Alliance Participation and Military Spending

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Abstract

How does alliance participation change military spending? Previous answers to this question are divided between assertions alliance participation increases or decreases military spending. I argue alliance participation can raise or lower growth in military expenditures, depending on treaty strength and state size. Greater treaty strength reduces growth in major power military spending because major powers gain more international influence. Strong treaties increase growth in non-major power military expenditures because these treaties constrain their freedom of action. I test this argument by creating a measure of alliance treaty strength and employing that measure in a multilevel model. The research design generates novel empirical evidence linking alliance participation and growth in state military spending from 1816 to 2007. I find that greater treaty strength increases growth in military spending in non-major powers and decreases spending growth for major powers. These results help scholars and policymakers understand the implications of alliance treaty design for defense spending.

1 Introduction

Scholars of international relations have long acknowledged two ways for states to increase their security. States can invest in military capability or form alliances (Morgenthau, 1948). Because both policies provide security, broadly defined, alliance participation should change how states invest in military capability. But how alliances impact military spending is unclear.

Scholarship is divided between competing predictions and evidence on the question of alliance participation and military spending. The force multiplier perspective expects alliance participation will reduce military spending (Morrow, 1993; Conybeare, 1994; DiGiuseppe and Poast, 2016). The foreign entanglement group predicts alliance participants will spend more on defense (Diehl, 1994; Morgan and Palmer, 2006). This paper addresses this theoretical and empirical division, clarifying when alliance participation leads to more or less defense spending. Addressing the academic divide has important consequences for policy.

Whether alliance participation increases or decreases defense spending is at the core of a contentious debate in US foreign policy. US policymakers from Eisenhower to Trump have complained that allies spend too little on defense. Possible solutions to this problem include further verbal pressure, issue linkages, or leaving the treaty entirely. But debates over deficient allied military spending lack a general understanding of alliance participation and military spending. Without such guidance, policy interventions are more likely to fail or have unintended consequences. This paper will help place military spending by US allies in theoretical and empirical context.

I argue that whether alliance treaty participation increases or decreases military spending depends on state capability and alliance treaty strength. A strong formal treaty adds additional depth and scope to the basic promises of military support. Changing treaty strength changes how alliance participation impacts military spending. Because major and non-major power states use alliances and military spending for different purposes, the way treaty strength alters the impact of alliance participation varies with state capability.

Major powers use alliances to increase their influence— shaping international relations to match their interests. In general, alliance participation will increase growth in military spending for these states. Stronger formal treaties provide extra influence, reducing growth in major power military expenditures from alliance participation. Weak treaties require higher growth in major power spending to realize equivalent influence.

Non-major powers use alliances to ensure their territorial security. Given the chance, these states will rely on their allies for security, so alliance participation will often reduce growth in military spending. Increasing treaty strength provides more security, but at the cost of freedom to reduce military spending. Thus, greater treaty strength will increase growth in non-major power military spending. Weaker treaties provide security without tying military support to other costly commitments, providing the opportunity to reduce growth in military spending.

I employ a novel research design to test these predictions, which generates novel and comprehensive empirical evidence. First I develop a latent measure of alliance treaty strength. I then

incorporate that measure into a multilevel model which estimates how specific alliance treaty characteristics and whole treaties impact growth in military spending. I find that increasing treaty strength raises growth in non-major power military spending, and lowers growth in major power military spending.

These findings have important implications. How alliances shift growth in military spending has distributional consequences in domestic and international politics. In domestic politics, growth in military spending has opportunity costs— funds spent on security cannot be spent on other goods. Greater military spending impacts economic growth (Shin and Ward, 1999; Alptekin and Levine, 2012) and domestic politics (Narizny, 2003; Whitten and Williams, 2011; Williams, 2015). So alliances can shape domestic prosperity by shifting growth in military spending.

In international politics, states bargain over distributing the costs and benefits of alliance participation. Greater growth in military spending for some states and lower growth for others shifts the burden from maintaining the treaty. Alliance formation and maintenance generate substantial tradeoffs for alliance participants.

My argument and findings indicate major and minor powers face different tradeoffs in alliance politics, however. Strong commitments give major powers more influence but lead to greater entanglement abroad. For non-major powers, strong treaties provide more security at the cost of freedom to reduce military spending. These tradeoffs shape treaty formation and maintenance, modifying the impact of alliance participation on military expenditures.

The paper proceeds as follows. First, I summarize competing arguments and mixed empirical evidence on alliance participation and military spending. Then I describe my state capability and treaty strength argument in more detail. The third and fourth sections present the research design and results. I then briefly apply the argument to understand how NATO treaty design has shaped military spending by the US and its allies. The final section concludes with a discussion of the results and implications for scholarship and policy.

2 Force Multiplier or Foreign Entanglement?

Alliances and military spending are closely connected in international relations theory. Both policies are a source of military power— states use arms and alliances to address their security concerns (Morrow, 1993). But how alliances impact defense spending is the subject of ongoing debate.

Scholarship on alliance participation and military spending is divided between two perspectives. The foreign entanglement view predicts alliance participation will increase military expenditures. The force multiplier school expects alliance participation will reduce military spending. In the next section, I summarize substitution and public goods logic connecting alliance participation with reduced defense spending.

2.1 Force Multiplier

All force multiplier arguments start with the premise alliances and military spending both provide security. Substitution arguments recognize that states can employ one policy in place of the other (Most and Starr, 1989). Alliances provide security that states could not achieve without additional military spending (Morrow, 1993; Conybeare, 1994). Given extra security from a treaty, states can rely on their allies and and reallocate military spending to other goods.

Essentially, allied military capability replaces defense expenditure for member states. DiGiuseppe and Poast (2016) refine the substitution logic by arguing that states will only reduce spending if the alliance is credible. Because democracies make more credible commitments, DiGiuseppe and Poast assert defense pacts with democracies will lead to lower defense spending. A difference force multiplier argument treats security from an alliance as a public good.

Olson and Zeckhauser (1966) argue alliances are subject to a collective action problem. Because alliance security is neither rivalrous nor excludable, members provide inadequate contributions of military spending. Each member free-rides on their partners, and smaller members exploit

larger states. Spending less allows alliance members to consume more non-defense goods, but the alliance provides suboptimal security.

Both the substitution and public goods models expect alliance participation will reduce spending. The common thread between these arguments is the opportunity costs of military spending. Because spending more on the military leaves less for other goods, states have incentives to rely on their allies for security. But the foreign entanglement group predicts alliance participation increases military expenditures, because alliances provide more than security.

2.2 Foreign Entanglement

The foreign entanglement perspective is less cohesive. Most scholars emphasize non-security benefits of alliance participation. In these arguments, extra military spending secures additional foreign policy gains from alliance participation.

Diehl (1994) argues that alliances increase foreign policy obligations, necessitating extra military spending. Because alliances expand what a state can achieve in international relations, states will increase military spending to pursue other foreign policy goals (Morgan and Palmer, 2006). Horowitz, Poast and Stam (2017) show that buffer states increase defense effort to make themselves a more attractive alliance partner, which is a more security-focused argument. Others assert that alliances generate cooperation, leading to higher defense spending (Palmer, 1990; Quiroz Flores, 2011). [1]

Alliances do more than provide security, so these arguments contain a crucial insight. However, neither perspective addresses the key insight of the other. Foreign entanglement arguments ignore the opportunity costs of military spending. Using extra military spending to secure foreign policy gains is costly.

Likewise, the force multiplier perspective does not acknowledge how military spending can

[1] Senese and Vasquez (2008) assert military spending and alliances are part of a conflict spiral that produces simultaneous growth in military expenditures and alliance participation. This argument suggests that any correlation between alliances and military spending is driven by conflict behavior, not treaty participation.

support alliances. As a result, the two perspectives have too little in common. This divergence carries over into empirical tests.

2.3 Mixed Evidence

The force multiplier or foreign entanglement dispute could be settled by a preponderance of evidence for one prediction. Unfortunately, the divided state of theory is reinforced by mixed empirical results.[2] Some studies find a positive association between alliance participation and military spending. Others find a negative relationship. These findings come from a wide range of research designs.

I divide the methodologies and samples in previous research into specific and general research designs. Specific studies examine the impact of a few alliances, usually by tracking how a state responds to the military spending of a key ally. General studies compare many states through dummy indicators of alliance participation. Each design has different virtues and shortcomings.

Specific designs provide more detail on the characteristics of individual treaties, but lack generalizability. Most support for force multiplier arguments comes from specific designs (Barnett and Levy, 1991; Morrow, 1993; Sorokin, 1994; Plümper and Neumayer, 2015). But other specific studies find increased spending by alliance members (Conybeare and Sandler, 1990; Chen, Feng and Masroori, 1996). General research designs also produce mixed findings.

General studies capture a wide range of state-year observations and compare states with an alliance to those without. Dummy indicators of alliance participation in a general study combine diverse treaties in a state-level measure. These coarse measures omit crucial differences between treaties, but give a broader picture than specific studies. Table 1 summarizes previous results from general models of alliance participation and military spending. There are two negative, four positive and two null estimates of the correlation between alliance participation and spending.

[2]Because tests of the public goods model regress military spending as a share of GDP on GDP, I ignore most tests of that theory while summarizing prior results. That research design suffers from an identification problem.

	Decrease	Increase	Null
Most and Siverson (1987)			X
Conybeare (1994)	X		
Diehl (1994)		X	
Goldsmith (2003)			X
Morgan and Palmer (2006)		X	
Quiroz Flores (2011)		X	
DiGiuseppe and Poast (2016)	X		
Horowitz, Poast and Stam (2017)		X	

Table 1: General Findings of Association Between Alliance Participation and Military Spending.

Mixed results in specific and general studies are the result of inadequate attention to differences between alliance treaties and participants. There is substantial heterogeneity among alliances. Treaties vary in their obligations, membership, and capability. Alliance heterogeneity makes it difficult to infer general relationships from specific studies, and undermines binary measures of alliance participation in general studies.

Moreover, alliance members have different goals and constraints depending on their military capability. Some states have extensive foreign policy ambitions, while others focus on defending their territory. The opportunity costs of military spending also vary across states. Therefore, the same alliance could have distinct effects on more or less capable members. I incorporate alliance heterogeneity and differences in member capability to explain how alliance participation is associated with military spending. I argue formal treaty strength changes the consequences of alliance participation for major and non-major powers.

3 Argument

My argument predicts growth in military spending. Annual growth in spending is equal to changes in spending as a share of the previous year's budget. So growth in military expenditures

is calculated as:

$$\text{Growth Mil. Expend} = \frac{\text{Change Mil. Expend}_t}{\text{Mil. Expend}_{t-1}} \tag{1}$$

Growth in spending is an appropriate quantity of interest. By benchmarking changes in spending to previous expenditures, I incorporate the likely opportunity costs of annual spending changes for that state. Defense budgets are subject to a "ratchet effect" Zielinski, Fordham and Schilde (2017), so increases in spending are rarely undone by corresponding cuts. Especially for major powers, levels of military spending tend to rise over time. Theorizing about growth in spending provides clarity about the implications of alliance participation— how much more or less would a state have changed their defense budget in the absence of a given treaty?

Predicting growth in spending changes the implications of my argument and empirical findings. If a variable is positively or negatively associated with growth in spending, it may only change the level of military spending in a counterfactual sense. For example, lower spending growth does not imply falling levels of defense expenditures. Only negative growth in spending reduces the level of military expenditures. If a variable reduces growth, but the overall the level of growth remains positive, the level of military spending will still rise.

Similarly, increasing expenditure growth does not indicate larger defense budgets. Only positive growth in spending increases the level of military expenditures. When increasing growth in military spending starts from a negative baseline, the level of spending may still fall.

My argument applies to the level of military spending through counterfactual reasoning (Fearon, 1991). Decreasing military spending growth means a state would have spent more in the absence of a particular alliance, all else equal. Increasing growth implies a state would have spent less on the military, all else equal.

For example, I claim that increasing treaty strength lowers growth in military spending for major powers. This does not imply strong treaties lead to reduced defense budgets. Major powers rarely lower the level of defense spending. Rather, a weaker treaty would have led to higher defense

expenditures through higher spending growth.

The argument proceeds as follows. First, I describe key characteristics of states and the actions they take for foreign policy gain. Then I describe a general framework to understand alliances and summarize the sources and implications of alliance treaty strength. Last I connect alliance formation and maintenance to growth in military spending for major and non-major powers, and detail the consequences of differences in treaty strength.

3.1 States and Alliances

My argument focuses on the behavior of states. I assume states value both domestic consumption and foreign policy goods (Powell, 1993; Fearon, 2018). The two major foreign policy goods are security and influence.

Security is the freedom to hold territory and consume wealth as a state sees fit. Influence is the ability of a state to shape international relations in beneficial ways. While security is essential, influence more of a luxury. To secure these foreign policy goods, states can increase their military capability through military spending or join alliances. Alliances and military spending have different costs.

I assume growth in military spending has opportunity costs— funds spent on the military cannot be used for other goods. Greater military spending reduces domestic consumption (Fearon, 2018). These opportunity costs are decreasing in state size, however.

Larger states have a lower tax price of spending, and benefit from economies of scale. As the number of taxpayers falls, the marginal cost per taxpayer of an increase in military spending rises (Dudley and Montmarquette, 1981). This greater tax price reduces demand for military spending. For economies of scale, producing more defense goods lowers the cost of additional units (Moravcsik, 1991; Alesina and Spolaore, 2006). Thus, larger and more capable states have lower opportunity costs of military spending.

I also assume alliances are a costly signal of shared foreign policy interests. Alliances promise

military support in the event of conflict. The formal hands-tying signal in a treaty generates a credible commitment to intervene (Fearon, 1997; Leeds, 2003*b*). Alliance members give up some freedom of action and provide other goods in exchange for foreign policy benefits.

Therefore, alliances are an exchange. Alliance members can participate in symmetric or asymmetric exchanges Morrow (1991). In a symmetric treaty, both members receive security or influence. In an asymmetric exchange, members receive different goods.

Alliance participation includes formation and maintenance (Snyder, 1997). During formation, prospective members determine what arrangement will provide the foreign policy benefits they seek at an acceptable cost. Formation produces the initial foreign policy gains and restraints on freedom of action.

After a treaty forms, members must maintain the institution in the face of a time inconsistency problem. Alliance formation reflects shared foreign policy interests, but interests change over time. Diverging interests increase the risk of opportunistic behavior by allies (Leeds, 2003*a*; Leeds and Savun, 2007) The time inconsistency problem generates demand for reassurance that members are committed to upholding their promises.

Reassurance requires additional costly signals. Maintaining or increasing military spending, aid, or cooperation on other issues are all costly signals of commitment. Bearing these costs indicates ongoing commitment to the treaty. On the other hand, failure to invest in the treaty undermines the alliance.

Alliance formation and maintenance are costly, so members must bargain over the distribution of costs and benefits. States design alliance treaties to address this distributional problem and potential opportunistic behavior. Therefore, observed treaty content reflects a mutually acceptable division of benefits and costs. Alliances are essentially a contract— states design alliance treaties to addresses opportunism and distributional problems (Williamson, 1985; Koremenos, Lipson and Snidal, 2001) so members can realize gains from exchange (Lake, 1996; Benson, Meirowitz and Ramsay, 2014).

In specifying an alliance contract, states can make a wide range of formal promises. Design choices impose costs on members and shape the benefits they receive. Because states form treaties they intend to honor, treaty content provides information to members and potential adversaries (Leeds, 2003*b*). Members and adversaries can use formal promises to predict if a treaty will be honored.

When a treaty contains many costly promises, observers can infer the commitment is more credible. Additional credibility is valuable, because not all alliances are equally credible (Benson, 2012). The formal strength of commitment is therefore a crucial difference between treaties.[3]

Changes in treaty strength alter the consequences of alliance participation for growth in military spending among member states. I argue that alliance treaties will have heterogeneous effects on military expenditures and that treaty strength is a key source of those differences. Membership in a strong treaty has different consequences for military spending than membership in a weak treaty.

3.2 Treaty Strength

If strength is so important, what determines the formal strength of an alliance treaty? Strong commitments stipulate deep and costly cooperation among members. Allies incur higher costs from forming a strong treaty and risk more consequences from breaking it.

By contrast, weak treaties contain few deep and costly promises. These alliances still provide useful promises of military support, but they represent the minimum possible commitment. Stronger treaties add more potential and sunk costs commitments.

Potential treaty costs depend on the kind of support promised. Commitments to fight expose states to the risk of bearing the costs of war on behalf of their ally. If the alliance is invoked, fighting is costly, but so is violating the treaty. Backing out of a promise to fight has audience (Levy et al., 2015) and reputation costs (Gibler, 2008; Crescenzi et al., 2012; Mattes, 2012).

Unconditional promises of military support increase the potential costs of an alliance. An un-

[3] I use treaty strength as shorthand for the costliness and depth of formal promises in an alliance treaty.

conditional commitment promises intervention no matter how or where the conflict began. Placing no conditions on intervention further strengthens military support commitments , but it creates other issues. Once a treaty is invoked, unlimited promises of support can either be violated or honored— there is no way to disavow the obligation. This can expose states either to entrapment in unwanted conflicts (Snyder, 1990; Benson, 2012), or the costs of violation. Providing military support and placing few conditions on that support increase the potential costs of an alliance.

Unlike the potential costs of treaty participation, sunk costs apply whether or not military support is invoked. States incur these costs during treaty formation and often continue to bear them to maintain the alliance. One sunk cost applies to all treaties— backing one state precludes alliances with potential antagonists (Snyder, 1997). Other sunk cost promises include aid, economic concessions, integrated military command, basing rights, international organization formation and concluding other agreements.

All of these commitments add depth to the alliance by expanding ties among partners. Sunk cost promises create a web of additional obligations which reinforce the core promise of military support. Bearing sunk costs increases the credibility of commitments to intervene in a conflict. For example, granting economic concessions shows a state is willing to bear costs to perpetuate an alliance (Wolford and Kim, 2017).

Higher sunk costs and potentially costly promises of support make strong formal treaties more credible. That credibility produces more foreign policy benefits for members. But foreign policy gains come at the cost of reduced freedom of action.

Greater treaty credibility is the result of states limiting their ability to behave opportunistically. In a credible treaty, there is less doubt a state will honor its alliance commitments, which implies that partners have ruled out other potential actions. Restricting the set of possible choices and making some actions more costly reduces alliance members' freedom of action. For example, forming an alliance makes nonintervention more costly, rules out alternative treaties and requires coordination among members (Snyder, 1997).

All states face a tradeoff between treaty credibility and freedom of action. The promises that make a treaty more credible also constrain alliance participants. Treaty designs reflect this tradeoff. Greater treaty reflects a willingness to accept lost freedom of action for greater freedom of action. The implications of this tradeoff for growth in military spending depend on state capability.

State capability shapes which foreign policy goods states pursue. Less capable states focus on territorial security through military spending and alliances. More capable states use alliances and military spending to expand their influence in international relations. While many states focus on immediate security, others invest in extra capability to pursue more ambitious foreign policy goals (Fordham, 2011; Markowitz and Fariss, 2017).

3.3 Major Powers

Major powers are the most capable actors in the international system. These states have a wider range of foreign policy interests than other states due to their economic ties, size, and ability to pursue a wide range of issues. Given their capability and interests, major powers pursue goals beyond their immediate security. Major powers seek influence— reshaping international relations to match their interests by changing the behavior of other states.

Influence comes from changing the expected outcome of conflicts between other states. Altering the value of international conflict, shifts how major power proteges and adversaries behave. How much influence a major power has depends on how likely they are to intervene and their military capabilities. Expressed as an abstract equation, influence is a product of the probability of intervention and capability: Influence $=$ Change War Outcome $=$ Probability Intervention $\times$ Capability.

Military spending and alliances both provide influence. Alliances increase the probability of intervention. Military spending adds capability, making a potential intervention more effective.

Major powers are willing to increase alliances and military spending simultaneously due to their lower opportunity cost of defense spending. Greater economic size and capability reduces

the tax price of spending and generates economies of scale. As a result, major powers have the capacity to expand their defense budget in pursuit of influence.

In general, major powers will use a mix of military spending and alliances to increase their influence. Additional military spending supports alliance commitments, while alliances make promises to use that capability more credible. For major powers, alliances and military spending complement each other. Therefore, major power alliance participation will often lead to increasing growth in spending.

Supporting an alliance by growing military spending is worthwhile because treaties give influence through exchange. Major powers provide military support in exchange for influence over their partner. This exchange is obvious in asymmetric treaties between major and non-major powers (Morrow, 1993). In return for protection, junior partners surrender some autonomy (Lake, 2009).

Symmetric alliances with other major powers are also a source of influence through exchange. The most capable states can lose territory in war, but defeat is rarely an existential threat (Fazal, 2011). Major power partners in symmetric treaties secure their territory, but these treaties are more focused on reshaping international relations.

Alliances between major powers clarify otherwise implicit alignments, giving partners greater leverage. Clarifying alignment defines potential spheres of influence and creates expectations of support on other issues (Snyder, 1997). In exchange for military support, states settle outstanding issues, or promise support elsewhere. Major power alliances often delineate territorial or colonial divisions Langer (1950); Kissinger (1994). For example, the 1904 Entente Cordiale between France and Britain included "a systematic effort to settle all outstanding colonial issues" (Kissinger, 1994, pg. 189).

These symmetric and asymmetric treaties are costly. After major powers form an alliance, influence comes at the cost of greater involvement abroad. Engagement with other states is needed to manage alliance partners and maintain commitments. These "foreign entanglements" build in-

fluence but constrain freedom of action. Major powers can address this tradeoff between influence and entanglement in alliance treaty design.

Major powers balance entanglement and influence by adjusting the depth of their formal commitments. Strong alliance treaties increase both influence and entanglement. A strong formal commitment is more credible, but also stipulates deeper engagement abroad. Less credible treaties are more "arms length," which allows major powers to retain more freedom of action.

When major powers prioritize influence through alliances, they will make stronger formal commitments. But when they fear entanglement abroad, they will form weaker formal treaties. Once a treaty forms, the depth of a formal commitment alters how major powers maintain the alliance.

Alliance maintenance by major powers must address fear of abandonment and distorted incentives in junior partners. Because major powers provide large amounts of capability, abandonment has huge consequences for partners. Imagine if the US failed to uphold its alliance with Lithuania after a Russia attack, for example. Thus, partners will often seek assurances the major power will not abrogate the treaty.

Growing military spending is one way for major powers to reassure their allies— it signals they have the capability to meet their commitments. Opportunity costs make ongoing investments in military capability a credible signal of commitment, but these investments distort allied incentives (Lake, 1996, 2009). Given the opportunity, allied states can reduce military spending and rely on more capable partners for protection. Lower allied defense expenditures leaves major powers to bear a greater burden if war breaks out.

The tension between reassurance and distorted incentives generates a challenge for major powers— they must reassure their allies without bearing overwhelming costs. Too much reassurance allows partners to reduce defense expenditures, placing more of the burden of providing capability on major powers. Inadequate reassurance leads allies to question the credibility of the alliance itself, jeopardizing influence. There are other ways major powers can reassure their allies, or check distorted incentives.

Threatening to abandon the treaty entirely is a possible check on reduced defense spending by allied states. But so long as influence from a treaty outweighs the costs of maintaining it, major powers cannot credibly threaten to abandon free-riding allies. Abandonment is only credible when foreign policy interests have changed dramatically, or the costs of maintaining a treaty are astronomical.

If abandonment rarely provides leverage in alliance bargaining, how else can major powers reassure their allies without bearing excessive costs? Adding depth to a treaty provides other ways to maintain a treaty. Sunk costs provisions make a treaty more credible and provide ongoing reassurance. Forming a strong alliance with multiple costly promises then gives major powers more leverage over partners. Instead of threatening to abandon the treaty, they can bargain using sunk costs promises.

Major powers can condition maintaining aid, economic agreements or integrated military command on adequate defense effort. This kind of bargaining establishes issue linkages between treaty commitments and allied contributions. Such issue linkages are viable because most sunk costs promises entail ongoing commitments, not one-shot infusions. Failing to make promised payments imposes costs on allies without destroying the treaty. Providing side-payments and bundling them with military support can also offset the costs of greater defense effort for allies.

A strong formal treaty with costly promises of military support and sunk costs commitments is therefore a greater source of influence. Extra credibility gives major powers influence without requiring additional growth in military expenditures. Weaker treaties require more spending to reach the same level of influence. While maintaining a treaty, major powers can bargain more effectively under a strong treaty, reducing the ability of allies to lower defense spending.

Greater treaty strength substitutes for growth in major power military spending. Britain's alliances in the Middle East after World War II illustrate how major powers can offer strong treaties as a substitute for extra military capability. After World War II, the UK faced acute economic challenges while attempting to maintain their influence in the Middle East. "In securing a victorious

outcome to the war, the British had severely overstrained themselves" (Kennedy, 1987, pg. 367). To finance the war London "liquidated over £1 billion of overseas investments and at the same time had brought the general foreign debt to more than £3 billion" (Louis, 1984, pg. 12).

Even so, the UK attempted to maintain an expansive foreign policy (Mayhew, 1950), especially in the Middle East (Rahman, 1982). But even the burdens of existing troop deployments were onerous. Winston Churchill attacked the Labour government because "nearly 100,000 British soldiers had been kept in Palestine, and £30,000,000 or £40,000,000 a year of our hard-earned money had been cast away there." [4] Therefore, the government was unwilling " to endorse political or economic settlements that might have required British bayonets" (Louis, 1984, pg. 15).

Because economic factors constrained military spending, the UK looked for alternative ways to uphold their influence (Monroe, 1963; Louis, 1984) London created strong alliances with Jordan (ATOPID 3125), Libya (ATOPID 3235) and Iraq (ATOPID 3280).[5] In return for basing rights, Britain promised aid, committed to defense consultations, and promised to resolve disputes through the International Court of Justice (Leeds et al., 2002). Before World War II, London had exerted influence through a preponderance of capability (Monroe, 1963). After World War II, the UK used strong alliance treaties to maintain influence in the Middle East without spending as much on the military.

The British case and argument suggest that greater treaty strength should reduce growth in major power military spending from alliance participation. Consider a hypothetical major power choosing between a strong and weak formal treaty to achieve a particular level of influence. Most treaties require growth in spending, but a stronger treaty provides equivalent influence with less growth in defense expenditures. Therefore, growth in major power military spending from alliance participation will be positive and decreasing in treaty strength.

HYPOTHESIS 1: As alliance treaty strength increases, growth in major power military

[4] Quoted in Louis (1984, pg. 11).

[5] Negotiations with Egypt were undone by Arab nationalism and the rise of Nasser.

spending will decrease.

To be clear, I do not claim that greater treaty strength will lower the *level* of major power military spending. Lower growth in spending, especially when alliance participation generally leads to increasing defense spending, need not reduce the size of the defense budget. The level of spending may be lower than it otherwise would have been, given a strong treaty, but the observed level probably will not fall.

The logic of treaty strength and major powers also suggests that even relatively weak treaties should lower growth in major power defense spending. Achieving greater influence without alliances requires massive growth in military expenditures. A weak alliance is stronger than no alliance.

Hypothesis 1 will not apply to non-major powers. These states have different goals and constraints.

3.4 Non-Major Powers

Non-major powers seek immediate security by using alliances and military spending to protect their homeland. In doing so, they have greater opportunity costs of military spending. Smaller economies of scale in defense and a higher tax price of military spending increase the marginal costs of military expenditures. Thus, higher growth in military spending constrains domestic consumption in non-major powers more, all else equal. [6] Reduced growth in defense spending is desirable for non-major powers.

Relying on allies is one way for non-major powers to maintain their security and lower growth in military expenditures. Allied protection provides additional security without requiring extra military spending. Thus alliance participation will generally reduce growth in non-major power military spending. Even so, alliance participation does not always lower military expenditure

[6] Economic growth diminishes this tradeoff.

growth. Stronger formal treaties limit the freedom of non-major powers to reduce growth in defense spending.

Limited freedom of action is the result of increased allied influence and deeper ties. At the same time, strong treaties provide more security through increased credibility. Therefore, non-major powers must balance security and freedom of action while forming alliances.

Alliance treaty design will reflect the relative value non-major powers place on security and freedom to set military expenditures. When security is more important, non-major powers will accept lost freedom of action. When these states prioritize domestic consumption, weaker treaties will prevail. Alliance maintenance reinforces this tradeoff between security and domestic consumption.

Like major powers, non-major powers maintain alliances by signaling ongoing commitment as interests change. Bearing costs connected to the alliance allows non-major powers to show they value the treaty and are worth protecting. Continued growth in military spending is a costly signal of commitment, because it has substantial opportunity costs. If non-major powers fail to invest enough in military capability, they risk undermining the treaty by shifting too much of the burden of fighting to partners. As treaty strength rises, non-major powers have extra inducements to signal commitment by allocating resources to the military.

The first inducement is the value of a strong treaty. Because stronger treaties give better security, non-major powers are more willing to bear the opportunity costs of military spending. Additional security offsets the opportunity costs of military spending under these treaties. Other constraints are less voluntary.

Deeper ties under a strong formal commitment give allies influence to demand continued defense effort. For example, I have already argued major powers can use issue linkages to bargain about defense spending. This influence extends to more coercive bargaining that uses side payments from formal alliance promises as leverage. If allies withhold aid or economic concessions, reducing growth in military spending is more costly. As the number of sunk costs commitments

falls, allied leverage declines.

In a weak treaty, non-major powers have more freedom of action. Allies have less bargaining leverage, because their main threat is withdrawing from the treaty. These threats are usually incredible, which limits allied leverage. Even so, weak treaties still provide security gains— a weak treaty is better than no alliance at all.

As a result, non-major powers will reduce growth in military spending under weak treaties. But as treaty strength rises and constrains non-major powers' freedom of action, growth in military spending will rise. Weak commitments provide security and enough freedom of action for non-major powers to lower growth in military spending and expand domestic consumption. Greater treaty strength increases treaty value and allied influence, increasing growth in military expenditures.

> HYPOTHESIS 2: As alliance treaty strength increases, growth in non-major power military spending will increase.

My argument focuses on differences between strong and weak treaties, so the research design must compare treaties and measure alliance treaty strength. I use a measurement model to infer treaty strength from formal content, then connect alliances to state military spending with a multilevel model. The next section describes the research design in more detail.

4 Research Design

My research design makes two contributions. First, I develop a latent measure of alliance treaty strength. Then I employ that measure in a multilevel model, connecting alliance-level variation with state-level outcomes. The multilevel model bridges specific and general research designs by simultaneously estimating the specific impact of each alliance on military spending and the general impact of different alliance characteristics. To examine differences between major and non-major

powers, I estimate the multilevel model in separate samples of major and non-major powers from 1816 to 2007. The next section describes my measure of alliance treaty strength.

4.1 Measuring Alliance Treaty Strength

Treaty strength can only be observed indirectly, but my argument implies observed alliance promises reflect the underlying strength of the treaty. Stronger alliance treaties will contain more costly promises. Therefore, I use observed alliance characteristics to infer treaty strength.

Treaty strength depends on the potential costs of core support, and supplementary sunk cost promises in the pact. The potential costs are tied to core commitments of defensive or offensive military support, and conditions on support.[7] Sunk costs promises in alliances include integrated military command, forming international organizations, basing rights, promises to make other agreements, and economic or military aid. All of these commitments are theoretically relevant, so the measure must incorporate multiple observable indicators of strength.

Conceptualizing observed treaty conditions as indicators of underlying strength permits two measures of treaty strength. The first is constructing an additive index of treaty strength. Treaties with multiple costly promises would score higher on such an index. This assumes each indicator is equally important, which is unlikely. I prefer latent variable modeling, which is a less restrictive way to use observable characteristics to infer an underlying trait.

Latent variable modeling offers a flexible and intuitive way to measure alliance treaty strength. My argument expects that there is a single factor underlying variation in potential and sunk costs across treaties. The measurement model estimates the correlations between alliance treaty content and the underlying formal strength, and then infers the likely values of strength.

Measurement models have a rich history in political science and generated notable measures of ideology (Clinton, Jackman and Rivers, 2004), democracy (Treier and Jackman, 2008) and human rights (Fariss, 2014). Benson and Clinton (2016) use the mixed factor analysis model of Quinn

[7] Some alliances promise only neutrality, consultation, or non-aggression, rather than military support.

(2004) to measure alliance scope, depth and capability. I emulate Benson and Clinton's approach, but employ a different concept and estimator.

I use the Bayesian Gaussian Copula Factor Model of Murray et al. (2013) to generate a measure of alliance treaty strength. Murray et al's model improves mixed factor analysis for continuous, ordinal, and binary observed data by relaxing distributional assumptions. Given discrete observed variables and non-Gaussian latent variables, the dependence among the latent variables and their marginal distributions are both influenced by the latent variables. Their model encodes the dependence structure of multivariate latent data using a copula [8] and expresses the latent variables and factor loadings as a series of latent normal variables. This semiparametric approach breaks the dependence between the latent factors and marginal distributions, improving inferences about the latent variable.

Besides its semiparametric component, this measurement model employs a general factor analytic approach. Factor analysis estimates the association between observed variables and some latent factor. Each observed variable has a factor loading— the association between the observed variable and the latent variable. Like standardized regression coefficients, factor loadings range from -1 to 1, so observed variables are positively or negatively correlated with the latent factor.

For each observation, a linear combination of observed alliance characteristics predicts latent treaty strength, like a regression with an unobserved outcome. I estimated the model using observed data from all 745 alliances in the alliance-level ATOP data (Leeds et al., 2002). Indicators of treaty strength are divided between the potential costs of abrogation and sunk costs commitments. The potential costs depend on promises of defensive support, offensive support, neutrality, consultation, non-aggression and unconditional military support. Sunk costs include military aid, economic aid, bases, international organization formation, integrated military command, as well as promises to form new agreements in multiple issue areas and to forgo competing alliances. Al-

[8] Copulas are distribution function on $[0, 1]^p$ where each univariate marginal distribution is uniform on $[0, 1]$. This function encodes the dependence structure of a multivariate distribution.

though we can divide observed treaty promises conceptually, the argument suggests there is one latent factor underlying variation in all 13 indicators. Therefore, I fit the model with one latent factor.

I used Parameter expanded Gibbs sampling, the default generalized double Pareto (GDP) prior, 10,000 burn-in iterations of the MCMC chain, and 20,000 samples thinned every 20 observations to ensure convergence. The resulting estimates include posterior distributions for the factor loadings and the latent factor. Because treaty strength is the main quantity of interest here, I focus on the posterior distributions of the latent factor.

Each alliance has a unique posterior distribution of its latent strength. I use the mean of that posterior to measure treaty strength— the mean is the expected strength of a treaty, given its content. Figure 1 describes the latent measure for ATOP alliances with military support from 1815 to 2016. I focus on the 289 treaties offering military support because prior studies of alliance participation and military spending emphasize these treaties. [9] Each alliance has a unique strength score, so my measure contains the expected strength of an alliance treaty, conditional on the formal promises it makes.

There is substantial variation in the strength of alliance treaties. The top panel of Figure 1 is a histogram of mean treaty strength for alliances promising military support. Most treaties are concentrated between .5 and 1.5 on the latent scale, but approximately 40 treaties are stronger or weaker. The bottom panel of Figure 1 plots the posterior means and uncertainty in those estimates against the start year of the treaty. Even after accounting for posterior uncertainty, it is possible to distinguish between strong and weak treaty commitments where the error bars do not overlap.

The measure makes clear distinctions between treaties. Although the values of the latent strength measure are not intrinsically informative, differences between treaties on the latent strength scale are meaningful. Thus, I can make comparisons between treaties based on their latent mea-

[9] I estimated the measurement model on all alliances to capture the contributions of defensive and offensive conditions to treaty strength. Including treaties without military support provides information about the value of support.

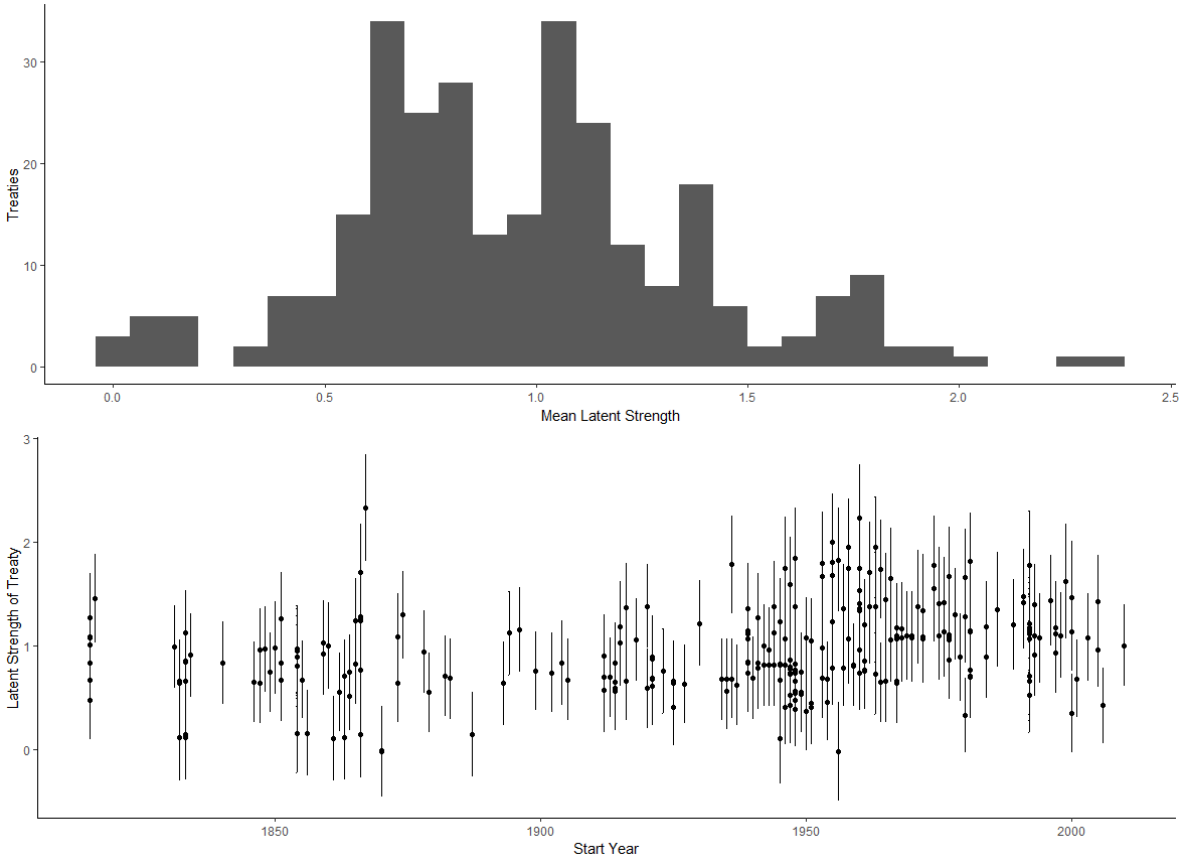

Figure 1: Summary of latent measure of alliance treaty strength for 289 alliances promising military support from 1816 to 2016. The top panel is a histogram of the expected of alliance treaty strength. The bottom panel plots mean treaty strength (points) and the standard deviation (error bars) against the start year of the treaty.

sure scores. The mean of treaty strength is 0.92, and the median is 0.90. The median treaty is an 1854 agreement between Austria, France, and Britain against Russia in the Crimean war (ATOP ID 1180).

The weakest treaty is an 1870 neutrality and offense pact between France and Britain (ATOPID 1300), which Britain used to protect Belgian neutrality during the Franco-Prussian war. Britain formed an identical with Prussia at the same time, which scores nearly the same on the latent measure. Both treaties have only offensive and neutrality promises, conditional on France and Prussia respecting Belgian neutrality. Otherwise, the UK made no sunk costs promises, so these two alliances are quite weak.

NATO (ATOPID 3180) has a mean latent strength score of 0.73, placing it in the second quartile of military support alliances. NATO's two costly provisions are the defense obligations in Article 5 and establishing the Atlantic Council. According to the ATOP coding sheet for NATO, "There are numerous bilateral agreements among NATO members re: military aid, bases, etc. but they do not qualify as separate alliances, nor are they part of the overall NATO structure." NATO treaty is below average in strength in part because additional costs were negotiated outside the formal treaty.

The three strongest treaties are an 1867 alliance between Prussia and Hesse (ATOPID 1290), a 1955 treaty between Greece, Turkey and Cyprus (ATOPID 3400) and the United Arab Republic (ATOPID 3300). All these treaties supplement promises of military support with costly promises of cooperation. The United Arab Republic attempted to unify Syria and Egypt, so it promises defense, integrated command, military aid, multiple international organizations, and basing rights. In the alliance between Greece, Turkey, and Cyprus, Greece and Turkey set up military aid, integrated military command, international organizations to mange relations on the island— a weaker commitment would have lacked any credibility. These extra costs made arrangements between historic enemies in Cyprus more credible. Both these treaties were undone by domestic coups, one in Turkey, the other in Syria, but that does not diminish the depth of cooperation they attempted.

The latent measure has some face, concept, and discriminant validity of the latent measure. For face validity, the UAR is a more costly commitment than a functional promise to respect Belgian neutrality. The weakest treaties make few costly promises beyond military support, matching my conceptualization of treaty strength. Last, this measure can distinguish between weak and strong commitments.

My argument uses variation in treaty strength between alliances to explain growth in military spending. Stronger and weaker treaties should have different effects. While the independent variable is alliance-level variation, the outcome is state-level growth in military spending. Therefore I use a multilevel model to estimate the association between this measure of treaty strength and alliance members' military spending. The next section summarizes the multilevel model in more detail.

4.2 Multilevel Model

Multilevel modeling is a natural way to bridge levels of analysis, and it incorporates elements of the specific and general research designs in previous research. Specific studies focus on responses to allied spending in particular treaties, while general studies in panel data rely on coarse aggregates of alliance participation. In this model, I estimate the specific impact of each alliance on members' military spending as well as the general association between treaty strength and military expenditures. I can simultaneously make inferences about the impact of individual treaties and the impact of treaty characteristics including strength. To facilitate computation and interpretation, I fit the multilevel model using Bayesian estimation in STAN (Carpenter et al., 2016).[10]

This multilevel model adds complexity to a more traditional panel data specification. But the additional components match the argument and data structure, while also generating novel inferences. Multilevel modeling connects the argument and research design. My predictions compare strong and weak treaties, so an alliance level regression in this multilevel model contains the cor-

[10] See the appendix for details of the weakly informative prior distributions and evidence the chains converged.

responding coefficient. Relying on a state-level proxy for alliance strength generates different comparisons and reduces variation in the key independent variable.

Aggregating variables at a different level of analysis may produce misleading inferences (McElreath, 2016). Multilevel modeling retains the structure of the data, where states are members of multiple alliances. Connecting the alliance and state level of analysis then allows me to infer how alliance-level variation impacts states' military expenditures.

Besides connecting alliance and state level variation, the multilevel model generates novel comparisons between alliances. Specific studies can only compare a few treaties at a time, while general research studies usually aggregate multiple treaties into a single measure. The multilevel model estimates the unique impact of each alliance on members' military expenditures. Partial pooling of these alliance-specific parameters generates reasonable estimates for every treaty, which can then be used to compare treaties.

In summary, multilevel modeling should provide more accurate and novel inferences about alliance participation and military spending. This model retains the alliance-level variation I argue modifies how treaty participation impacts military spending. Furthermore, by estimating the cumulative impact of participation in each alliance treaty, the model generates new evidence to help test my questions. The next section summarizes the model specification. I

4.2.1 Model Specification

This multilevel model connects two distinct regressions. The base is a state-level regression, which is similar to a random effects panel data regression. A second alliance-level regression predicts parameters in the state-level regression, like an interaction.

The state-level regression starts with a distribution for the outcome:

$$y \sim student_t(\mu, \nu, \sigma) \tag{2}$$

y is the dependent variable— growth in military spending. I model spending growth using a t-distribution with degrees of freedom ν to address outliers. [11] σ is analogous to the error term in a frequentist regression— this captures unexplained variation in spending growth. μ, the mean of the outcome, depends on several covariates.

$$\mu = \alpha + \alpha^{st} + \alpha^{yr} + \mathbf{W}_{n\times k}\gamma_{k\times 1} + \mathbf{Z}_{n\times j}\lambda_{j\times 1} \tag{3}$$

Growth in spending is a function of an overall intercept α, state and year varying intercepts α^{st} and α^{yr} and a matrix of state-level control variables $\mathbf{W}$. These components comprise a standard random effects model. The $\mathbf{Z}\lambda$ term incorporates alliance participation.

$\mathbf{Z}$ is a matrix of state participation in alliances. Columns correspond to alliances, and rows to state-year observations. If a state is not part of an alliance, the corresponding cell of the matrix is zero. If a state is part of an alliance in a given year, the matrix cell contains the log of total allied military spending.

I use total allied spending in the alliance participation matrix because more capable alliances provide extra benefits. Increasing allied capability makes promises of military support more valuable (Johnson, Leeds and Wu, 2015). $\mathbf{Z}$ encodes a quasi-spatial indicator of alliance participation for all j alliances in the data. States can be members of multiple treaties at once, so observations are not neatly nested. This specification allows each alliance to have a unique impact on military spending, even when states participate in multiple treaties.

λ is a vector of parameters which estimate the impact of participation in specific alliances. Because the non-zero elements of Z are allied spending, the λ parameters capture alliance members' responsiveness to greater allied capability. Each alliance has a unique λ, and the λ parameters have a common distribution. The shared distribution assumes alliances are similar but different in how they impact growth in military spending. I then use alliance treaty strength and other alliance

[11] I estimate ν directly.

characteristics to predict differences between treaties.

The second part of the multilevel model uses alliance characteristics to predict how allied spending is associated with growth in military spending. The λ parameters are the dependent variable in an alliance-level regression. I focus interpretation on this second-level regression, where:

$$\lambda \sim N(\theta, \sigma_{all}) \tag{4}$$

and

$$\theta = \alpha_{all} + \beta_1 \text{Treaty Strength} + \mathbf{X}\beta \tag{5}$$

In this alliance-level regression, $\mathbf{X}$ is a matrix of alliance-level control variables and α_{all} is the constant. Adding σ_{all} means predictions of λ are not deterministic— the alliance level regression contains an error term. The second-level regression includes treaty strength, and each β parameter modifies the impact of alliance participation on growth in military spending. The β parameters are like marginal effects in an interaction.

Treaty strength is connected to military spending by how it changes the consequences of alliance participation. A change in treaty strength modifies λ, which alters growth in military spending. Hypothesis 1 predicts β_1 will be negative among major powers, and Hypothesis 2 expects β_1 will be positive for non-major powers. Greater treaty strength should reduce the propensity of major powers to increase military spending to back their alliances, and limit reduced growth in military expenditure by non-major powers.

Consider one observation as an example of how the model works. Growth in Argentina's military spending in 1955 depends on Argentina's economic growth, political regime, conflict participation, and rival military spending. Argentine participation in the Rio Pact and OAS also

changes growth in spending through allied capability.

$$\text{Argentina 1955} = \text{Overall mean} + \text{Argentine Intercept} + \text{1955 Intercept} + \text{Argentine Characteristics} + \lambda_{OAS} * \text{OAS Expenditure} + \lambda_{Rio} * \text{Rio Pact Expenditure} \tag{6}$$

λ_{OAS} and λ_{Rio} are modified by the alliance level regression. The institutional design and membership of these treaties alter the λ parameter. Other alliances have no impact on growth in Argentine military spending.

In this model, the β parameters capture the general association between key alliance characteristics and military spending. The λ parameters express the total impact of participation in each alliance and heterogeneous effects of different treaties. Using alliance characteristics to modify the impact of alliance participation matches my conditional argument. I now describe the sample and covariates in the analysis.

4.3 Sample and Covariates

I estimate this model on two samples of states from 1816 to 2007— one sample of major powers, the other of non-major powers. Splitting the sample means I cannot directly compare estimates from the major and non-major power samples, but it will show different trends in the two samples. A split sample followed by graphical comparison of the estimates is a simple approximation of letting the slopes vary (Gelman and Hill, 2007). If major powers focus on influence and non-major powers emphasize immediate territorial security, the data generating process for military spending in major and non-major powers is completely different. Therefore state and alliance-level coefficients besides strength should vary between major and minor powers, and splitting the sample is a

simple way to capture these distinctions. [12]

I employ divide states into two samples using a measure of major power status from the Correlates of War Project. Alliance participation data in both samples comes from the ATOP project (Leeds et al., 2002). I focus on participation in defensive and offensive treaties, because prior studies of alliances and military spending examine these treaties.

The non-major power sample contains 8,668 observations in the state-level regression, and 192 alliances. There are 930 major power observations and 148 alliances. Although the major power sample is smaller and has fewer states, Bayesian estimation and partial pooling should generate plausible estimates (Stegmueller, 2013).

The state-year dependent variable is growth in military spending. I calculated growth in spending using the Correlates of War Project's measure of military spending (Singer, 1988). Growth in spending is equal to changes in spending as a share of the previous year's military spending, so changes are relative to previous levels of spending.

Using military expenditure growth as the dependent variable has several benefits for the research design. The level of military spending rises over time for most states, especially in longer panels. Benchmarking changes to prior expenditures facilitates comparisons across diverse states and time periods. Last, using growth in spending in regression models limits the risk of spurious inferences from non-stationarity in military spending.

The key independent variable is the mean latent strength of each alliance. This variable enters the model in the alliance-level regression. I then include a series a state and alliance-level controls.

In the state-level regression, I adjust for several variables that are correlated with of alliance participation and military spending. State-level covariates include GDP growth (Bolt et al., 2018), regime type, international war (Reiter, Stam and Horowitz, 2016), civil war participation (Sarkees and Wayman, 2010), annual MIDs (Gibler, Miller and Little, 2016), rival military spending (Thompson and Dreyer, 2012) and a dummy for Cold War years. Conflict participation, alliances,

[12] Estimating a model with varying slopes is possible, but adds further complexity.

and military spending likely covary (Senese and Vasquez, 2008). I include growth in GDP instead of levels of GDP because GDP levels are non-stationary, and economic growth shapes the opportunity costs of military spending (Kimball, 2010; Zielinski, Fordham and Schilde, 2017).

The alliance-level regression contains the mean of the latent treaty strength— the key independent variable. Other alliance level variables are correlates of treaty design and military spending, including the number of members and share of democracies in a treaty at time of formation (Chiba, Johnson and Leeds, 2015). I adjust for superpower membership— whether the US or USSR participated in a treaty during the Cold War. Two dummy indicators of wartime alliances and asymmetric obligations (Leeds et al., 2002) complete the alliance-level regression specification. Wartime alliances are likely to require higher spending and deeper commitments, while asymmetric obligations will likely require greater spending from major powers while reducing non-major power spending.

The democratic membership control is important and interesting. Prior studies find democratic membership is associated with limited obligations (Chiba, Johnson and Leeds, 2015) and lower military spending (DiGiuseppe and Poast, 2016). This research design can establish whether democratic alliance membership reduces military spending after adjusting for alliance treaty strength.

Adjusting for all of these covariates helps address systemic differences between states and alliances from strategic selection into alliances. Regime type and external threat are especially important in that endeavor. The next section describes the results from the major and non-major samples.

5 Results

Results are based on 2,000 total samples from four chains, with 1,000 warm-up iterations. To facilitate model fitting, I employed a non-centered parameterization of the varying intercepts and a sparse matrix representation of $\mathbf{Z}$. Standard convergence diagnostics indicate the chains adequately

explored the posterior density.[13]

Because I use Bayesian modeling to estimate the association between treaty strength and growth in military spending each coefficient has a posterior distribution— the likely values of the coefficient conditional on the priors and observed data. There are no conventional indicators of statistical significance. Instead I calculate the negative and positive posterior probability for the two treaty strength coefficients to assess Hypotheses 1 and 2.

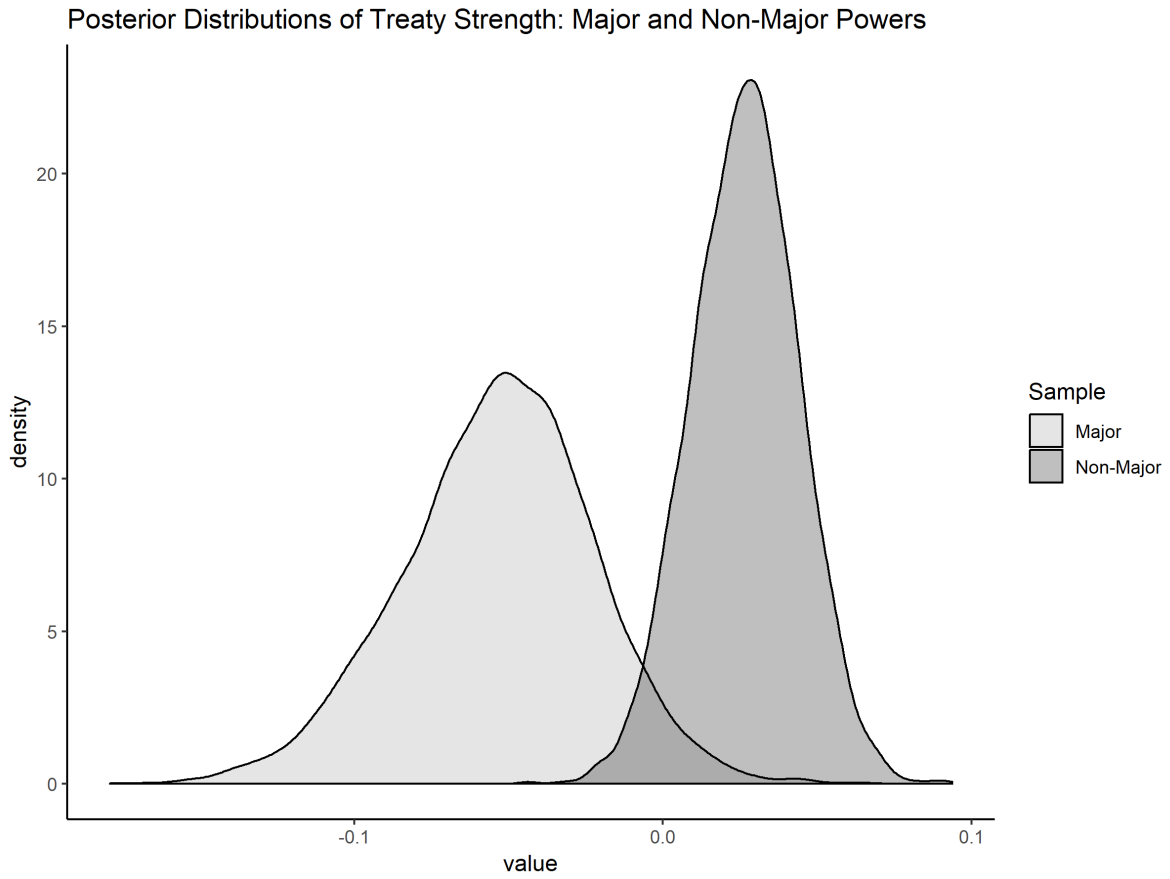

Figure 2: Posterior density of treaty strength coefficient in major and non-major power samples, 1816 to 2007. 96% of the major power posterior mass is negative. 94% of the non-major power posterior mass is positive.

Figure 2 plots the full posterior density of the treaty strength coefficients in the major and minor

[13] See the appendix for more details on convergence.

power samples. [14] 96% of the posterior mass for major powers is negative. 94% of the posterior mass for minor powers is positive.

These two coefficient estimates match the predictions of Hypotheses 1 and 2. For major powers, there is a 96% chance increasing treaty strength is associated with lower growth in military spending. There is a 94% chance greater treaty strength is associated with higher growth in military spending for non-major powers.

Of course seeing the expected sign on these two coefficients does not imply changing treaty strength is substantively important. To assess the substantive importance of a change in treaty strength, I compare the expected value of the coefficient to typical growth in military spending in each sample. Among major powers, the mean of the treaty strength coefficient is -0.05, and median growth in military expenditures is 0.04. [15] So a one-unit increase in treaty strength more than offsets the typical annual growth in military spending. This change in spending is a plausible effect— 5.1% of the 2018 US defense budget was spent directly on NATO. [16]

For non-major powers, the mean of the treaty strength coefficient is 0.03, and median growth in military expenditures is 0.06. Greater treaty strength increases growth in minor power military expenditures by about half of typical growth. In both the major and non-major power samples, the expected impact of higher treaty strength has a large substantive effect. [17]

I also assess substantive importance by looking at patterns in the λ parameters. Each λ parameter measures the aggregate impact of treaty participation as function of treaty characteristics. If greater treaty strength has a large influence on the λ parameters, there will be a clear trend in the mean of λ across the range of alliance treaty strength. We should observe a negative trend in the expected value of λ as treaty strength increases in major power alliances. There will be a positive trend in λ for non-major power alliances.

[14] The smaller sample for major powers produces more variance in all the coefficient estimates.

[15] The median is a better summary of the dependent variable because large positive and negative outliers influence the mean.

[16] See this blog post from the IISS.

[17] Of course, uncertainty in the posterior estimates includes larger and smaller effects.

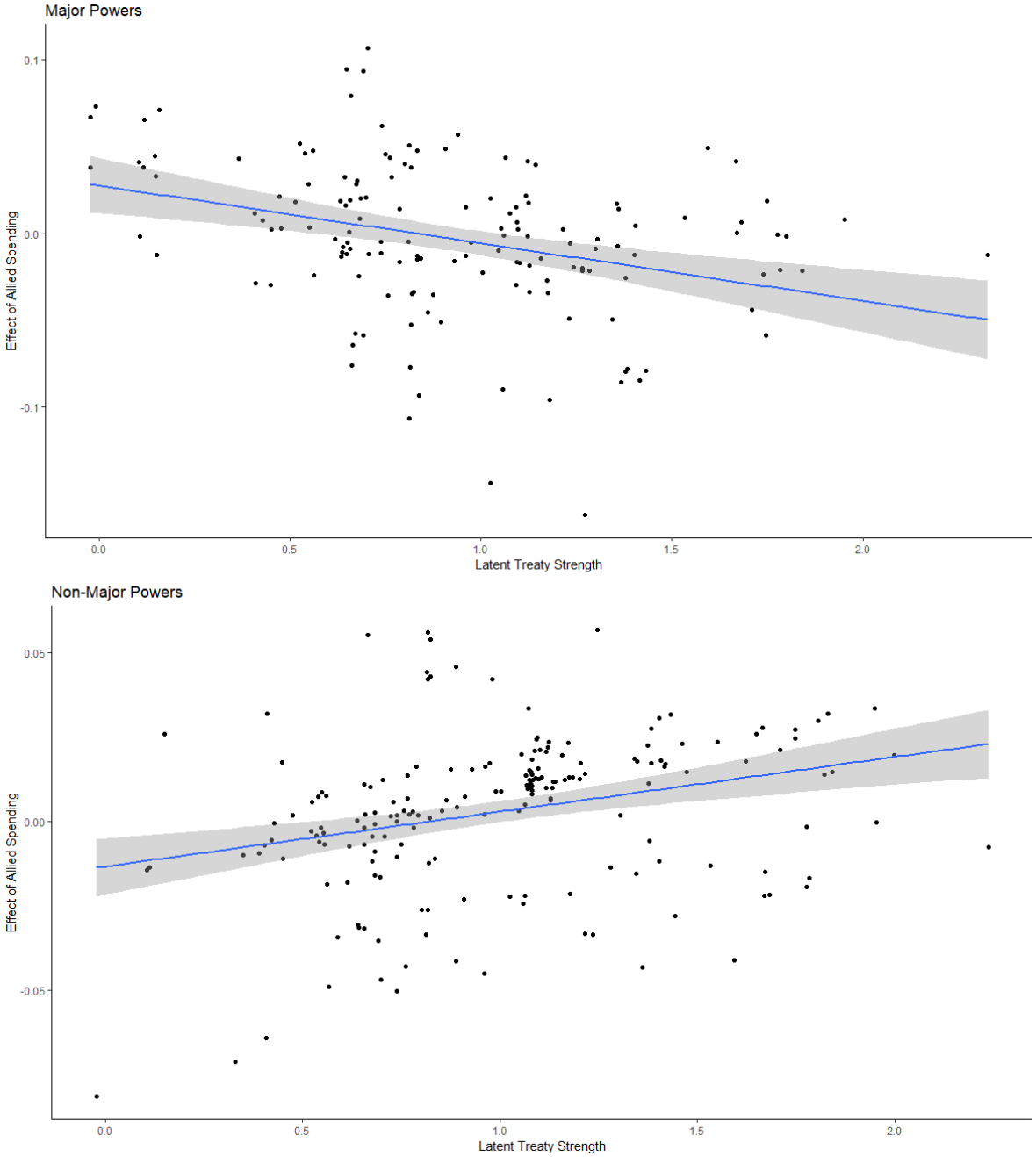

Figure 3: Scatter plots of trends in mean λ parameters and treaty strength. λ is the total impact of alliance participation on growth in military spending. The top panel is major powers, where this is a negative trend between λ and treaty strength. In the bottom panel the same trend is positive for non-major powers. Trend lines estimated using linear regression.

Figure 3 plots the expected value of λ against treaty strength in the two samples. In the major power sample, there is a negative trend in the scatter plot. For non-major powers, the trend is positive. The correlations between mean λ and treaty strength are statistically significant in both samples.

These trends match the underlying logic of Hypotheses 1 and 2. Weaker treaties tend to increase growth in defense spending for major powers, but those associations fall as treaty strength increases. In non-major powers, weak treaties tend to reduce growth in military spending, while stronger treaties are more likely to have little impact or add to growth in military spending. Because other treaty characteristics and unmeasured factors also influence the λ estimates, not all treaties conform to the expectations of decreasing or increasing growth in spending.

Because λ captures the total impact of an alliance, trends in these parameters across the range of treaty strength suggests that changing treaty strength has an important role. Even after accounting for other alliance characteristics, alliance strength drives the overall effect of allied spending down for major powers, and up for non-major powers. Alliance treaty strength is a key source of heterogeneity in how alliance participation impacts military spending. Making these comparisons underlines the benefits of the multilevel model estimates.

While the statistical model estimates general associations, it does not show the underlying theoretical mechanisms. To illustrate the theoretical process, I offer evidence from US alliance politics in the next section. I focus on NATO— the most important alliance in the international system.

6 NATO, Treaty Strength and Military Spending

US foreign policy after World War II illustrates the tradeoff between entanglement and influence for major powers. American choices in treaty design also had important consequences for junior partners. While forming alliances, the US balanced between fear of "foreign entanglements"

and maintaining influence to check the USSR. The Soviet threat allowed US policymakers to form a wide network of alliance treaties, but isolationists in the Senate weakened the formal promises in most treaties.

Most US treaties contain few formal promises besides defense against aggression. These limited formal promises led to additional defense outlays to support Washington's influence. NATO is an excellent example of these dynamics.

After the end of World War II, the US sought a way to protect Europe from the USSR. Despite concern about Soviet intentions, isolationists in the US Senate feared an alliance would force America to intervene automatically if partners were attacked, bypassing the power of Congress to declare war (Acheson, 1969, pg. 280-1). Therefore Article V states that if one member is attacked the others "will assist the Party or Parties so attacked by taking forthwith, individually and in concert with the other Parties, *such action as it deems necessary* (emphasis mine)." Military support was and is not guaranteed.

The absence of automatic US involvement increased demand for reassurance by European allies. Europeans feared that if the Soviets invaded, the US would decide not to fight. Therefore, bilateral agreements on troop deployments provided reassurance and increased US influence.

In 1950 West Germany formally requested clarification on whether an attack on US forces in Germany would be treated as an armed attack on the US- which the US said it would (Acheson, 1969, pg. 395). A 1951 presentation by Dean Acheson to Dwight Eisenhower argued European allies "fear the inconstancy of United States purpose in Europe. ... These European fears and apprehensions can only be overcome if we make the necessary full and active contribution in terms of both military forces and economic aid" (Acheson, 1951, pg. 3). But even after agreeing to deploy troops, US policymakers hoped Europeans would soon provide more for their own defense, while acknowledging the US "should not dictate what they shall do" (Johnson, 1950, pg. 2).

Isolationist fears of foreign entanglement also constrained sunk costs promises in the NATO treaty. Many Senators also opposed military aid to Europe (Acheson, 1969, pg 285), leading to

more bilateral bargaining and aid through other channels. Due to the absence of formal sunk costs commitments in the NATO treaty, the US has limited leverage in NATO. NATO members have been free to reduce growth in defense spending with few consequences.

In response, American policymakers from Eisenhower to Trump have attempted to browbeat NATO members into spending more. These shaming efforts have usually failed. Most European members of NATO have been unresponsive to changes in external threat and US defense spending (Plümper and Neumayer, 2015).

The US has threatened to leave NATO in response to this European "free-riding," but those threats were not credible. During the Cold War, US interests in containing the USSR trumped irritation with allied free-riding. But without other costly treaty commitments to use as leverage, the US had few ways to check allied incentives to reduce growth in military spending.

Estimates of the λ parameter in the major and non-major power samples corroborate this reading of the NATO case. NATO is below the median in latent strength, so its formal promises are weaker than average among defense treaties. In the major power sample, NATO membership adds 0.04 to growth in military spending in expectation. For non-major powers, NATO membership lowers growth in military expenditure by -0.006 in expectation. [18]

So the multilevel model findings match prevalent narratives surrounding NATO. US fear of entanglement led to a need for growth in military spending and limited bargaining leverage in alliance maintenance. European members still gained security, but retained the freedom of action to lower growth in defense spending. Evidence from NATO corroborates the expectations and process of my argument. These results have important implications for our understanding of alliance participation and military spending.

[18]The UK and France are major powers from 1945 on, and Germany is coded as a major power by the Correlates of War after 1991. Therefore, these estimates may underestimate reduced growth in spending by NATO members, because all three of these states relied on US capability for protection. The positive growth in major power spending is driven by the US. In a future iteration of this paper, I will expand the classification of states to include superpowers.

7 Discussion

My findings address the debate over whether alliance participation increases or decreases military spending. Dissension between the force multiplier and foreign entanglement views of alliances is based on competing claims about the purposes of alliances. This dispute omits crucial differences between states and alliances.

My findings and argument suggest claims alliance participation only increases or decreases military spending are inappropriate. Major and non-major powers respond differently to alliance participation, because they use treaties for different purposes. Alliance treaty design also has different ramifications for more or less capable states.

While alliance participation tends to increase major power military spending, greater treaty strength reduces that growth in spending. Conversely, the tendency of non-major powers to lower growth in military spending due to alliance participation, is attenuated by increasing treaty strength. Therefore, my argument and evidence expose the limits of the conventional wisdom on this question, and clarifies where each perspective can be applied.

The force multiplier perspective applies best to non-major powers. But these states cannot reduce growth in military spending in all alliances, because strong treaties constrain their freedom of action. The foreign entanglement view holds for major powers. But additional entanglement in a strong treaty provides more influence, which attenuates the positive correlation between alliance participation and growth in military spending.

How do these findings compare to prior evidence on alliance participation and military spending? Connecting my findings with earlier evidence requires renewed attention to specific and general research designs. General studies compare states in a particular kind of alliances to those without such an alliance. Specific studies estimate responsiveness to allied military spending in a few treaties.

My research design borrows from specific by estimating the unique impact of participation in

individual treaties. I then use alliance treaty design to explain variation in how treaty participation impacts growth in military spending. Differences in alliances give general estimates that are not tied to individual treaties.

The key coefficient estimates compare strong and weak treaties. The alliance-level coefficient estimates are like marginal effects- increasing treaty strength alters the effect of alliance participation. This captures the general consequences of participating in a particular treaty. Therefore, my results encompass specific and general studies in a unified framework. I provide estimates to infer and compare the impact of individual treaties and general differences between treaties.

This paper has several limitations. The argument does not address the domestic political economy of military spending. My argument reduces domestic politics to an assumption that military spending has opportunity costs, which are decreasing in state size. Domestic politics shapes how states define their foreign policy interests and the tools they use to pursue those interests (Fordham, 1998, 2011; Narizny, 2007). At the moment, my argument treats foreign policy interests as given.

In the research design, the COW measures of military spending contain substantial measurement error. There is also a great deal of missing data in the 1816–2007 time frame of this study. I plan to check the robustness of my results to these issues by adding measurement error to the outcome and imputing missing data.

The multilevel model only incorporates time-invariant alliance characteristics, save for changing capabilities in the membership matrix. So I measure share of democratic members and the number of members at time of formation. Allowing time-varying alliance characteristics might improve the statistical model, but would require altering the model structure.

Strategic alliance design is the last major weakness of the research design. Non-random selection into different kinds of alliances might produce systematic differences between members that are no adjusted for in my statistical model. I attempted to control for correlates of alliance treaty strength, especially democracy, but oversights are possible.

Despite these limitations, I believe the argument and results provide valuable insights about al-

liance participation and military spending. I explain when alliance participation is associated more or less growth in military spending, addressing a debate between the force multiplier and foreign entanglement views of alliances. Whether alliance participation increases or decreases military spending depends on state capability and alliance treaty strength. For major powers, greater treaty strength leads to lower growth in spending. Non-major power growth in spending is positively correlated with alliance treaty strength. I provide evidence for these predictions using a new measure of alliance treaty strength and a multilevel model. The argument and findings have implications for scholars and policymakers.

8 Conclusion

There are several ways scholars can build on these results. First, my findings reinforce calls to pay attention to heterogeneity among alliances (Leeds, 2003*b*; DiGiuseppe and Poast, 2016). Scholars should also consider the distributional consequences of changes in military spending and assess a wider range of empirical evidence.

Changes in military spending from alliance participation have important distributional consequences. By altering growth in military spending, the design of international alliances alters the domestic political economy of member states. But the domestic economic consequences of alliance politics are not well understood.

Besides exploring the domestic political economy of alliance participation, future work should extend my argument to other alliance characteristics. If major and non-major powers employ alliances for different ends, then other alliance characteristics may have different impacts on military spending. Other treaty design considerations, such as asymmetric obligations, should have different effects for major and non-major powers.

Another task for future research is making more detailed comparisons of the λ parameters. Each λ captures the aggregate impact of alliance participation for individual treaties. Due to lack

of space, this paper offers a cursory treatment of these estimates. As such, these parameters are a novel measurement, and additional evidence of when alliance participation increases or decreases military spending.

Although the multilevel model estimates are novel and detailed, they cannot establish causality (Seawright, 2016). I provided a brief illustration using NATO, but selected that case for its illustrative value and policy importance. This leaves room for more precise selection of cases to corroborate the regression results. One possible design is using the five largest and smallest λ values for major and minor powers to select cases. Process tracing in these cases could then examine theoretical mechanisms and validate measurement (Seawright, 2016).

Moving beyond the immediate issue of alliance participation and military spending, the research design in this paper could apply to other international relations questions. If scholars are interested in a class of international organizations where membership in multiple organizations is not nested and institutional characteristics generate heterogeneous effects, the multilevel model addresses all of these concerns. For example, international political economy scholars could apply this model to trade agreements. Studies of international law could examine the impact of membership in different conventions and international organizations on human rights.

Besides their scholarly value, the argument and evidence have important consequences for policy debates. The tradeoffs major and non-major powers face in alliance treaty design can guide our understanding of why some treaties lead to "free-riding" and potential responses. US policymakers must consider the major power tradeoff between foreign entanglement and influence in strong treaties. Greater influence can limit allied free-riding, but it requires deeper engagement abroad.

The United States is currently wrestling with the implications of differences in treaty strength. Washington has often decried "free-riding" by allies who provide too little for their own defense (Lanoszka, 2015). But allies are able to free-ride because the US makes relatively weak formal alliance commitments. "Entangling alliances" may provide more influence to curb falling allied defense spending.

Therefore, growing institutionalization of NATO, including the agreement for all allies to spend at least 2% of GDP on defense, may be effective. A deeper formal structure will tie the US more closely to Europe, but it is probably a better check on allied free-riding than the usual verbal exhortations. Threatening to leave the alliance is not credible and risks undermining US gains from alliances. So long as formal ties are relatively weak, US leaders will lack leverage in intra-alliance bargaining.

The US could use stronger formal commitments as a substitute for greater defense effort in reassuring allies. The danger is that making stronger commitments could create a situation where obligations exceed capabilities (Kennedy, 1987). Emboldening junior partners with a strong treaty might have deterrent value (Benson, Meirowitz and Ramsay, 2014), or increase the risk of conflict (Benson, 2012). Every change in alliance treaty strength generates different risks and tradeoffs—policymakers must strike an appropriate balance.

Alliance participation will not uniformly increase or decrease military spending. Rather, the connection between alliance participation and military expenditures depends on treaty strength and state capability. Both the force multiplier and foreign entanglement views of alliance participation are correct, each in different circumstances.

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