if it acted, would stand alone" (Asmus 2010, 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 (Lanoszka 2020; Shifrinson 2020) to how NATO membership shapes the form of Russian aggression (Gannon et al. 2023). 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.

5 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 (Mattes 2012). Dominant states want to free ride on their smaller partners, but cannot because they have more at stake and thus end up over-providing (Olson and Zeckhauser 1966). 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 (Yarbrough and Yarbrough 2016). 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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