The return on social bonds: Social hierarchy and international conflict

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Abstract

This article takes a game-theoretic and latent variable approach to modeling the effect of international social hierarchies on conflict among states. I start with the premise that international states are social actors and are nested within informal social networks of friendly and conflictual relationships. Rather than lateral relationships among equals, networks among states tend to have a vertical or hierarchical structure. Although international hierarchical relationships may arise as a result of material power asymmetries, this article focuses on non-material asymmetries that stem from political legitimacy or policy innovation – a subject that has received less attention in scholarly research. I argue that, within these hierarchies, states adopt one of two roles – a dominant or a subordinate. Each resulting (dyadic) dominant–subordinate relationship is a social contract, in which the subordinate concedes some autonomy in exchange for the dominant's protection. This social hierarchy affects the relationships among subordinates, as well as between a dominant and subordinates. The model predicts that a state's degree of subordination reduces its probability of conflict initiation against other subordinates. Moreover, the decision to initiate conflict is influenced by the expectation that the dominant will intervene, which itself is affected by the target's relative level of subordination to the dominant vis-à-vis the challenger. These predictions are supported by empirical analyses of the US hierarchy (1950–2000).

Keywords

international networks, interstate conflict, social hierarchy, strategic interactions

Introduction

International states are social actors and, as such, are nested within dense informal networks of friendly and conflictual relationships. Rather than lateral relationships among equals, networks among states tend to have a vertical or *hierarchical* structure. During different time periods, states have chosen to look for policy cues and leadership to one or few policy leaders or innovators (e.g. UK in the 18th and 19th centuries, USA or USSR/Russia in the 20th century). International hierarchical relationships may arise as a result of both material power asymmetries and non-material asymmetries that stem from political legitimacy or policy innovation. Hierarchies of the latter type – *social hierarchies* – have received little scholarly attention (Lake, 2009). While most scholars (implicitly) acknowledge the existence of such social hierarchies among international states, few

studies have modeled such hierarchies and their effects on international outcomes.[1]

The most obvious reason for this lack of attention is that the study of social authority or legitimacy is often impeded by the informal or intangible nature of these concepts. Measuring a state's intangible power to

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[1] Despite overlapping terminology, it is important to distinguish between the study of social hierarchy and the rich literature on material hierarchies/hegemonies (e.g. Organski, 1958). In contrast to that literature, the current study focuses on social, rather than material, processes. Moreover, rather than explaining outcomes at the systemic level, I derive predictions regarding a hierarchy's effect on minor powers' interactions – a topic of little interest to the traditional literature.

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persuade is not as simple as counting up its number of tanks or warships. Unlike material power, a state's level of authority can only be measured in a relational way. When the USA, for example, increases its number of tanks, it is increasing its material power vis-à-vis every other state. Most would agree, however, that when it comes to authority, an increase in US legitimacy vis-à-vis Egypt is not necessarily associated with a change in legitimacy in the USA–Argentina relationship. Each state, in other words, grants and is granted varying degrees of authority by every other state.

To alleviate these theoretical issues, I model the effects of social hierarchy using a game-theoretic approach. I start by assuming that international social hierarchies are made up of states that adopt one of two roles: a *dominant*, who acts as the creator and enforcer of social contracts, and a *subordinate*, who decides to what degree, if any, to accept the dominant's authority. Dominant states are defined as states that serve (and are viewed by subordinates) as legitimate authorities on policy innovation; they are 'trusted' as having expertise in some or most policy areas (Fordham & Asal, 2007; Thies, 2013). Legitimate authority, or 'rightful rule', is particularly important for separating states that take on the role of the dominant within a social hierarchy from a hegemon whose dominance is based solely on material power (Lake, 2009: 8).[2] In fact, as I show later, the degree of social hierarchy between two states is uncorrelated with differences in their material power capabilities.

A state's *degree of subordination* within a dominant's hierarchy refers to this state's level of (informal) policy dependence on the dominant. Belarus, for example, has a high degree of subordination to Russia: Minsk looks to Moscow for policy guidance and approval, and is unlikely to implement policies that contradict Moscow's interests. Contrast this with Japan, which has a low degree of subordination to Russia: Russia's policy interests do not enter into Japan's policy decisions. A state's *relative level of subordination*, on the other hand, is defined as its hierarchical position vis-à-vis another subordinate state. Continuing with the example of Russia's social hierarchy, prior to the 2013–14 EuroMaidan protests, Ukraine might have been characterized as moderately subordinate to Moscow, perhaps *less* subordinate than Belarus, yet *more* subordinate than Japan.

Importantly, in addition to explaining the dominant–subordinate interactions, this theoretical framework helps explain interactions *among* subordinate states. Belonging to the same hierarchy, for example, may alleviate a *rivalry* between subordinate states, as long as each subordinate values its relationship with the dominant more than it distrusts a rival. The quasi-alliance between Japan and South Korea (via the USA), for example, is often used to explain why their oft-contentious relationship has seldom boiled over into militarized conflict (Cha, 1997). Sharing dense ties to the USA is also a contributing factor in creating a peaceful culture of dispute resolution among Latin American states, despite numerous competing territorial claims and rivalries (Thies, 2008).

The theoretical model also sheds light on the debate within the alliance literature on whether close ties between states (e.g. alliances) have a constraining or emboldening effect (Machain & Morgan, 2013; Smith, 1995). States with higher levels of subordination relative to their rivals may, for example, expect the dominant to 'look the other way', should they decide to settle scores. Yet, on balance, the model shows that subordination has a constraining effect on conflict initiation, as long as the (potential) challenger has at least a small degree of uncertainty regarding the dominant's likely response.

I test the theory by empirically modeling the relationships between the USA and its subordinates using a strategic probit – a type of random utility model. The estimator isolates the deterring effect of a dominant protecting a protégé from *social* factors that make states less inclined to challenge the status quo in the first place. Interestingly, by separating preferences for the status quo from deterrence, the model allows for conducting one of the few direct tests of general deterrence.

Social hierarchy

International social hierarchy is made up of bilateral social contracts, in which subordinate states concede varying levels of policy autonomy, in return for ideological and material benefits provided by the dominant state (Lake, 2009; Thies, 2013; Wendt & Friedheim, 1995). Expressions of social hierarchy permeate every aspect of international relations. They manifest themselves, for example, in symbolic alliance networks among the dominant's allies (e.g. alliance among Costa Rica, Haiti, and Uruguay): while, on its own, each of these bilateral alliances may contribute little to its members' defense, taken together, dense embeddedness within the US alliance network signals (to the USA and others) rather tangible policy dependence on the USA, as such

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[2] While often conflated, material superiority and legitimacy are distinct concepts (Lake, 2009: 21–23). For example, despite military superiority, a foreign occupier is not always viewed as legitimate.

alliances are often associated with reductions in defense spending among smaller states (Machain & Morgan, 2013; Lake, 2009). Although not using the social hierarchy terminology, Morrow (1991) makes a similar argument regarding asymmetric alliances, which he views as arrangements in which the weaker state effectively trades some policy flexibility for security guarantees by the stronger state.

Hierarchy manifestations are, of course, not limited to alliance relationships. Hierarchical relationships are reflected in membership patterns within international organizations, adherence to certain economic policies, or high embeddedness within the dominant's trade network. The strength of British social hierarchy between 1815 and 1914, for example, can be gleaned from the density of trade connections/exchanges among the states adhering to British leadership (Pahre, 2008).

Although not problematized here, the subordinate's choice to follow the policy lead (join the hierarchy) of a particular dominant is often explained as resulting from social interactions among political and economic elites. Cox & Sinclair (1996: 518) note, for example, that social hierarchy 'derives from the ways of doing and thinking of the dominant social strata of the dominant state or states insofar as these ways of doing and thinking have *inspired emulation or acquired the acquiescence* of the dominant social strata of other states' (emphasis added). Likewise, Ikenberry & Kupchan (1990: 283) argue '[e]lites in secondary states buy into and internalize norms that are articulated by the hegemon and therefore *pursue policies consistent with the hegemon's notion of international order*' (emphasis added). Thus, the number of Western-educated elites within a state increases the likelihood of democratization (Gift & Krcmaric, forthcoming) and economic liberalization (Weymouth & Macpherson, 2012).

Acceptance of a social contract limits expressions of power and reduces the range of possible actions for both parties. While material factors put physical restraints on a state's reach (e.g. loss of strength gradient), social hierarchy acts as a social constraint on dominant and subordinate states. The trade-off between autonomy and security within the alliance arrangements, for example, is known to produce more reliable alliances than those that merely aggregate capabilities or 'marriages-of-convenience', because the former are based on shared preferences rather than short-term material considerations (Gibler & Rider, 2004; Morrow, 1991).

The central argument here is that identifying and modeling social hierarchies helps gain leverage on explaining (foreign and domestic) policy choices of international states, in a similar way that studying social cliques helps understand actions of their individual members (Chyzh, 2016, forthcoming). In particular, knowing a state's relative position within a hierarchy provides information on its relationships with other states that occupy higher or lower positions within this hierarchy. Much as members of social cliques adopt particular habits and styles, states internalize or bureaucratize the policies dictated by their hierarchical position (Wendt & Friedheim, 1995).

Subordinates are more likely to pursue 'appropriate' policies (from the dominant's perspective) if they are more committed to the dominant's ideological/normative policies (Lake, 2009; Thies, 2013). Yet, even states with a high degree of subordination to a dominant may still hold some roles, and even act on roles, that are inconsistent with the dominant's preferences. State A may, for instance, value its role as a rival of State B more than its role as the dominant's ally, even if State A is highly subordinate to the dominant. In this scenario, State A would adhere to the dominant's preferences as they relate to all states, except its rival (State B). For example, despite otherwise implementing policies consistent with US preferences throughout the 1960 and 1970s (secular government, host to US military bases, economic liberalization), Turkey continued to engage in militarized disputes with Greece.

The pursuit of foreign policies that are incongruent with the dominant's interests are defined as (foreign) policy *challenges*. In the security domain, a challenge may involve, for example, (unsanctioned) conflict initiation against a third party (e.g. settling rivalries, despite the dominant's disapproval). The dominant state may respond to a challenge with a *punishment*, such as military or economic sanctions.[3]

In the immediate aftermath of World War II, for example, Yugoslavia was highly subordinate to the USSR, accepting the USSR as the leader of global communism. This had changed, however, in 1948, when Yugoslavia rejected Soviet input regarding its domestic economic plan. Yugoslavia continued to challenge Soviet authority by failing to seek authorization before intervening in the Greek civil war or signing a treaty with Bulgaria (Priestland, 2009: 218–219). The USSR responded to these challenges by expelling Yugoslavia from the Communist Information Bureau and

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[3] Punishments can only occur in response to a challenge and aim to re-enforce the hierarchical relationship. In contrast, predatory actions, coercive actions by the dominant for imperial or other reasons, do not occur in response to a challenge and generally serve to undermine the authority which social hierarchy is built on.

Table I. Punishments and US security hierarchy, 1950–2000

	Relative target–challenger subordination		
	Challenger $\leq$ target	Challenger $>$ target	Total
Punishment	303 (42.4%)	79 (12.9%)	382 (28.8%)
No punishment	411	533	944
Total	714	612	1,326

Degree of subordination within US security hierarchy; variable measurements discussed in Research Design section.

Figure 1. Interaction of subordinate and dominant in a social hierarchy

terminating their bilateral alliance (Leeds et al., 2002). By 1955, however, Yugoslavia moved back up in the Soviet hierarchy, with the two states reconciling and exchanging ambassadors (Priestland, 2009: 332–333).

A state's degree of subordination, in absolute and relative terms (in relation to the target/challenger), may affect its likelihood of challenging and being punished. Table I shows the frequencies of challenges and punishments among the subordinates within the US hierarchy. We can see, in particular, that challenges by states with higher subordination (in relation to targets) are less frequent than vice versa (46% vs. 54%), despite a substantially lower frequency of punishments against such challenges (13% vs. 42%). While the results depicted in Table I do not account for strategic behavior, they provide some preliminary evidence that state behavior may be affected by their positions within social hierarchies.

A model of social hierarchy and conflict

I model the above argument as a two-player, non-cooperative game with private information and solve it using the quantal response equilibrium (QRE) concept (McKelvey & Palfrey, 1998; Signorino, 1999). The formal model helps flesh out the potential alliance–'emboldedness' dynamic induced by social hierarchy, while also acknowledging the endogenous relationship between the degree of subordination and the relative degree of subordination: an increase in a state's degree of subordination both raises its own utility for the status quo, and also reduces its likelihood of being punished by the dominant (since its relative degree of subordination also increases). The model extends previous work by shifting the focus from material to ideational power relationships among states.

Consider a game between a dominant state, D, and a subordinate state, S. Both actors are rational and pursue actions that maximize their expected utility. Additionally, two other actors influence the payoffs of S and D: the target of the subordinate state's challenge, T, and the
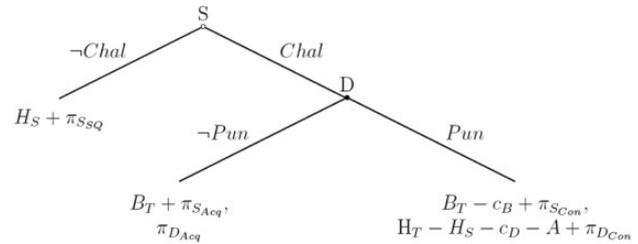
presence of an alternative dominant, A. I normalize parameter values between 0 and 1, unless otherwise denoted. The extensive form game is depicted in Figure 1.

In the first stage, S chooses whether to challenge the status quo. If S does not challenge, the game ends with the status quo outcome, SQ. If S challenges, the game moves to the second stage where D decides whether to punish. If D does not punish, the game results in acquiescence by the dominant state, Acq. If D punishes, then the game ends with the conflict outcome, Con.

In addition to utilities, each payoff includes private information known only to player i. Private information captures uncertainty regarding the other state's true intentions and may represent a state's efficiency or resolve in coping with (levying) punishments (Signorino, 1999). Private information is denoted as π_{i_j}, where i represents the player and j an outcome. Neither $\neg i$ nor the analyst knows the value of π_{i_j}; they do, however, know its mean and distribution. π_{i_j} are assumed to be independently and identically normally distributed with mean 0 and variance σ^2. When σ^2 is small, $\neg i$ and the analyst have a better idea of i's utility from each outcome.

The payoff for SQ reflects reflects S's degree of subordination within D's hierarchy, H_S, and private information $\pi_{S_{SQ}}$. As H_S increases, S places greater importance on adhering to the policies of D. A state with high H_S, such as Great Britain, for example, is unlikely to act against US interests in the Middle East by selling Iran centrifuges. S's status quo utility can be written as $U_S^*(SQ) = H_S + \pi_{S_{SQ}}$.

S's payoffs for both Acq and Con include its expected benefits, B_T, from challenging by initiating conflict against T. Since the goal of the model is to isolate the dominant–subordinate interactions, rather than explicitly modeling S's interaction with T, I assume that S has calculated its expected utility from fighting T (for similar modeling assumptions, see Powell, 1999: Appendix 5). A state that has territorial claims with a neighbor, such as Nicaragua's claims against Columbia

in the San Andres Archipelago, has an expectation of the benefits/costs of resolving the claim.

The *Con* payoff also includes a cost parameter, c_S, which captures the costs that S pays as a result of being punished ($0 < c_S \leq 1$). This parameter ensures that S prefers *Acq* to *Con* and reflects that punishments involve some cost. Returning to the Nicaragua–Columbia example, should Nicaragua decide to invade San Andreas, it would prefer that the USA not respond with sanctions. The payoffs also include the private information terms $\pi_{S_{Acq}}$ and $\pi_{S_{Con}}$. More formally, the utilities for the outcomes are $U_S^*(Acq) = B_T + \pi_{S_{Acq}}$ and $U_S^*(Con) = B_T - c_S + \pi_{S_{Con}}$.

D's payoff for *Con* includes the relative subordination between T and S, or $H_T - H_S$.[4] As $H_T - H_S$ increases in value, so does D's expected utility from punishment (*Con*). In other words, D derives greater benefit from punishing challenges, directed against targets with higher subordination (compared to the challenger): for example, when Japan or South Korea receive threats from North Korea.[5] A cost parameter, c_D, is included to model D's costs of punishing ($0 < c_D \leq 1$). To account for the presence of alternative dominants, D's payoff from *Con* also includes S's degree of subordination to an alternative dominant, A. A represents the expected costs of intervention by an alternative dominant, should D choose *Pun*; hence, A serves as a deterrent on the dominant from punishing (the alternative dominant may intervene to fulfill its own obligation to defend its subordinates). I also include the private information term, $\pi_{D_{Con}}$. Finally, D's payoff for *Acq* includes only its private information, $\pi_{D_{Acq}}$. Formally, $U_D^*(Con) = H_T - H_S - c_D - A + \pi_{D_{Con}}$ and $U_D^*(Acq) = \pi_{D_{Acq}}$.

Equilibria

The best response of a player is conditioned by the observable portion of the games (H_S, H_T, B_T, c_S, c_D, A), the known distributions of the unobservable terms ($\pi_{S_{SQ}}$, $\pi_{S_{Acq}}$, $\pi_{S_{Con}}$, $\pi_{D_{Acq}}$, $\pi_{D_{Con}}$), and the history of the game. Players make their decisions based on random utility assumptions, selecting the best choice available to them based on the equilibria distribution of their

opponent's choices (McKelvey & Palfrey, 1998: 9–10). More intuitively, players make strategic choices based on the expected action of the other player, and the game's equilibria are probabilistic.[6]

The game is solved backwards, by first solving for D's equilibria choice and then using this to inform S's equilibrium choice. D chooses *Pun* if and only if $U_D^*(Con) > U_D^*(Acq)$. Thus,

$$
\begin{aligned}
p_{pun} &= \Pr[H_T - H_S - c_D - A + \pi_{D_{Con}} > \pi_{D_{Acq}}] \\
&= \Pr[\pi_{D_{Con}} - \pi_{D_{Acq}} < H_T - H_S - c_D - A] \\
&= \Phi\left[\frac{H_T - H_S - c_D - A}{\sqrt{\sigma_{\pi_{D_{Con}}}^2 + \sigma_{\pi_{D_{Acq}}}^2}}\right]
\end{aligned}
\tag{1}
$$

where p_{pun} is the probability that D chooses to play *Pun* and $\Phi(\cdot)$ is the normal cumulative distribution function (cdf). This implies that $1 - p_{pun}$ is the probability that D selects $\neg Pun$.

The numerator in Equation 1 represents the observed components of D's utility from *Pun*. The denominator in Equation 1 represents the amount of uncertainty S has regarding D's utility. When S (and the analyst) are more certain, p_{pun} is closer to either 0 or 1, while less certainty moves p_{pun} closer to 0.5.

Moving up the game tree, we can derive S's equilibrium strategies. When calculating its expected utility from *Chal*, S takes into account D's expected actions. This means that S conditions its utility for *Acq* and *Con* based on the probability that D plays *Pun*, or p_{pun}. That is, $U_S^*(Chal) = (1 - p_{pun})(U_S^*(Acq)) + p_{pun}(U_S^*(Con))$. The utility for playing $\neg Chal$ is simply $U_S^*(SQ)$. S selects *Chal* if and only if $U_S^*(Chal) > U_S^*(SQ)$. This inequality yields:

$$
\begin{aligned}
p_{chal} &= \Pr[p_{pun}(B_T - c_S + \pi_{S_{Con}}) \\
&\quad + (1 - p_{pun})(B_T + \pi_{S_{Acq}}) > H_S + \pi_{S_{SQ}}] \\
&= \Pr[p_{pun}(\pi_{S_{Con}}) + (1 - p_{pun})\pi_{S_{Acq}} - \pi_{S_{SQ}} \\
&\quad < p_{pun}(B_T - c_S + \pi_{S_{Con}}) \\
&\quad + (1 - p_{pun})(B_T + \pi_{S_{Acq}}) - H_S] \\
&= \Phi\left[\frac{p_{pun}(B_T - c_S) + (1 - p_{pun})(B_T) - H_S}{\sqrt{p_{pun}^2 \sigma_{\pi_{S_{Con}}}^2 + (1 - p_{pun})^2 \sigma_{\pi_{S_{Acq}}}^2 + \sigma_{\pi_{S_{SQ}}}^2}}\right]
\end{aligned}
\tag{2}
$$

where p_{chal} is the probability that S selects *Chal* and $\Phi(\cdot)$ is the normal cdf. This implies that $1 - p_{chal}$ is the probability that S chooses $\neg Chal$.

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[4] This is analogous to Savun (2008), who argues that a mediator's relative bias for/against claimant A compared to B, rather than its bias for/against A, affects mediation outcomes.

[5] Though $H_T - H_S$ can take on negative values, this does not mean that D prefers 'challenge' to 'not challenge'; this merely reflects that D views some targets as more valuable than others.

[6] QRE is consistent with other Nash-based concepts, such as perfect Bayesian equilibrium.

The numerator in Equation 2 contains the difference in S's expected utility for playing *Chal* and $\neg Chal$. S is more likely to choose *Chal* when the observable parts of $U_S(Chal)$ increase relative to those of $U_S^*(SQ)$. The denominator again represents uncertainty, only this time, the uncertainty is conditioned by the beliefs p_{pun} and $1 - p_{pun}$.

Equilibrium outcome probabilities are calculated from the products of the choice equilibria of each player. The probability of observing the status quo is the same as the probability that S plays $\neg Chal$. The probability that D acquiesces is equal to the product of S playing *Chal* and D playing $\neg Pun$. Lastly, the probability of conflict is the product of S playing *Chal* and D playing *Pun*.

$$\Pr(SQ) = 1 - p_{chal} \tag{3}$$
$$\Pr(Acq) = p_{chal}(1 - p_{pun}) \tag{4}$$
$$\Pr(Con) = p_{chal}p_{pun} \tag{5}$$

Empirical implications

The equilibria lead to a number of testable propositions. I focus on two here.

The first proposition links the changes in the degree of subordination between a subordinate and dominant state to the likelihood of observing a challenge.

Proposition 1: (For proof, see Online appendix.) Assuming that the subordinate state has at least a moderate amount of uncertainty regarding the dominant's expected utilities, p_{chal} decreases as H_S increases. Thus, the probability of a challenge is negatively correlated with the degree of subordination.

A change in H_S has both a direct and an indirect effect on the utility of the subordinate (note p_{pun} in Equation 2). These effects act in opposite directions: an increase in subordination decreases the likelihood of a challenge (direct effect), yet it also decreases the probability that the dominant will punish, as the relative target–challenger subordination decreases (indirect effect). The indirect effect represents a moral hazard – a possible emboldening effect of closeness to the dominant (Machain & Morgan, 2013; Smith, 1995). Assuming that players are at least moderately uncertain regarding other's expected utilities, however, the direct effect is necessarily larger than the indirect effect, because the indirect effect enters S's utility as a part of the probability of punishment term, while the direct effect faces no such constraint. Despite its outstanding territorial claim against Belize (and its military

superiority), Guatemala is highly subordinate to the USA and, thus, unlikely to pursue military options. It is not emboldened by its higher (relative to Belize) position in the US hierarchy, as long as there is some uncertainty regarding a US response.

Hypothesis 1: States with higher subordination are less likely to challenge the status quo.

The second proposition concerns the relationship between the relative degree of challenger–target subordination and the probability of observing a punishment.

Proposition 2: (For proof, see Online appendix.) The probability of a punishment, p_{pun}, is positively affected by the relative difference in subordination between the target and challenger, $H_T - H_S$.

Proposition 2 suggests that, from the perspective of a dominant, not all challenges are equally disruptive. When deciding whether to punish a challenge, the dominant considers the *relative degree of subordination* between the challenger and the target. The dominant is less likely to punish challenges against targets with lower levels of subordination (relative to the challenger). For instance, even though the USA did not authorize the Israeli bombing of an Iraqi nuclear facility in 1981, Israel faced only minor repercussions for this action.

Hypothesis 2: Dominant states are more likely to punish challenges against targets with greater subordination relative to the challenger.

This theoretical insight contributes and extends the general deterrence literature by treating the status of a protégé as continuous and relational rather than as a binary measure. The concept of general deterrence is enriched by considering the implicit threat of retaliation as dependent on the location of the target and aggressor within dominant's hierarchy. The challenger's decision to attack a target is affected by the target's relative degree of subordination and the associated risk of punishment.

Research design

The above theoretical framework is very general: one can use it to study the effects of social hierarchy at the regional or global level, or even in the presence of several competing dominant states. The empirical tests conducted in this article, however, focus on exploring the effects of US social hierarchy between 1950 and 2000. Appropriate to this time period, the USA is treated as the

dominant state, the USSR/Russia is treated as an alternative dominant, and all other states are coded as subordinates with varying degrees of subordination to either dominant.[7]

The unit of analysis is the directed-dyad-year. Directed-dyad-years account for both the actions of state A towards state B and state B towards state A. This unit of analysis allows for identification of the conflict initiator in the first stage of the analysis – the challenger of the status quo – and whether this action is punished by the dominant state in the second stage. The analysis is temporally constrained to 1950–2000 due to data availability on the degree of subordination explanatory variable. I measure subordination using data originally generated by Lake (2009: Ch 3). I have data for 141 countries, which yields a sample of 549,576 non-missing observations.

Methodology

I conduct the analysis using a two-stage strategic probit model (Bas, Signorino & Walker, 2008). A two-stage strategic probit is effectively a recursive system of equations, where parameter estimates from later stages are used to improve estimates from earlier stages, that is, statistical backwards induction (Bas, Signorino & Walker, 2008: 26–27). The estimator is able to separate the constraining effects of social hierarchy (i.e. the preference for the status quo) from the deterring effects of punishment, which is achieved by accounting for the challengers' *strategic* selection of targets.[8] A failure to model this selection effect would produce biased estimates and incorrect inferences (Signorino & Yilmaz, 2003).

In substantive terms, the estimator treats subordinate states as able to calculate their expected utilities from a challenge by estimating the probability of a punishment from other observed cases of challenges. The subordinate uses this estimated probability, or belief regarding the threat of punishment, to weigh its costs and benefits from challenging the status quo. This allows the estimator to isolate the independent effects of the predictors, such as the pacifying effects of subordination, from the deterring effects of military capabilities and relative target–challenger subordination, since both *challenge* and *punishment* have their own equation within the random utility model.
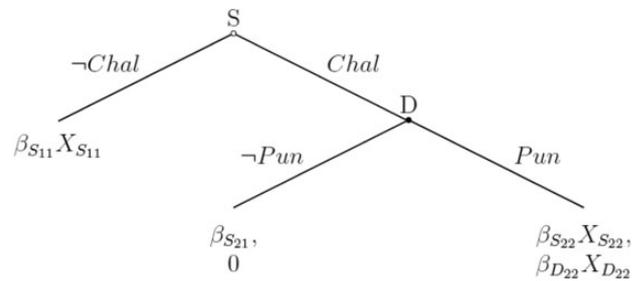

Figure 2. Specification of strategic probit estimator

Figure 2 displays the empirical specification of the strategic model, where the observable components of the theoretical model are represented by a set of regressors X_{i_j}. The discrete nature of actor choices in Equations 1 and 2 allows for estimating the parameters of these regressors using two probit models, assuming variance is normally distributed with $\sigma^2 = 1$ (Bas, Signorino & Walker, 2008). Consistent with the functional form of the theoretical model, I first estimate the probability of a punishment (Equation 2).[9] This provides estimates for $\beta_{D_{22}}$ as well as for p, the subordinate's belief that the dominant punishes a challenge.

The subordinate's expected value for challenging can be calculated by multiplying p and the regressors $X_{S_{22}}$, while the constant from the *Acquiesce* outcome is multiplied by $(1 - p)$. The modified regressors are necessary to account for the expected action of the dominant state when challenging. These modified regressors and the unmodified status quo regressors $X_{S_{11}}$ are then used in a probit model to identify the probability that the subordinate challenges (Equation 1).[10] Finally, I calculate the standard errors for coefficients related to the subordinate's action using non-parametric bootstraps, because the subordinate's choice is conditioned by the expected action of the dominant (Bas, Signorino & Walker, 2008: 29).

Dependent variables

The first dependent variable – *Challenge* – indicates whether a state challenges the status quo. Given US frequent military involvement, its willingness to form coalitions, and, more generally, its military capabilities and global interests, I argue that any challenger prefers to act as part of a coalition with the USA, if at all possible.[11]

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[7] For the sake of consistency, states not aligned with either of the dominants are defined as subordinates with 0-degree of subordination, and make up the plurality of the sample (approximately 61%).

[8] In contrast to a bivariate selection model, strategic models treat an actor's choice in the first stage as a function of both its own expected behavior and the expected behavior of the other actor in the second stage.

[9] The dominant's utility from acquiesce outcome is normalized to 0.

[10] The same variable cannot be included in every outcome or the model cannot be identified. I exclude a constant in $X_{S_{22}}$.

[11] Great powers have a higher than average tendency toward conflict initiation (Chiba, Machain & Reed, 2014), and frequently build coalitions prior to initiating conflicts (Krahmann, 2005).

A failure to convince the USA to support the conflict from day one is, therefore, indicative of a lack of US support, and hence, constitutes a *challenge* (at least in a nominal sense).[12]

Then, in accordance with this article's theoretical framework, international disputes in the second half of the 20th century can be thought of as falling into one of two categories: (1) those initiated by the USA or by another state with US support or authorization, and (2) those that were initiated without US authorization. The latter group of disputes constitutes challenges – to some degree – of the US-established status quo. The strength of the challenge – captured in this study by the concept of relative target–challenger subordination – is an independent variable influencing how the USA responds to a challenge and is discussed later.

Challenge, therefore, is a dichotomous variable coded as 1 if state A initiates a militarized interstate dispute (MID), defined as the threat, display or use of military force, without the USA as an originator on the same side. An independent dispute initiation is treated as an attempt to alter the status quo without approval from the dominant state. MID data are obtained from the Correlates of War project (Palmer et al., 2015). I exclude joiners – states which become conflict participants after the first day of a dispute – because they did not initiate the conflict, but may have been drawn in by an alliance or saw fighting spill over onto their soil (e.g. Syria's involvement in a 1994 clash between Israel and Lebanon).

Given the general willingness of the USA to resort to military means when it seeks international change, as well as its tendency to form coalitions or aid allies, states that initiate conflict without initial US support must find their existing situation unacceptable and are unwilling to compromise their aims to the extent that is necessary to gain US support (Morrow, 1991: 909). While the USA may offer to support an ally's aggressive actions later, the lack of the initial US support suggests that it did not want the conflict to occur, at least at that particular time.

Hence, such conflict initiation represents at least a nominal challenge to US authority.

The second dependent variable represents the dominant's (coercive) responses to challenges – *Punishments*. *Punishments* are operationalized as a dichotomous variable indicating whether the USA either initiated a MID or issued economic sanctions against the challenger in the same or following year as the challenge. MIDs and economic sanctions are only considered a *Punishment* if the subordinate has already initiated a *Challenge*. Data related to the threat or use of sanctions are gathered from the Threat and Imposition of Sanctions (TIES) dataset (Morgan, Krustev & Bapat, 2006). Sanctions are coded as 'actions such as tariffs, export controls, embargoes, import bans, travel bans, freezing assets, cutting foreign aid, and/or blockades' (Morgan, Krustev & Bapat, 2006: 1). The measure includes both military and economic actions, since they may be substitutes (Peterson & Drury, 2011). In the sample, about 26% (169/652) of all *Challenges* are *Punished*. Approximately 64% (109/169) of all *Punishments* within the sample involve MIDs – about one-fifth of which are used in conjunction with economic sanctions (34/109) – with the exclusive use of economic sanctions making up the remaining 36% (60/169).

Independent variables

I argue that subordination increases the subordinate's value for the status quo ($X_{S_{11}}$). The measures of subordination are obtained from Lake (2009: Ch. 3) and are measured on a continuous scale, consistent with the theory developed here.[13] Subordination is measured along two dimensions: security and economic.[14] *US security subordination* is operationalized as the composite of two measures. The first is based on the number of US *Military personnel*. It is measured as $\frac{\text{No. of Military personnel}}{\text{No. of Host population}}$. Lake (2009: 69) argues that 'to the extent that B accepts A's personnel on a continuing basis, this control can be regarded as legitimate and, therefore, authoritative' (see also Morrow, 1991: 905). A subordinate's acceptance of the dominant's troops signals a (tacit) acceptance of its authority. The measure models the relational nature of hierarchy: both the dominant and the subordinate must

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[12] A possible alternative way of 'authorizing' aggressor action is via arms transfers. Evidence regarding arms transfers inciting interstate conflict, however, is mixed. While the initial transfer of arms is found to produce more aggressive foreign policies, arms dependence restrains this effect (Kinsella, 1998). Thus, the presence of arms transfers on its own does not necessarily indicate support for initiating a conflict, nor does it identify an approved target. In contrast, involvement as a conflict originator is a clear signal of support.

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[13] To ease temporal comparability, each subordination measure is normalized to 1 by dividing by the highest value in 1995 (Lake, 2009: 69).

[14] The formal model makes no a priori assumption regarding the number of hierarchies that may affect conflict behavior. I include both security and economic issue dimensions because these have traditionally been the most salient within IR research.

agree to the troop placements (e.g. the territory holds strategic value).[15]

The second measure of *US security subordination* is related to the number of allies that the subordinate shares with the dominant as a proportion of all formal alliances. The logic here is that states with non-diversified alliance portfolios are more accepting of the dominant state's foreign policy (Morrow, 1991). The measure implies that alliance networks anchored around key states provide more information about foreign policy preferences than a more general measure of alliance similarity. *Shared alliances* is measured as $\frac{1}{\text{State } i\text{'s no. of independent alliances}}$, where state i is assumed to always be allied with itself, to avoid undefined values. The security subordination variables are not highly correlated ($r = 0.17$), suggesting they are capturing different aspects of security hierarchy. Higher values of either measure are associated with greater security subordination.

The second dimension captures *US economic subordination*. This is also the composite of two measures. The first is related to exchange rates. A state's autonomy over its exchange rate directly affects its control over its monetary policy and, therefore, proxies the level of economic subordination. This measure seems an especially appropriate measure of authority 'since exchange rates are typically chosen with only minimal pressure from the anchor country, but are nevertheless constraining' (Lake, 2009: 73). *Exchange rate* is coded on a four-point scale using IMF measures where higher scores indicate greater subordination. These are, in order of most to least autonomous: floating exchanges, crawling peg, fixed exchange, and 'merged' or 'dollarization'. Floating exchange rates change value according to market forces and include most of the world's major currencies (e.g. the Euro, Japanese yen, British pound, and US dollar). Crawling pegs are currencies that 'float' within a specified range of a foreign currency or a bundle of foreign currencies (e.g. Chinese yuan). Fixed exchange rates were used by most countries during the 1950s and 1960s under Bretton Woods. Lastly, dollarization refers to pegging one's currency directly to a foreign currency, such as the US dollar (e.g. Panama).

The second measure captures subordinates' trade dependence on the dominant compared to other major powers in the system. Similar to the independent allies argument, failure to diversify trading partners is viewed as an acceptance of the dominant's hierarchy. *Trade dependence* is measured as

$$\frac{(\text{State } i\text{'s trade with the US}) - (\text{State } i\text{'s trade with other major powers})}{\text{State } i\text{'s GDP}}$$

where state i's trade with other major powers is truncated at zero.[16] As with security measures, measures of economic subordination are not highly correlated ($r = 0.23$).

The measures of subordination, described above, capture a contractual relational power that exists independent of coercive military power. In fact, neither the *Security* nor *Economic* dimensions of subordination are highly correlated with traditional measures of military power, such as *Power ratio* ($r = -0.09$ and $r = 0.01$, respectively). This means that a stronger state in terms of coercive capabilities, such as Great Britain or Japan, is nearly as likely to defer to the USA as leader of a social hierarchy, as a weaker state, such as El Salvador or New Zealand. Finally, *Security* and *Economic subordination* capture different types of hierarchy, as they are only correlated at $r = 0.25$.

The second primary explanatory variable is *Relative target–challenger subordination*, which affects the likelihood that the dominant punishes a challenge ($X_{D_{22}}$). *Relative target–challenger subordination* reflects the hierarchical position of a challenger in reference to a target state within a dominant state's social hierarchy. As noted earlier, the dominant does not equally weigh all challenges. This variable represents the severity of a challenge as it is viewed by the dominant state; hence, *Relative subordination* is measured as the difference between target and challenger for all subordinate dyads along both the security and economic dimensions. Thus, targets with greater relative subordination (than the challenger) have positive values on *Relative Subordination*: the dominant has a greater utility of punishing challenges against such targets.[17] This measure captures the importance of a challenge to the US.

To account for the presence of an alternative hierarchy, I create a variable which captures a state's subordination to the USSR/Russia within the security domain –

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[15] Even in cases of postwar occupation, host governments influence whether to continue the arrangement – for example, contrast West Germany and contemporary Afghanistan.

[16] Other major powers are defined as Great Britain, China, France, and Russia. Lake's original data do not include trade dependence or composite economic subordination figures for these powers; I calculate these and include them in the analysis.

[17] When the challenger has greater relative subordination than the target, *Relative subordination* takes on negative values. This, of course, does not mean that the dominant prefers that the challenger attacks these targets, only that these targets are less important to the dominant.

Table II. Control variables and measures

Variable	Utility	Sign	Measure
USSR/Russia security subordination [a]	$X_{D_{22}}$	−	$\frac{1}{\text{State } i\text{'s no. of independent alliances}}$
Power ratio [b]	$X_{D_{22}}, X_{S_{22}}$	+,+	$\frac{\text{CINC A}}{\text{CINC A}+\text{CINC B}}$
Power ratio squared [b]	$X_{D_{22}}, X_{S_{22}}$	−,−	$\left(\frac{\text{CINC A}}{\text{CINC A}+\text{CINC B}}\right)^2$
Power change [b]	$X_{D_{22}}$	+	$\text{CINC}_t - \text{CINC}_{t-1}$
Civil war [c]	$X_{S_{22}}$	−	Binary: 1 if civil war
Ongoing US MIDs [d]	$X_{D_{22}}$	−	Count of US MIDs at t
Previous challenge [d]	$X_{D_{22}}, X_{S_{22}}$	+,−	Count of previous challenges at t
Contiguity [e]	$X_{S_{22}}$	+	Binary: 1 if shared border
Distance [e]	$X_{D_{22}}$	−	Log(Distance + 0.01)
Trade [f]	$X_{S_{22}}$	unclear	$\frac{\text{Trade A}+\text{Trade B}}{\text{GDP A}}$
Joint democracy [g]	$X_{D_{22}}, X_{S_{22}}$	−,−	Binary: 1 if both ≥ 6 on Polity2
Alliance [a]	$X_{S_{22}}$	−	Binary: 1 if defense pact

[a]Gibler (2009); [b]Composite Index of National Capabilities (CINC) (Singer, 1987); [c]Sarkees (2000); [d]Palmer et al. (2015); [e]Bennett & Stam (2000); [f]Barbieri, Keshk & Pollins (2009); [g]Marshall & Jaggers (2008).

USSR/Russia security subordination. USSR/Russia security subordination is analogous to *US security subordination*, yet is limited to just the shared alliances measure. Greater USSR/Russia subordination is expected to deter the USA from punishing, as a punishment may trigger USSR/Russia involvement (i.e. the alternative dominant may seek to fulfill its obligation to defend subordinates within its *own* hierarchy).

The literature identifies a number of material factors that influence interstate conflict, such as power ratio, shared borders, and joint democracy, among others (e.g. Russett & Oneal, 2001). Table II lists the full set of control variables, which equation they are included in, their expected effect, and how they are measured.[18] Control variables are discussed in more detail in the Online appendix.

Empirical analysis

Table III presents the results of the strategic probit estimation.[19] Following the practice in the literature (e.g. Nieman, 2015), the table of results is subdivided into four parts, which correspond to each of the estimated equations: *Dominant's conflict*, *Subordinate's status quo*,

Subordinate's acquiescence, and *Subordinate's conflict*. Positive (negative) coefficients are interpreted as increasing (decreasing) the corresponding actor's utility from the given outcome. For example, a positive coefficient under *Subordinate's status quo* indicates that the associated regressor increases the subordinate's utility from the status quo and, all else equal, decreases its likelihood of challenging.

The coefficient on *US security subordination* is positive and statistically significant in the *Subordinate's status quo* equation, while the coefficient on *US economic subordination* is insignificant. The positive result on *US security subordination* indicates that states with higher levels of subordination (in the security hierarchy) are more likely to value the status quo, relative to other outcomes (i.e. conflict and acquiescence). This is consistent with Hypothesis 1, which posited an inverse relationship between states' degree of subordination and the probability of challenging.

Relative US security subordination is positive and statistically significant in the *Dominant's conflict* equation. This indicates that the dominant is more likely to punish challengers, when the target has a higher relative subordination (than the challenger) within the US security hierarchy. The coefficient on *Relative US economic subordination* is statistically significant at the 0.1 level, offering evidence that 'low politics' are an important consideration in the dominant's punishment calculus. These results provide support for Hypothesis 2, which posited that a dominant is more likely to punish challenges that are directed against targets with higher relative subordination.

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[18] Nieman (2015: 438–439) demonstrates that strategic models are relatively robust to inclusion of spurious variables, and even to variable misplacement in utility equations.

[19] See the Online appendix for robustness checks, including various operationalizations of the dependent variables, inclusion of a Cold War dummy variable, and other model specifications.

Table III. Militarized challenge and punishment in US hierarchy

Actor	Subordinate		Dominant	
Status quo equation:				
US security subordination	0.185**	(0.056)		
US economic subordination	0.001	(0.048)		
Constant	4.456**	(0.240)		
Acquiesce equation:				
Constant	1.400**	(0.258)		
Conflict equation:				
Relative US security subordination			1.032**	(0.214)
Relative US economic subordination			0.284†	(0.160)
USSR/Russia security subordination			−0.393	(0.275)
Challenger–target power ratio	4.788**	(0.806)		
Challenger–target power ratio ^{2}	−4.016**	(0.690)		
Dominant–subordinate power ratio			0.361**	(0.081)
Dominant–subordinate power ratio ^{2}			−0.243**	(0.049)
Power change	−0.111	(0.380)		
Ongoing US MIDs			0.080*	(0.047)
Civil war	0.495**	(0.169)		
Previous challenge	0.725**	(0.060)	−0.054*	(0.021)
Contiguity	3.273**	(0.166)		
Distance			−0.255**	(0.096)
Trade	4.600	(3.284)		
Challenger–target joint democracy	−1.025**	(0.232)		
Dominant–subordinate joint democracy			−0.439**	(0.144)
Challenger–target alliance	−0.440*	(0.208)		
Constant			−10.939**	(3.299)
Log-likelihood	−4,054.323		−314.118	
Observations	549,570		652	

**$p < 0.01$, *$p < 0.05$, †$p < 0.1$, two-tailed; subordinate standard errors are bootstrapped (500 simulations).

It is worth noting that the *USSR/Russia security subordination* is negative and statistically significant (*p*-value < 0.1, one-tailed). This indicates that the USA is less likely to punish challengers who are subordinate to USSR/Russia. Most of the other control variables have the expected effects or are statistically insignificant. A few of the results are surprising. Subordinate states engaged in *Civil war* are more likely to initiate challenges in the *Subordinate's conflict* equation. This may highlight the transnational aspects of civil war (Salehyan & Gleditsch, 2006). *Trade* is also positive and statistically significant (*p*-value < 0.1, one-tailed), suggesting that, once social hierarchy is accounted for, increased trade between subordinates may be associated with a greater probability of conflict.

Table III, of course, does not provide an easy way to gauge the net effect of social hierarchy, which enters the model in two separate ways – in the *Subordinate's status quo* equation (via the *Subordination* variables) and in the *Dominant's punishment* equation (via the *Relative*

subordination variables). To account for the net effect of changes in a state's subordination, Figure 3 presents predicted probabilities for each of the three outcomes (*status quo, acquiescence*, and *conflict* between the dominant and challenger). Predicted probabilities are calculated by varying the challenger's *Security subordination*, while holding the target's *Security subordination* constant at either the 5th, 50th, or 95th percentile (to reflect targets with low, medium, or high degree of subordination).[20] To make the predicted probabilities more substantively meaningful, I examine each outcome for the situation where challengers share a border with the target, while all other variables are held at their median values.

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[20] Increasing/decreasing challenger's (absolute) subordination leads to increases/decreases in the relative subordination between challenger and target (even though target's subordination remains constant in absolute terms).
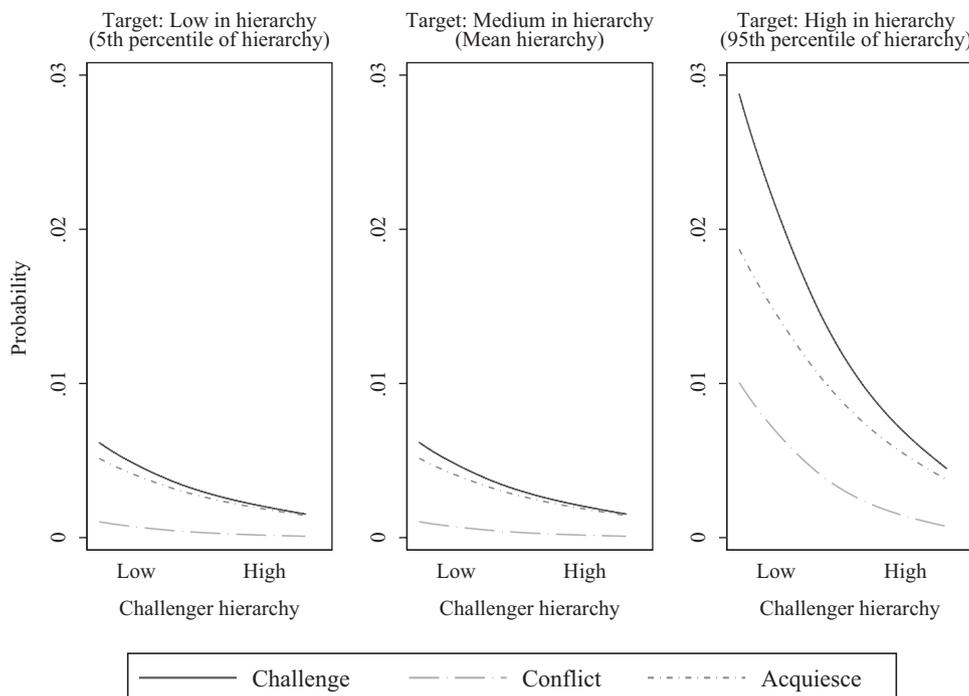
Figure 3. Predicted outcomes at varying levels of security hierarchy
Predicted probabilities for contiguous states with all other variables held at median.

Figure 3 illustrates four substantively important results. First, increasing challenger's subordination (going from left to right within each subfigure) is associated with a declining probability of challenge (solid line). This is consistent with the theoretical expectation that states with greater subordination are more accepting of the status quo and are less likely to challenge. Second, dominants are always more likely to acquiesce (short dashed line) than punish/engage in conflict with the challenger (long dashed line). Third, comparing the probability of conflict (long dashed line) among the three subfigures (from left to right), we can see that there is a positive relationship between the target's subordination and the probability of dominant–subordinate conflict. The probability of conflict is greater as we move from targets with low to medium subordination, and as we move from the targets with medium to high subordination.

Fourth, comparing the probability of challenge (solid line) among the three subfigures (from left to right) shows that the targets with greater (relative) subordination are at the highest risk of being attacked, even though such challenges are the most likely to be punished by the dominant (as demonstrated in Figure 4 and discussed below). The higher rate of challenges against

highly subordinate targets (compared to challenges against targets with moderate or low subordination) provides face validity to the conceptualization/measure of *challenge*, adopted here. In other words, we should expect that, if independently (of the USA) initiated military conflicts are indeed challenges to the US hierarchy (rather than just expressions of settling scores among states), then most of such conflict initiation will be directed against states that are more subordinate to the USA, as they are. For example, unable to reach the USA, North Korea frequently threatens Japan – a state with high security subordination to the USA. Similarly, Iran has frequently linked its threats to the USA with its threats to Israel.

Finally and related to the previous result, highly subordinate challengers (the right-hand side of each subfigure) are more likely to initiate challenges against highly subordinate targets than against targets with moderate or low subordination. Taken together with the first point above, this result suggest an intriguing pattern of behavior among US subordinates: states with high subordination rarely challenge, but when they do, they tend to attack highly subordinate targets. This may be a result of selection: that is, US subordinates only select into independent conflicts
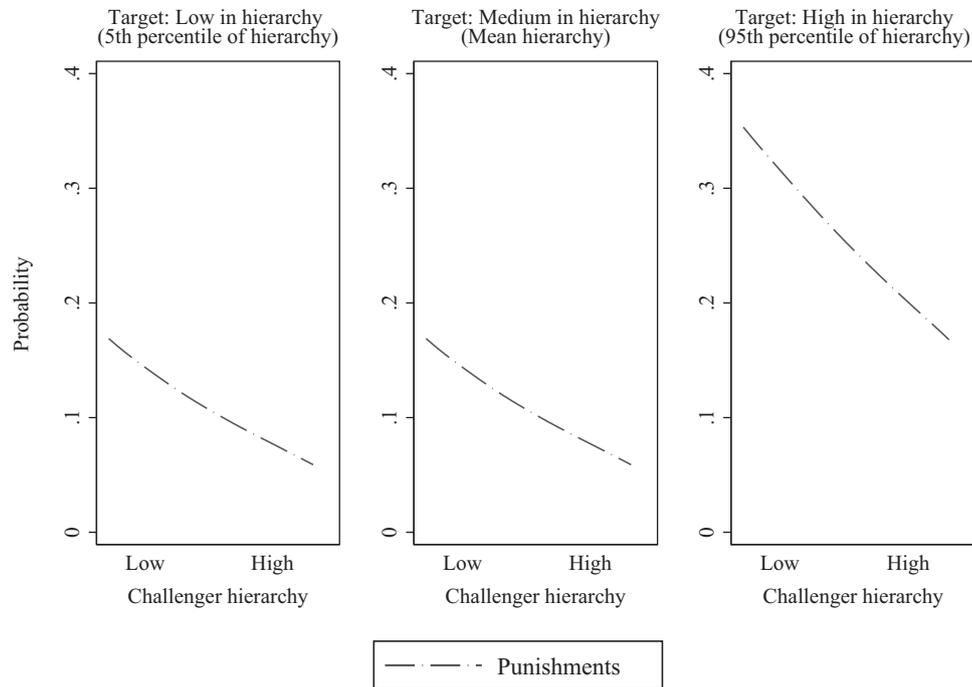
Figure 4. Proportion of punishments if a security challenge occurred
Predicted probabilities for contiguous states with all other variables held at median.

when they are highly motivated and, thus, are less likely to be deterred. Another possible explanation is that the result is an artifact of the data: hierarchy tends to be clustered geographically. Though militarized disputes are rarely observed in Latin America and Western Europe, those that take place tend to involve two states that are close to the USA (as most states in these regions are highly vested in the US security and economic hierarchies).[21]

Figure 4 shows the proportion of challenges that result in conflict, as opposed to acquiescence, on the part of the dominant. If we move from left to right across the subfigures, we can see that the probability of conflict between the dominant and the challenger increases with the targets' degree of subordination. While dominants are always more likely to acquiesce to challenges than to punish, they are especially likely to acquiesce when the target is positioned lower than the challenger than vice versa. This is illustrated by the declining slope of the line as the degree of hierarchy increases in each of the graphs.

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[21] Using the difference in degree of subordination – *Relative US subordination* – helps to properly identify effects that might otherwise be obscured in the presence of spatial clustering. See the Online appendix for models with regional dummies.

Conclusion

The account of social hierarchy developed and tested in this article sheds new light on the strategic causes of international conflict. It highlights that states exist in a strategic environment; rather than simply being a function of dyadic covariates, conflictual and peaceful interactions between pairs of states are affected by factors beyond the dyadic level of analysis. I am able to empirically isolate the effects of social hierarchy on subordinate states' propensity to initiate conflicts from the deterring effects of material power, using a two-stage strategic probit estimator. The results suggest that variation in the degree of authority conferred to a dominant has wide ranging consequences on third-party interactions.

The article suggests several directions for future research. Extending the operationalization of *challenge* to include additional actions, such as shifts between social hierarchies, could help explain other instances where dominant states intervene in other states, such as Russia's incursions into Georgia and Ukraine following their governments' shift towards Europe. Extending the framework to include intra- and extrastate actors would also allow it to intersect with recent work by Bapat (2006), who shows that states that host extrastate terrorist organizations affect the ability of target states to negotiate with terrorist groups. By treating the degree of

subordination of dissatisfied political minorities (to either a domestic or external sponsor) as a continuous variable, we can expand our explanatory power of the political minority groups' decision to mobilize within the existing political structure, or choosing to take up arms

Future research could also explore the interaction between multiple hierarchical dimensions. The empirical results demonstrate, for example, that while *relative target–challenger economic subordination* affects the probability of *punishment*, the challenger's degree of *economic subordination* is not a significant predictor of *challenging*. This suggests that the two different types of social hierarchy impact the behavior of dominants and subordinates in different ways: while subordination within the economic hierarchy matters to dominants, it seems to have a smaller and indirect effect on the decisions of subordinates (by increasing the probability of punishment). Future research could explore the varying deterring effects of hierarchies on the dominant and subordinates, as well as the possible overlap in the effects of different dimensions of hierarchy (e.g. does security hierarchy deter economic challenges?). This direction can also build upon Liu (2014), who explores the effect of language hierarchies on economic activities. Finally, one can explore the role of hierarchies in policy diffusion.

The article may also contribute to several literatures beyond the study of interstate conflict. The theoretical framework is very general; it applies to the broad class of strategic interactions between actors with asymmetrical power, such as government–rebel negotiations during an intrastate crisis, opposition parties or factions bargaining among themselves or with the ruling party, or even the interaction between international investors and borrowers.

Replication data

Replication datasets, command files, and the Online appendix are available from http://www.prio.org/jpr/datasets and www.marknieman.net.

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